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Attaining Sustainable Development Goals (SDGs): New evidence on foreign aid and the "bundling" of domestic revenue mobilization in sub-Saharan Africa

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A G D I Working Paper

WP/22/088

Attaining Sustainable Development Goals (SDGs): New evidence on foreign aid and the “bundling” of domestic revenue mobilization in Sub-Saharan Africa*

Forthcoming: Review of Black Political Economy

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Research Department

Attaining Sustainable Development Goals (SDGs): New evidence on foreign aid and the “bundling” of domestic revenue mobilization in Sub-Saharan Africa**Oludele Folarin & Isiaka A. Raifu****Abstract**

With the global sustainable development goals, it has become imperative for developing countries, especially sub-Saharan African countries, to think inward on ways to increase domestically mobilized revenue. The recovery of the global economy within the last few years has increased foreign assistance inflow into African countries. However, the direction of its impact on domestic mobilized revenue is unclear. This study revisited the relationship between foreign aid and domestic mobilized revenues for 32 sub-Saharan African countries using a more recent and novel dataset on tax revenue. We employed instrumental fixed effect Quantile regression, a novel technique in aid and tax revenue literature. The study findings show that the impact of foreign aid varies across tax revenue distribution. We found a negative and significant effect in countries with high tax effort, while the effect is insignificant in countries with low tax effort. Sub-Saharan African countries, especially those with low tax revenue, need to use foreign aid to strengthen their tax administration and adopt modern tax revenue collection technologies. As a result, sub-Saharan African countries should request advanced countries or donors to provide technical support in tax revenue mobilization.

Keywords: Foreign aid, Tax revenue, Quantile regression, Sub-Saharan Africa.

JEL classification: F35, H2, H27

1. Introduction

Official development assistance (ODA)¹ to African countries stood at an average value of US\$17.5 billion during the 1970s. By the 2010s, it has increased to US\$48.8 billion. Specifically, it was US\$51.8 billion in 2017 (OECD, 2019). Hence, over the last four decades, official development assistance flows into Africa have increased by more than 125%. The high values of ODA flow into Africa with little developmental evidence associated with it has led to renewed interest by academia, policymakers as well as foreign donors in understanding the effectiveness of foreign aid in Africa with contradicting evidence (Addison, et al., 2017; Adedokun, 2017; Asiedu, 2014; Asongu and Nwachukwu, 2017, 2018; Asongu and Tchamy, 2019; Loxley and Sackey, 2008; Mallik, 2008). This study is motivated by the quest to understand the developmental impact of foreign aid in Africa. Instead of examining its impact on economic growth, the study looks at its effect on domestically mobilized revenue. In other words, this study aimed at understanding the effect of foreign aid on the tax efforts by the African governments.

A typical government in developing countries based on its developmental objectives would react to the inflow of foreign aid in any of these three ways: (i) reduce tax revenue; (ii) increase government expenditure and; (iii) repay domestic borrowing (Heller, 1975; Franco-Rodriguez et al., 1998). Whichever way the government adopts; it has its own implication. For instance, an increase in government expenditure as a result of foreign aid has implications on tax revenue. Tax revenue will reduce if the increase in foreign aid inflow is less than government expenditure. However, if government expenditure increases at an amount in excess of foreign aid, the government will increase tax revenue to cover the shortfall in revenue from foreign aid. In addition, repayment of loans now leads to a reduction in future tax payments (i.e. tax burden).

In 2017, Ethiopia, Nigeria, Tanzania, Kenya, Democratic Republic of Congo are the top five recipients of foreign aid in Africa. More than a quarter of official development assistance flows into Africa went to these countries. For instance, Ethiopia received US\$4.1 billion out of US\$52.8 billion in official development assistance flows into Africa in 2017. Figure 1 provides a preliminary relationship between foreign aid and domestically mobilized revenue. Domestically mobilized revenue is low in Africa, this is reflected in the low ratio of tax revenue to gross domestic product. For instance, in 2010 the ratio of tax revenue to gross domestic product stood at 25% and has been

¹In this study, official development assistance and foreign aid means the same thing.

relatively stable at that figure over the last few years (UNECA, 2016). Figure 1 reveals that countries that benefit more from foreign aid have lower tax efforts. A similar pattern was also observed for the decomposition of foreign aid (into grant and loan elements) and tax revenue as presented in Figure 2. This provides an indication that countries that are major recipients of foreign aid have lower tax efforts. Hence, to realize all the sustainable development goals by 2030 in all African countries, domestically mobilized revenue needs to increase substantially (UNECA, 2016). If foreign aid is seen by African governments as free funds or revenue, which in turn discourages them to intensify their efforts to increase domestically mobilized revenue. Then, this suggests that low domestically mobilized revenue will adversely affect the actualization of SDGs in Africa. Since a pivot role is assigned to domestically mobilized revenue due to the huge cost of funding projects required to bring about the actualization of the goals. Hence, there is a need to implement strategies that will spur domestic mobilized revenue in the face of rising official development assistance flows into the continent.

