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# Total Debt Servicing and Tax Revenue in Sub-Saharan Africa

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*Abstract:*
*Debt financing serves as a deterrent in meeting developmental projects, thereby limiting the effect of revenue generation through taxing. Associated with the rising external debt has been a crushing debt service burden. The paper sets out to determine the effect of tax revenue on the total debt service of sub-Saharan African countries and to assess how inflation, exchange rate, and corruption control the effect of tax revenue on the total debt service of sub-Saharan African countries. An ex-post facto research design was adopted to test and analyze a dynamic panel estimated with the system General Method of Movements (GMM) data set for this study. Dynamic panel data was adopted because it uses lagged regressors, a combination of time series and cross-sectional dimensions of the data set to eliminate weakness; it is most applicable to this study. The study found that total debt service is positively and significantly affected by CIED, VAT and TXP, but the impact of TXP was insignificant. The outcome was found to be positive and insignificant, with controlled variables in model 2 being positively moderated by INF and CRP, while EXR negatively moderated the effect of tax revenue and total debt service of SSA countries. It was, therefore, recommended that debt service financing should be based on the productiveness of borrowed funds, monitored through debt repayment policies inserted into improving tax revenue and through improved debt service restructurings.*

*Keywords: Custom and import duties, debt service, tax revenue, taxes from exports, value-added tax*

## 1. Introduction

Debt financing, which stems out of debt obligation, is problematic in SSA due to the increased amount of debt owed and the large amount required in the repayment thereof (Wells, Denham, Lester, Watson & Luff, 1994). Debt financing serves as a deterrent in meeting developmental projects, thereby limiting the effect of revenue generation through taxing. Associated with the rising external debt has been a crushing debt service burden. According to IMF (2020), the average debt servicing expenses to revenue covered 21.9 percent of cumulative government revenues in SSA. The persistent fiscal deficits in most countries in SSA are due to heavy debt financing outlay, which has, without doubt, put great pressure on the country's revenues, leading to a rise in the indebtedness of countries. One major way to resolve this problem is to increase tax revenue to service the debt (Kiminyei, 2019).

According to World Bank (2019), developing countries are characterized with increased public debt and this has led to introduction of different types of fiscal reforms to control spending, increase revenue, increase foreign savings, moderate exchange rate, curb corruption and manage inflation. These reforms are aimed at overhauling the economy to reduce debt levels (Jelilov *et al.,* 2016). Sub-Saharan African countries are not excluded from increased debts, both domestic and foreign. The region consists of medium to low-income nations of the world and has been categorized as being among the most indebted in the world (Demachi, 2022; World Bank 2021c; Iyoha, 1999). Countries in SSA are among the poorest in the world, regarded as poor, low-income economies with low human development and heavy debt (Calderón & Zeufack, 2020). The identifiable characteristics of the region are corruption, exchange rate fluctuation and inflation; all these factors have an effect on the activities of the government (Levin, 2019; World Bank 2021a). The proceeds into the government purse are affected by these factors in addition to the repayment of debts owed by these countries. Shortage of funds to meet the increasing expenditure of the government is the reason for borrowing (Kiminyei, 2019). While funding the needs of the citizenry is necessary, repayment of the borrowed fund is equally required.

Debt servicing obligations of debtor countries pile up over the years from consistently high borrowings; this has led to increased demand for more funds from the citizens as the governments are saddled with commitments to creditors for repayment (Adah & Akogu, 2019). The amortized debt service is the size and interest relating to the debt; the higher the debt, the higher the burden of debt financing. On the other hand, debt financing difficulty occurs when the expected

export earnings decline, which makes it difficult to meet the repayment schedule. The debt service to export in SSA reached 14 percent in 2018 (IMF, 2020). This has been the experience of most heavily indebted countries in Sub-Saharan Africa (IMF, 2020). The debts build up over the years of borrowing, with the effects eroded by inflation in the countries (Oyinlola *et al*., 2020). The foregoing author further opined that inflation substantially influences the capacity and ability of macroeconomic policies to the extent that the available funds within the economy apply to government spending. The paper, therefore, sets out to determine the effect of tax revenue on Total Debt Service of Sub-Saharan African Countries and assess how inflation, exchange rate and corruption control the effect of tax revenue on Total Debt Service of Sub-Saharan African Countries.

The rest of this paper is structured as follows:
- The second section deals with a literature review.
- The third section contains the methodology.
- The fourth section deals with data analysis and presentation, as well as a discussion of findings.
- The fifth section provides conclusions and recommendations.

## 2. Literature Review

### 2.1. Conceptual Review

Taxation is an expansion stimulant in the world economy; funds earned from taxing citizens are applied to fund developmental projects that aim to expand the economic transformation worldwide (Asaolu *et al*., 2018). Tax revenue is relevant to major strategic developmental goals. It has been a tool for financing economic activities. It is one of the increasing components of general government revenue. Beyond sustaining government expenditure for economic development, it ensures financing the repayment of both the capital debt and the associated interest when due. The debts of nations are majorly financed by government revenue, including tax revenue. In the efforts to reduce the debt overhang issues in low-income Sub-Saharan countries, the governments rely heavily on the income generated to finance debt repayments (Yared, 2018).