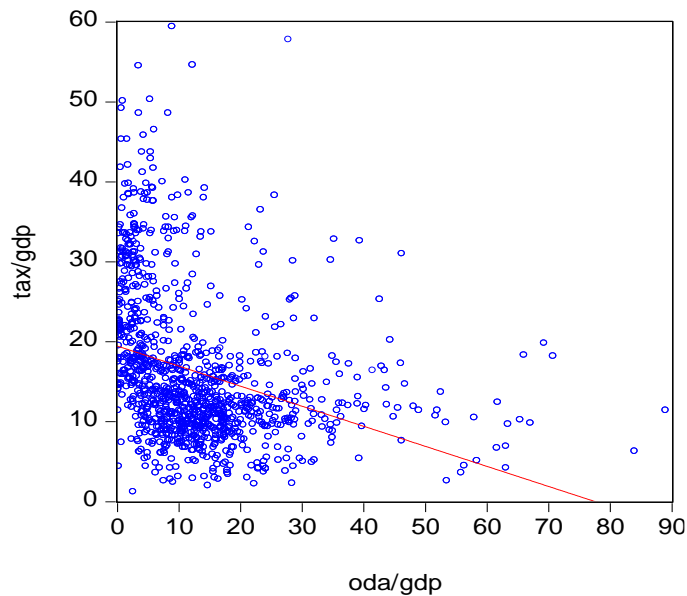


Figure 1: The Scatter diagram showing the relationship between foreign aid and tax revenue

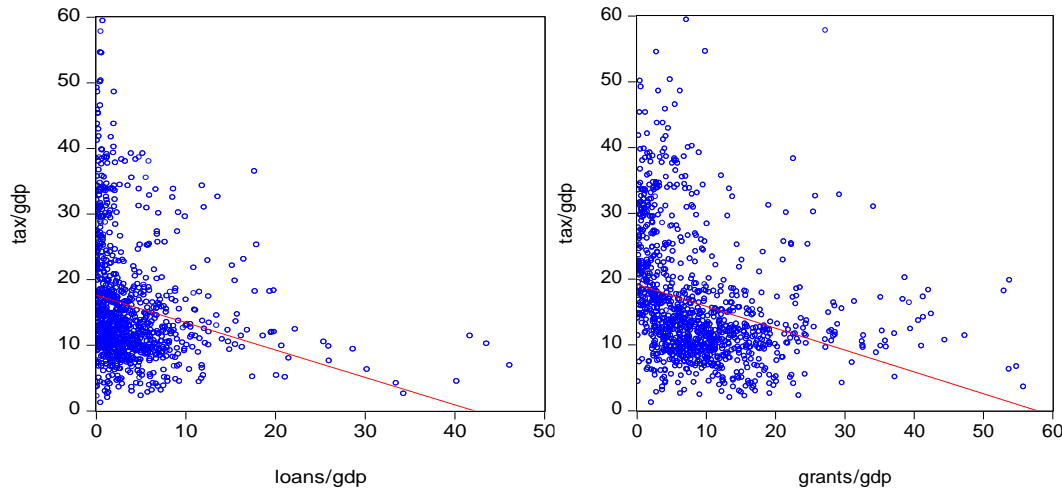


Figure 2: The Scatter diagram showing the relationship between the composition of foreign aid and tax revenue

This study, therefore, will revisit the relationship between foreign aid and domestic mobilized revenues using a more recent and novel dataset on tax revenue developed by UNU-WIDER. The study covers 32 Sub-Saharan African countries spanning the period from 1996 to 2019. To achieve the study objective, fixed effect quantile regression developed by (Machado and Silva, 2019) was employed. This method of estimation allows us to examine the effect of foreign aid and its component on tax revenue across the distribution of tax revenue and mitigate and/or eliminate the bias that can result from the endogeneity of regressors. Furthermore, the method helps in adjusting for the effect of tax reforms implemented in several African countries over the last two decades. In addition, the UNU-WIDERtax data is the most comprehensive data on taxation, which enables us to avoid the use of multiple sources of tax revenue data. A more important advantage of this dataset is that it provides a complete dataset for most sub-Saharan African countries as compared to previous data sources, which exhibit huge missing data-points

Two main hypotheses were tested in the study simultaneously: aid dependency effect and welfare effect. The aid dependency effect is said to hold if foreign aid has a significant negative effect across tax revenue distribution, especially in the lower quantile (Koenker and Hallock, 2001). While welfare effect is said to hold if the negative effect is significant at the upper quantile, which is the region where the impact of extra tax revenue on the tax burden is highest. Our study shows that the impact of foreign aid on tax revenue varies across the distribution of tax revenue. Foreign aid had a significant and negative effect on tax revenue in the high quantile of the tax revenue distribution.

The effect turned insignificant in the low quantile of the tax revenue distribution. This suggests that foreign aid lowers tax revenue in countries with relatively high tax revenue.

Furthermore, the study findings show that foreign aid produces welfare benefits through a reduction in tax burden. Foreign aid inflow induces government, with relatively high tax revenue to lower taxation than if there is no foreign aid. In addition, the “unbundling” of foreign aid into disaggregated components (grant and loan) shows that the observed impact of foreign aid on tax effort in SSA is dominated by the effect of the grant element. ODA grants. This dominating tendency of the grant element is not surprising because it accounts for a huge chunk of the total foreign aid inflow into the region. For policy implication, the study points out that government action targeted at improving tax administration is needed to increase domestically mobilized revenue. This submission is based on the significant role economic structure plays in boosting tax revenue in SSA. The result obtained is robust to the use of the lagged value of foreign aid and its components

The rest of the study is organized as follows. A review of the literature is presented in Section II. Section III presents the methodology and data-related issues. The main findings of the study are documented in section IV and the conclusion, policy implications, and suggestions for future research are discussed in Section V.

2. Literature review

Heller (1975) presents the first theoretical framework that examined the relationship between foreign aid and tax revenue. An extension to the theory is provided by Gupta et al. (2004), which postulates that a typical government minimizes a loss function subject to the budget constraint that includes both foreign aid and its target. The target of the government is usually influenced by the political environment and such target includes but may not be limited to economic growth and welfare improvement (Collier, 1999; Gupta et al 2004).

As earlier explained, the behavior of a government in the form of repayment of loans, increase expenditure and reducing tax burden depends on the political objective of those in the arm of affairs. An increase in government expenditure following an inflow of foreign aid could motivate the government to pay attention to boosting domestically mobilized revenue. However, in the case whereby foreign aid is lower than government expenditure, government borrowing will increase, which in turn, could trigger the government to enhance tax revenue. This implies that foreign aid, as well as its decomposition, can lead to either increase or decrease in tax revenue. Gupta et al. (2004)

argued that the effect of the decomposition is likely to be different due to the fact that the loan component will be repaid. This is because it is assumed that foreign aid in the form of a loan will be an investment in public expenditure that is capable of repaying the amount of loan obtained. Hence, the loan component of foreign aid is expected to lead to an increase in tax revenue while the grant component is expected to reduce tax revenue as the amount received is not expected to be repaid.

There exist two strands in the literature on the presumed reduction in tax revenue as a result of foreign aid inflow. The first strand argued that the tax revenue would continue to reduce due to the inflow of foreign aid, which impacts negatively on the level of governance in aid recipient countries. Asongu (2013) claimed that foreign aid mitigates gate institutional quality in Africa. Furthermore, Brautigam and Knack (2004) argued that foreign aid makes recipient governments less creative. As a result, aid recipient governments are perceived not to be able to think independently for themselves on strategies to raise funds for developmental projects. This strand viewed a reduction in tax revenue as an aid dependency effect of the continuous inflow of foreign aid. Thornton (2014) claimed that as long as a country benefits from foreign aid inflow, the incentive to implement tax reforms that will spur tax revenue are less likely to materialize. In the race literature, the dependency effects of aid have been attributed to the persistence of racial inequalities, which emphasizes the need for system changes in solving developmental challenges (Niles, 2022).

The second strand, viewed a reduction in tax revenue as a welfare benefit of foreign aid inflow as it reduces the tax burden associated with an increase in government expenditure. The government is able to achieve its political targets with less tax burden on the citizens. Foreign aid, therefore, softens the tax burden that citizens ought to have been subjected to, in the course of implementing government projects (Collier, 1999).

Gupta et al. (2004) viewed that foreign aid inflow broadly lowers tax revenue in developing countries. They, however, claimed that the decomposition of foreign aid matters, an increase in the grant component has a negative effect on tax revenue while the loan component was reported to stimulate tax revenue. However, Clist and Morrissey (2011) contradict the conclusion arrived at by Gupta et al. (2004). Essentially, they found that both grant and loan components of foreign aid have a positive effect on tax revenue, thereby concluding that foreign aid leads to an increase in tax revenue. Clist and Morrissey (2011) further argued that the difference in their result, as compared to Gupta et al. (2004), can be attributed to data spanning and the inclusion of lagged aid in their study. In addition, Benedek et al. (2012) identified the weaknesses of Gupta et al. (2004) including the

length of estimation, endogenous issues, and tax structure identified. Accounting for these weaknesses does not absolutely erode the conclusion that foreign aid lowers tax revenue. In furtherance of this assertion, Clist (2014) replicated the estimation in Benedek et al. (2012) and found that the result obtained could be questioned on the quality of data on tax revenue². Clist (2014) showed that the results are sensitive to changes in the source of tax revenue. Hence, the debate as regards the exact relationship between foreign aid and tax revenue³ is far from arriving at a conclusion.

Existing studies on foreign aid and tax revenue have not examined the effect of foreign aid on tax revenue along with the entire distribution of tax revenue. They are based on mean estimation and the result obtained can be categorized into two groups. The first group found that foreign aid has a significant negative effect on tax revenue (Heller, 1975; Franco-Rodriguez et al., 1998; Ghura, 1998; Brautigam and Knack, 2004; Gupta et al., 2004; Remmer, 2004 and Benedek et al, 2012). The second group found that the effect of foreign aid on tax revenue is positive (Pack and Pack, 1990; Clist and Morrissey, 2011; and Clist, 2014).

3. Methodology and Data issue

a) Methodology and model specification

Consistent with the motivation for the study discussed above, this study combines a novel dataset on tax revenue developed by UNU-WIDER and the instrumental fixed effect Quantile regression (QR) estimation technique developed by Machado and Silva (2019) to examine the effect of foreign aid on domestic revenue mobilization in Africa. The instrumental fixed quantile regression approach helps in examining the determinants of tax effort throughout the conditional distributions of tax effort and mitigates the bias associated with endogenous regressors⁴. This enables the study to articulate countries with low, intermediate, and high levels of tax effort. Therefore, parameters are produced at various points of the conditional distribution of the tax effort (Koenker and Hallock, 2001).

² This is due to the fact that Benedek et al. (2012) lumps-up different sources of tax revenue with different definitions.

³ Foreign aid and Official Development Assistance (ODA) on the one hand, and tax effort and tax revenue, on the other hand, are interchangeably used in this study.