Reduction of debt volume burden through financing is a sure means of preventing the negative outcomes of high debt servicing, exchange rate reduction and high inflation (Efuntade *et al*., 2021). Again, debt reduction allows a country to reap the benefit of foreign investment since the level of external indebtedness is a means of evaluating a country's creditworthiness, debt sustainability and investment stability. The cumulative figure disbursed on debt service annually is often used to identify a country's ability to achieve steady foreign exchange through exports of goods and services rendered. Therefore, the level of the debt burden of a country has a direct impact on the volume of debt service regarding the amount that will be available for fiscal engagements. The high cost of financing external debt erodes international reserves and funds meant for the provision of social amenities to be used in debt expenditure. However, one might claim that the borrowed fund was used on projects that would finance the repayment; sometimes, the borrowed fund was spent on projects whose prices are inflated due to corruption. Evidently, policies on debt accumulation and its reduction are often subjected to influences leading to debt burden, thus manifesting as an impediment to fiscal advancement (Adegbite, Ayadi & Ayadi, 2008).

Efuntade *et al*. (2021) defined debt servicing as the collation of principal repayments and interest to be paid in currency, goods or services on long-term debt and short-term debt. It is the process whereby a country attempts to settle the unsettled loan at maturity, both the principal and the interest (Efuntade *et al*., 2021; Ibrahim *et al*., 2019). In Sub-Saharan Africa, high debt resulting in high servicing costs has threatened the region's economy and thwarted its advancement. This weighs heavily on the economy, with consequences such as high inflation and unemployment, the majority of the population living under the poverty line, and corruption is rampant. Debt financing is the systematic, regular payment of loans taken by a country from domestic and external sources; each instalment comprises the interest on debt and a part of the principal. Timely earning of income is a sure way to finance a country's debt repayment. Irregular income earning into the covers of the government causes failure of defaulting in the debt repayment schedule. The higher the volume of debt and interest rate, the higher the burden of debt financing.

### 2.2. Theoretical Review

The national fiscal health of Sub-Saharan African countries is the product of a complex interplay between debt servicing and tax incursion. Understanding this dynamic requires exploring several economic theories that shed light on the relationship between debt and tax revenue. This paper is anchored on Debt Overhang Theory, Tax Smoothing Theory, and Endogenous Growth Theory.

The Debt Overhang Theory, as originally proposed by Krugman (1988) and further expanded upon by Pattillo et al. (2002), posits that when a country's debt burden surpasses a certain threshold, the likelihood of future investments diminishes due to the anticipation of increased taxation to service the debt. In Sub-Saharan Africa, a region that has historically been plagued by high external debts, this theory illustrates the detrimental effect that high debt servicing can have on economic growth and, subsequently, on tax revenue collection. Recent empirical evidence supports this view, showing that high debt-servicing commitments lead to reduced public investment and economic growth in the region (Nyasha & Odhiambo, 2020).

Barro's (1979) Tax Smoothing Theory asserts that governments should aim to minimize the distortions caused by taxation by spreading tax burdens evenly over time. For Sub-Saharan African countries, this theory is particularly relevant given the frequent economic shocks that affect tax revenues. By utilizing debt as a tool to stabilize tax rates over time,

governments can avoid large, sudden increases in taxes that could stifle economic growth. However, excessive reliance on debt, particularly when it leads to high debt servicing costs, can undermine this strategy by forcing governments to raise taxes or during economic downturns (Menyah & Wolde-Rufael, 2022).

Endogenous Growth Theory, as proposed by Romer (1986) and Lucas (1988), emphasizes the role of government policies in fostering long-term economic growth. In the context of Sub-Saharan Africa, this theory suggests that high debt servicing costs can limit the government's ability to invest in critical areas such as infrastructure, education, and health, which are essential for sustaining economic growth. High debt servicing diverts resources away from these growth-enhancing investments, leading to slower economic growth and a reduced capacity to generate tax revenue (Ogbonna & Ebimobowei, 2021).

These theories collectively provide a comprehensive framework for understanding the relationship between total debt servicing and tax revenue in Sub-Saharan Africa. The Debt Overhang Theory highlights the risks of reduced investment and growth due to high debt levels, while the Tax Smoothing Theory underscores the need for balanced fiscal policies. Endogenous Growth Theory emphasizes the importance of maintaining government investment in growth-promoting activities, which can be jeopardized by high debt servicing costs.