⁴ The use of instrumental fixed effects eliminates the endogeneity associated with the investigation of the effects of foreign aid on the tax revenue. In the study, the lagged values of the independent variables were used as instruments. Hence, the coefficient of foreign aid is expected to be efficient and would be devoid of either overestimation or underestimation associated with endogeneity bias.

Within the last two decades, several reforms were implemented in African countries, notable examples of reforms include the adoption of Autonomous Revenue Authorities, and Value Added Taxes (VATs), with substantial changes in tax codes for some countries in the sub-region. Furthermore, country characteristics, particularly for those with abundant resources from petroleum or mining production, have important implications for tax revenues. In light of this, estimating a quantile regression with fixed effects using panel data becomes a desirable and preferred approach. The fixed effect approach would account for heterogeneity across countries and minimize potential bias in the results due to omitted country-specific and time-varying factors. Consequently, the estimation method used has some sorts of advantages over the existing quantile regressions. First, it allows the estimation of conditional means in conjunction with the estimation of how the independent variables affect the entire conditional distribution of the dependent variable. In the context of this study, it can be used to estimate both the conditional mean and distributional effects of foreign aid (ODA) on tax revenue (TAX). Second, this quantile regression approach can be employed to address issues of heterogeneity and endogeneity inherent in the panel data model while taking into consideration the individual fixed effects as well.

The Machado and Silva's quantile regression model which estimates the conditional quantiles with the location model is specified as follows:

$$Y_{it} = \alpha_i + X_{it}'\beta + (\delta_i + Z_{it}'\gamma)U_{it} \quad (1)$$

In equation (1), it is assumed that X and Y share the same dimension (Machado and Silva, 2019), then the parameters to be estimated is given as $(\alpha, \beta, \delta, \gamma)' \in R^{2(k+1)}$. The individual fixed effect is also given as $(\alpha_i, \delta_i), i=1, \dots, n$. Z is a k -vector of components of X . X follows a normality assumption of Ordinary Least Squares (OLS) which states that variables are independently and identically distributed for a fixed, i and as well independent across time, t . Given this, equation 1 can be re-specified to reflect the quantile regression as follows:

$$Q_Y(\tau/X_{it}) = (\alpha_i + \delta_i q(\tau)) + X_{it}'\beta + Z_{it}'\gamma q(\tau) \quad (2)$$

In equation (2), X_{it} denotes a set of independent variables which, in this study, include total official development aid (TODA), grant official development aid (GODA), loan official development aid (LODA), agricultural value-added (AGR), industrial value-added (IND), external debt (EXD), GDP per

capita growth rate (GDPPC), export (EXP), import (IMP) and institutional quality (INST). $Q_Y(\tau/X_{it})$ denotes the quantile distribution of the dependent variable-tax revenue (TAX) which depends on the location independent variables, X_{it} . The scalar coefficient which denotes the quantile, τ for individual fixed effects is specified as $\alpha_i(\tau) \equiv \alpha_i + \delta_i q(\tau)$. These individual fixed effects are time-invariant parameters homogenous impacts could be permitted to differ across the quantiles of conditional distributions of endogenous variable. $q(\tau)$ represents the τ -th estimates of quantiles to be estimated by solving the following optimization problem specified as follows:

$$\min_q \sum_i \sum_t \rho_i(R_{it} - (\delta_i + Z'_{it}\gamma)q) \quad (3)$$

This approach is adopted instead of ordinary fixed effects approach because the cross-sectional panel model might be characterized by endogeneity problem between dependent variable (ODA) and main independent variable on the one hand and on the other hand among the independent variables. The quantile regression is estimated for different quantiles which include 0.1th, 0.25th, 0.50th, 0.75th and 0.90th quantiles.

To test how foreign aid affects tax revenue, equation (4) is re-specified as follows

$$Q_y(\theta/x'_{it}) = \alpha_i + \delta_t + \beta_1 TODA + \beta_2 TODA^2 + \beta_3 Z + \varepsilon_{it} \quad (4)$$

In equations (4) tax revenue as a ratio to GDP (y) is expressed as a function of foreign aid (TODA), TODA squared term and economic structure (Z). TODA squared term captures the non-linear relationship between foreign aid and tax revenue. The coefficients estimated in equation (3) measure the semi-elasticity of the tax revenue ratio in response to a one percentage point change in the explanatory variable. The variables to capture the structure of the economy are drawn from previous studies that analyzed the relationship between aid and tax effort (Gupta et al, 2004; Gupta, 2007; Clist and Morrissey, 2011). The measure of the structure of the economy included the overall development of an economy, agricultural value-added, industrial value-added, external debt, imports, exports and institutional quality.

Hence, the model to be estimated empirically is given as

$$Q_y(\theta/x'_{it}) = \alpha_i + \delta_t + \beta_1 TODA + \beta_2 TODA^2 + \beta_3 AGR + \beta_4 IND + \beta_5 EXD + \beta_6 GDPPC + \beta_7 EXP + \beta_8 IMP + \beta_9 INST + \varepsilon_{it} \quad (5)$$

Where AGR, IND are share of agriculture and industrial output in value added are expressed in ratio of GDP, respectively. GDPPC is GDP per capita is calculated in constant 2005 U.S. dollar measured in log. EXD is the level of external debt, while EXP and IMP are export and import respectively, and INST is institutional quality. All these variables, with the exception of GDPPC and institutional quality are expressed as a ratio of GDP.

GDPPC measures the overall development of an economy, an increase in GDP per capita is expected to have positive effect on tax revenue since higher degree of economic development is associated with higher taxable income. AGR is expected to have negative effect on tax revenue because agricultural sector is hard to tax due to high informal and subsistence agricultural practices. On the other hand, an increase in IND is expected to generate an increase in tax revenue because profit realized in this sector is easy to tax. EXD measures the level of external indebtedness of an economy, the higher the level of external debt implies that revenue generated will be diverted for servicing debt, reducing government expenditure on investment, hence, it lowers tax revenue. Import and export are expected to influence tax revenue differently. Imports increase tax revenue; this is because taxes are easily collected on imports. By contrast, exports are usually taxed lesser than imports, this is because the high tax on exports reduces the competitiveness of the exported commodity in the global market. Institutional quality is an index and was constructed from World Bank Governance indicators such as voice and accountability, rule of law, government effectiveness, and control of corruption.

For further analysis, we split foreign aid into two components, grant and loan, and examined them as two separate entities. Where Grant foreign aid is represented as GODA, and loan foreign aid is represented as LODA. This further analysis is important given the different orientations associated with the two forms of foreign aid. Grant foreign aid does not have commitments on the part of the receiver and it is usually in the form of technical assistance whereas loan foreign aid requires commitments from the benefiting countries.

b) Data issues

The dataset comprises 32 sub-Saharan African countries for the period of 1996-2019⁵. The data on tax revenue is drawn from the new tax revenue dataset developed by UNU-WIDER. Data on foreign aid were sourced from the Development Co-operation Directorate database, this includes Net ODA, and its disaggregation i.e., grant and loan. The economic variables are sourced from the World Development Indicators (WDI). Institution quality was constructed using six measures namely control of corruption, government effectiveness, political stability, rule of law, regulatory quality, and voice and accountability – World Governance Institution. Principal Component Analysis (PCA) was employed following the method adopted by Raifu, Nnadozie and Adeniyi (2021) to construct institutional quality index.

4. Empirical findings

This section reports findings of the study based on the estimation of the equation (4) using quantile regression estimation techniques described in the previous section. Table 1 presents the description of the variables used. The baseline model is presented in Table 2 without the inclusion of control variables. In Tables 3 and 4 control variables were included. The robustness test is presented in Table 5, where the lag of foreign aid was used.

4.1 Descriptive analysis

The descriptive statistics show that the mean of the ODA grant is about three times of the ODA loan, this shows that the bulk of foreign aid flows into Sub-Saharan Africa enters as an ODA grant. Also, the mean of tax revenue is greater than that of the mean of foreign aid (ODA) by approximately 58%. This shows that foreign aid inflow into Sub-Saharan Africa is relatively high when compared to tax revenue, this further confirms the submission by Gupta et al (2004) on the relative size of foreign aid to tax revenue in developing countries. Thereby necessitating the need to further understand the nature of the relationship between foreign aid and tax revenue. It is also important to stress here that the most volatile series in the model is GDPPC, given that the size of the standard deviation is about three times the mean value. This shows the varying level of development in the SSA states.

⁵The Selected countries are Angola, Benin, Botswana, Burkina Faso, Burundi, Cape Verde, Cameroon, Central African Republic, Chad, Congo, Rep, Cote d'Ivoire, Eswatini, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Mali, Mozambique, Niger, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Table 1: Descriptive statistics.

Variables	Obs	Mean	Std.Dev.	Min	Max	p1	p99	Skew.	Kurt.
TAX	768	13.901	8.161	1.295	60.946	3.719	46.212	2.093	8.524
TODA	768	8.771	7.270	0.024	66.848	0.209	33.661	2.053	11.124
GODA	768	7.955	7.612	0.138	54.645	0.196	37.809	2.340	10.318
LODA	768	2.387	2.403	0.000	33.163	0.002	10.406	3.907	39.795
AGR	768	24.389	14.085	1.828	61.416	2.088	57.396	0.267	2.344
IND	768	23.954	11.51	4.556	72.717	7.834	65.488	1.670	6.389
EXD	768	58.967	54.984	3.895	504.477	8.323	302.956	3.022	17.057
GDPPC	768	1.907	4.511	-36.557	28.676	-10.862	12.619	-1.320	16.605
EXP	768	28.502	16.05	4.686	96.834	6.031	81.038	1.321	4.958
IMP	768	38.812	18.086	13.155	113.661	15.127	106.322	1.784	6.395
INST	768	0.519	0.195	0.000	1.000	0.000	1.000	0.009	3.203

Source: Authors' computation.

Note: TAX is tax revenue; TODA is official development assistance; GODA and LODA are the grant component and loan component of official development assistance, respectively; AGR and IND are shares of agriculture and industrial output in value-added are expressed in a ratio of GDP, respectively; GDPPC is GDP Per Capita; DEB is the level of external debt; while EXP and IMP are export and import respectively, and INST is an institutional quality index

4.2 Main regression analysis

The regression analysis commenced with the effect of foreign aid and its square on tax revenue, as well as its components in two separate models. The results obtained are presented in Table 2. The scale coefficient of foreign aid had a positive sign whereas the location coefficient had a negative effect. This indicates that the negative impacts of foreign aid on tax revenue narrow over the quantiles. Specifically, the result in Table 2 depicts that at lower quantiles (i.e. 10th and 25th), foreign aid had a higher negative effect on tax revenue, than at higher quantiles (i.e. 75th and 90th). The results indicated that at the 10th quantile, an increase in foreign aid by 1% is expected to lower tax revenue by 0.27%, and at the 90th quantile by 0.19%. This result, therefore, lends support to the aid dependency effect on lower tax revenue in SSA as the negative impact of foreign aid was higher in the lower quantile. The insignificant of the square of foreign aid (though at higher quantiles and OLS) suggests that foreign aid has a linear relationship with tax revenue.

A closer look at the component of foreign aid, grant and loan, indicated that both components had divergent impacts over the quantiles. For grant foreign aid, as we move from lower quantiles to higher quantiles, the negative impact reduces from -0.35% in the 10th quantile to -0.31% in the 50th quantile and -0.26% in the 90th quantile. However, for loan foreign aid, the negative impact increases with an increase in quantiles. At the 10th quantile, an increase in loan foreign aid by 1% results in a -0.35% decline in tax revenue, and at the 90th quantile, it resulted in a 0.73% decline in tax revenue. This result, therefore, indicates that loan foreign aid does not support aid dependence, as it had a

higher negative effect at the higher tax revenue effort. Furthermore, unlike grant foreign aid where the squared coefficient was insignificant, the squared of loan foreign aid is significant across the different quantiles. This indicates that as the size of loan foreign aid increases, tax revenue decreases, which might suggest that countries that excessively depend on loan foreign aid experience a decline in tax revenue.

Table 2: Foreign Aid and Tax Revenue without control variables

	Location	Scale	0.10	0.25	0.50	0.75	0.90
TODA	-0.233***	0.024*	-0.271***	-0.254***	-0.234***	-0.217***	-0.194***
TODA2	0.007	-0.004	0.012	0.010	0.007	0.004	0.001
CONS			2.424***	2.640***	2.877***	3.095***	3.375***
No of Obs.			736				
GODA	-0.310***	0.021	-0.348***	-0.329***	-0.310***	-0.289***	-0.263***
GODA2	0.016	-.008	0.032**	0.024**	0.017	0.008	-0.002
CONS			2.447***	2.684***	2.911***	3.177***	3.501***
No of Obs.			736				
LODA	-0.569***	-0.203***	-0.297***	-0.363***	-0.438***	-0.549***	-0.732***
LODA2	-0.110***	-0.036***	-0.062***	-0.073***	-0.087***	-0.106***	-0.139***
CONS			2.152***	2.436***	2.763***	3.248***	4.045***
No of Obs.			736				

Notes: The value in the parenthesis is the bootstrap standard error. *, ** and *** denote significant at 10%, 5% and 1% respectively. TAX is tax revenue as a ratio of GDP; TODA is the total official development assistance; TODA² is squared of the total official development assistance; GODA is the grant official development assistance; GODA² is squared of the grant official development assistance; LODA is the loan official development assistance; LODA² is squared of the loan grant official development assistance.

The results in Table 2 were re-estimated by incorporating control variables such as institutional quality, and the structure of the economy. The results obtained were presented in Table 3. The scale coefficient was insignificant whereas the location coefficient was negative and significant. This result indicated that the impact of foreign aid reduces as the quantile increases. Furthermore, the result presented in Table 3 depicts that at lower quantiles (i.e. 10th and 25th), foreign aid has an insignificant effect on tax revenue. On the contrary, foreign aid has a significant negative effect on tax revenue in higher quantiles (i.e. 50th, 75th and 90th), such that an increase in foreign aid by 1% is expected to lower tax revenue within the range of 0.11% - 0.18%. When this is slightly different from what was reported in Table 2, which indicated that the omission of control variables might lead to an

inaccurate conclusion on the relationship that exists between foreign aid and tax revenue. Thus, the results in Table 3, therefore, raise doubt on the perceived aid dependency effect on lower tax revenue in SSA as the negative impact of foreign aid cannot be found in the lower quantile. These findings suggest that additional taxes, which ought to be imposed on the citizenry as a result of an increase in government public expenditure are being funded through foreign aid. This claim is further substantiated through the relative high size of the coefficient of the impact of foreign aid on tax revenue in the 90th quantile.

Similar to the evidence in Table 2, the results in Table 3 show that the square of foreign aid had an insignificant effect on tax revenue. This suggests that foreign aid has a linear relationship with tax revenue. This implies that the size effect does not influence the impact of foreign aid on tax revenue. Furthermore, the results show that an increase in agricultural value-added had negative and significant effect on tax revenue, and the effect is higher in low tax revenue effort countries. Furthermore, the results show that in countries with low tax efforts (10th to 50th), an increase in external debt is associated with lesser tax revenue. Importation is associated with higher tax revenue, and the effect is higher in high tax effort countries (90th). Furthermore, the study evidence indicated that an improvement in institutional quality only matters in low tax efforts countries, such that an improvement in institutional qualities enhances tax revenue.

Table 3: Foreign Aid and Tax Revenue with control variables

	Location	Scale	0.10	0.25	0.50	0.75	0.90
TODA	-0.108***	-0.043	-0.038	-0.075	-0.111**	-0.146**	-0.176*
TODA2	-0.004	-0.003	0.001	-0.001	-0.004	-0.006	-0.008
AGR	-0.256***	0.056	-0.347***	-0.299***	-0.253***	-0.209**	-0.170
IND	-0.014	0.118**	-0.205**	-0.104	-0.007	0.087	0.170
EXD	-0.099***	0.064*	-0.203***	-0.148***	-0.095***	-0.043	0.001
GDPPC	-0.003	0.007*	-0.014	-0.009	-0.003	0.002	0.007
EXP	-0.314***	-0.007	-0.303**	-0.309***	-0.315**	-0.320*	-0.325
IMP	0.643***	0.151	0.397**	0.527***	0.651***	0.772***	0.878***
INST	-0.054	-0.248**	0.348**	0.135	-0.069	-0.267	-0.440
CONS			3.953***	3.248***	2.573***	1.917**	1.343

Notes: The value in the parenthesis is the bootstrap standard error. *, ** and *** denote significant at 10%, 5% and 1% respectively. TAX is tax revenue as a ratio of GDP; TODA is the total official development assistance; TODA² is squared of the total official development assistance; AGR and IND are shares of agriculture and industrial output in

value-added are expressed in a ratio of GDP, respectively; GDPPC is GDP Per Capita; DEB is the level of external debt; while EXP and IMP are export and import respectively, INST is an institutional quality index.

Table 4: Components of foreign Aid and Tax Revenue

	Location	Scale	0.10	0.25	0.50	0.75	0.90
GODA	-0.139***	-0.008	-0.125	-0.133	-0.140**	-0.147*	-0.152
GODA2	0.008	-0.009	0.025	0.015	0.007	-0.001	-0.008
AGR	-0.264***	0.010	-0.281*	-0.271**	-0.263**	-0.255*	-0.248
IND	-0.084	0.114***	-0.293*	-0.175	-0.076	0.020	0.108
EXD	-0.108***	0.057	-0.213	-0.154**	-0.105**	-0.057	-0.015
GDPPC	0.006	0.002	0.001	0.004	0.006	0.008	0.010
EXP	-0.239***	-0.027	-0.191	-0.218	-0.241	-0.263**	-0.283
IMP	0.593***	0.144	0.330	0.479	0.604***	0.725***	0.836***
INST	-0.050	-0.337**	0.564*	0.216	-0.074	-0.357	-0.615
CONS			3.818**	3.240***	2.757***	2.286**	1.857
LODA	-0.273***	-0.025	-0.230**	-0.250***	-0.272***	-0.293***	-0.314***
LODA2	-0.103***	0.024	-0.144**	-0.125**	-0.104***	-0.084***	-0.064***
AGR	-0.485***	-0.029	-0.436***	-0.459***	-0.484***	-0.509***	-0.532***
IND	-0.252*	0.057	-0.348***	-0.304***	-0.254***	-0.206*	-0.160
EXD	0.041	0.054*	-0.051	-0.009	0.039	0.085	0.129*
GDPPC	-0.018	-0.016***	0.009	-0.003	-0.017	-0.031***	-0.043***
EXP	-0.460***	-0.017	-0.430***	-0.444***	-0.460***	-0.475***	-0.490***
IMP	0.728***	0.119	0.527***	0.619***	0.724***	0.826***	0.922***
INST	0.077	-0.397***	0.746***	0.437***	0.090	-0.248	-0.569***
CONS			3.969***	3.864***	3.746***	3.631***	3.521***

Notes: The value in the parenthesis is the bootstrap standard error. *, ** and *** denote significant at 10%, 5% and 1% respectively. TAX is tax revenue as a ratio of GDP; GODA is the grant official development assistance; GODA² is squared of the grant official development assistance; LODA is the loan official development assistance; LODA² is squared of the loan official development assistance; AGR and IND are shares of agriculture and industrial output in value-added are expressed in a ratio of GDP, respectively; GDPPC is GDP Per Capita; DEB is the level of external debt; while EXP and IMP are export and import respectively, INST is an institutional quality index.

The decomposition effect of foreign aid on tax revenue is presented in Table 4. The results indicated that loan ODA (LODA) had a negative and significant effect across the quantile, and the impact is higher at a higher quantile level. However, the impact of grant ODA is only statistically significant at the 50th and 75th quantiles. This is consistent with the evidence obtained for total foreign aid presented in Table 3. This, therefore, suggests that grant ODA reduces the tax burden in higher quantiles. The results presented in Tables 3 and 4, confirm Collier (1999) submission on the welfare dependency effect of foreign aid in developing countries, which is contrary to the idea of aid dependency. Here, we argue that reduction in tax revenue as a result of additional foreign aid reduces tax burden in countries with high tax effort.

Away from foreign aid and tax revenue, the study examined the role of economic structure on tax revenue. This is evaluated through the effect of agricultural value-added, industrial value-added, external debt, economic development and trade components. The study result presented in Tables 3 and 4, revealed that in the lower quantiles (10th, 25th, 50th and 75th) increase in agricultural value added has a significant negative effect on tax revenue and is insignificant in the 90th quantile. This suggests the coexistence of a relatively huge informal agricultural sector in countries with low tax revenue. Industrial value-added has a significant negative effect on tax revenue across the quantile, although the effect reduces at higher quantiles. An increase in industrial value-added is expected to bring about a decrease in tax revenue by 0.35% at the 10th quantile, and 0.25% at the 50th quantile. The effect became insignificant at the 90th percentile.

The parameter estimates also reveal that in the upper tail of the distribution of the tax revenue (50th, 75th, and 90th), imports had a higher and significant positive effect on tax revenue than in the lower tail (10th and 25th). Also, institutional quality was found to have a positive effect on tax revenue. The slight divergence in the results presented in Tables 2 and 3 indicated that the structure of the economy (agricultural value-added, industrial value-added, economic development, export, and import) is important in understanding how foreign aid affects tax revenue.

4.3 Sensitivity analysis: Robustness test

We re-examined the baseline estimation by using the lagged value of foreign aid. This alternative analysis is important to evaluate the effect of the time lag of foreign aid on tax revenue. This is important because foreign aid is usually assigned to projects with an execution timeline that exceeds a year. The result for the re-estimation is presented in Table 5. It can be summarily stated that the results obtained from the robustness check are similar to the results obtained earlier. The effect of

foreign aid on tax revenue is statistically significant in all the quantiles without the inclusion of control variables. However, when we controlled for the structure of the economy and institutional quality, the effect of foreign aid on tax revenue had a negative and significant effect at the 75th and the 90th quantile. Suggesting that the resulting reduction in tax revenue as a result of foreign aid is to reduce the overall tax burden resulting from increased government expenditure. This suggests that the study is robust towards the use of lagged foreign aid.

Table 5: Lag of Foreign Aid and Tax Revenue

	Location	Scale	0.10	0.25	0.50	0.75	0.90
LTODA	-0.247***	0.043**	-0.313***	-0.282***	-0.249***	-0.218***	-0.176***
LTODA2	0.012	-0.011	0.028**	0.021*	0.013	0.006	-0.004
CONS			2.457***	2.660***	2.881***	3.088***	3.375***
LTODA	-0.108*	-0.034	-0.055	-0.083	-0.110	-0.136**	-0.160**
LTODA2	-0.018	0.002	-0.021	-0.019	-0.018	-0.016	-0.015
AGR	-0.265***	0.037	-0.322***	-0.292***	-0.263**	-0.234*	-0.208
IND	-0.060	0.110	-0.230*	-0.140	-0.054	0.033	0.109
EXD	-0.098*	0.054***	-0.181*	-0.137*	-0.095	-0.051	-0.015
GDPPC	0.002	0.009	-0.012	-0.005	0.002	0.010	0.016
EXP	-0.367***	0.022	-0.401	-0.383*	-0.365***	-0.348***	-0.333**
IMP	0.698***	0.130	0.498	0.604**	0.705***	0.809***	0.899***
INST	-0.038	-0.267***	0.373*	0.156	-0.053	-0.264	-0.448*
CONS			3.946***	3.336***	2.753**	2.162	1.647

Notes: The value in the parenthesis is the bootstrap standard error. *, ** and *** denote significant at 10%, 5% and 1% respectively. The coefficients that are bold are significant at 10%. TAX is tax revenue as a ratio of GDP; LTODA is the lag of the total official development assistance; ODA² is squared of the lag of the total official development assistance; AGR and IND are shares of agriculture and industrial output in value-added are expressed in a ratio of GDP, respectively; GDPPC is GDP Per Capita; EXD is the level of external debt; while EXP and IMP are export and import respectively; INST is an institutional quality index.

5. Conclusion and policy implications

In this study, we revisited the relationship between foreign aid and domestic revenue mobilization in sub-Saharan African countries using a new dataset on tax revenue developed by UNU-WIDER. Our study showed that the impact of ODA varies across the distribution of tax revenue. The effect was observed to create a negative and significant effect in countries with high tax revenue while the

effect was insignificant in countries with low tax revenue. These findings raise questions on the growing perception that foreign aid crowds out domestic mobilized revenue in developing countries, as suggested in aid dependency literature. This study has shown that foreign aid creates welfare benefits by reducing the tax burden as it induces the government to lower taxation.

In addition, parameter estimates suggest that the unbundling of foreign aid into loans and grants elements reveal some interesting results. First, the domineering nature of the grant element was uncovered. Second, the grant element has significant coefficients at higher quantiles and also exhibits linearity. Third, across all regressions, the loan component was found to be statistically significant. Furthermore, the study showed that countries with high tax revenue in sub-Saharan Africa achieved such feat as a result of their ability to effectively manage their tax administration, which is reflected in the positive and relative size of the coefficients for economic development, and industrial output-based scale coefficient positive value.

In the last few decades, there has been increasing advocacy based on empirical evidence about the effectiveness of market-driven principles in solving developmental challenges (Banerjee et al., 2011; Niles, 2022). The advocacy is rooted in the empowerment effect of foreign aid. The dominant argument in race literature indicates that race inequality arises from material differences that can only be addressed through system changes and not individual empowerment attainable under the market-driven principles enriched in neoliberalism (Pailey, 2020; Niles, 2022). The evidence in Niles (2022) pointed out that even though market-driven solutions to development challenges are not racial neutrality, colorblind racism creates leverage for neoliberalism ideas such as empowerment to spur development. This is because equality and non-hierarchical are the principles underlying colorblind racism. Hence, when aid is designed in such a way that it does not lead to dependency, which this study established, it has the capacity of promoting development without widening racial inequality. A process that aligned with the attainment of the sustainable development goals.

With increased calls for sub-Saharan African governments to boost domestic revenue to actualize the sustainable development goals, an important implication of the study findings is that African countries should seek foreign aid targeted at strengthening tax structure and administration through the provision of technical assistance. As a result, improvement in tax administration could serve as a medium through which foreign aid increases developmental finance in sub-Saharan African countries. This is important because, without systemic improvement in tax administration in African countries, domestic revenue would perpetually be inadequate to meet growing expenditure needs.

Furthermore, sub-Saharan African countries with low tax revenue should optimize the gains associated with strengthening institutions to boost domestic revenue mobilization. However, when the donors are providing technical assistance, there is a need to adhere to the principle of non-hierarchical relations.

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