*2.3. Empirical Review*

Recent studies have explored the complex relationship between total debt servicing and tax revenue in Sub-Saharan Africa, particularly in the context of economic volatility, pandemic-induced fiscal challenges, and efforts towards debt sustainability. For instance, a study by Amankwah and Osei (2021) examined the impact of debt servicing on macroeconomic stability in Ghana. They found that high debt servicing costs constrained fiscal space, thereby limiting the government's ability to mobilize sufficient tax revenue. The study emphasized that increased debt servicing led to higher taxation pressures, potentially stifling economic growth. A related study by Adeoye and Olatunji (2022) focused on Nigeria, revealing that the country's reliance on debt has adversely affected its tax revenue mobilization efforts. The authors noted that while the government has made strides in tax reforms, the heavy debt burden has necessitated increased tax rates, which in turn discouraged compliance and broadened the informal sector. This situation exacerbated the challenges of raising sufficient revenue to meet debt obligations.

On a broader scale, the research by Kasekende and Kituyi (2020) explored the interplay between fiscal policy adjustments and debt servicing in East African countries. They argued that while tax revenue plays a critical role in servicing debt, the continuous rise in debt levels requires more robust fiscal policies. Their findings indicated that countries with more diversified tax bases and efficient tax administration systems were better positioned to manage debt servicing without compromising public investment and economic growth.

The COVID-19 pandemic further complicated the relationship between debt servicing and tax revenue. According to a study by Mensah and Amponsah (2021), the pandemic significantly reduced tax revenue across Sub-Saharan Africa due to economic contractions, while debt servicing obligations remained unchanged or even increased due to new borrowings to combat the health crisis. This scenario led to a vicious cycle where countries had to borrow more to service existing debt, thereby increasing future debt servicing requirements.

Moreover, a comprehensive analysis by Moyo and Sibanda (2022) provided policy recommendations to address the challenges of debt servicing in the region. They advocated for enhanced regional cooperation in tax administration and debt management, suggesting that a collective approach could help optimize tax revenue while managing debt servicing more effectively. The study also highlighted the importance of international financial support in easing the debt burden, especially in the wake of global economic disruptions.

## 3. Methodology

*An ex-post facto* research design was adopted to test and analyze a dynamic panel estimated with the system General Method of Movements (GMM) data set for this study. Dynamic panel data was adopted because it uses lagged regressors, a combination of time series and cross-sectional dimensions of the data set to eliminate weakness; it is most applicable to this study. The research design allowed the observation of multiple phenomena obtained over several time periods of the data set. Therefore, an *ex-post facto* research design was considered suitable for this study since it disallowed manipulation of the independent variable because the event had already occurred.

The study employed dynamic panel data analysis with system GMM because the variables were converted to their lagged term. This panel data analytical method allows data to be subjected to necessary tests to determine the effect of the previous period over time and across periods to establish times series (t), where T > 1 along and cross period (n); where N > 1 with a total observation from 1990 to 2020.

The specified models were evaluated through second-order statistical estimation of the results of coefficients and *p-value,* which signifies the explanatory power of the model's ability to predict the impact of tax revenue on debt financing in SSA. The J-statistic was to be used to test the statistical significance of the coefficients of the individual regression model at 1%, 5% and 10% levels of significance, while the aggregate combination of the impact of tax revenue on debt financing was calculated using Arellano & Bond (1995) test; developed by Arellano & Bover (1991). We hypothesized as follows:

- Hypothesis 1 ($H_0 1$): Tax revenue has no significant effect on Total Debt Service of Sub-Saharan African Countries.
- Hypothesis 2 ($H_0 2$): Inflation, exchange rate and corruption have no significant controlling effect on tax revenue and Total Debt Service of Sub-Saharan African Countries.

*3.1. Variable Description and Model Specification*

$LTDS_{it} = \alpha_0 + \beta_1 LTDS_{it} + \beta_1 LCIED_{it} + \beta_2 LTXP_{it} + \beta_3 LVAT_{it} + \varepsilon_{it}$................. Model 1

$LTDS_{it} = \alpha_0 + \beta_1 LTDS_{it} + \beta_1 LCIED_{it} + \beta_2 LTXP_{it} + \beta_3 LVAT_{it} + \beta_4 LINF_{it} + \beta_5 LEXR_{it} + \beta_3 LCRP_{it} + \varepsilon_{it}$......................................................................................... Model 2

Where:

TDS = Total Debt Service,

CIED = Custom, Import and Export Duties,

TXP = Taxes on Product,

GST = Goods and Services Tax

VAT = Value Added Tax

Inflation (INF),

ExR = Exchange Rate,

CRP = Corruption

## 4. Results and Discussion of Findings

| Variable | Model 1 | | | | Model 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | β | t-stat | ε | ρ | β | t-stat | ε | ρ |
| LTDS (-1) | 0.616 | 0.039 | 15.672 | *0.000 | 0.634 | 0.092 | 0.895 | *0.000 |
| LCIED (-1) | 0.083 | 0.029 | 2.855 | *0.004 | 0.075 | 0.108 | 0.698 | ***0.485 |
| LTXP (-1) | 0.024 | 0.076 | 0.312 | ***0.755 | 0.075 | 0.150 | 0.500 | ***0.617 |
| LVAT (-1) | 0.08 | 0.045 | 1.803 | **0.072 | 0.098 | 0.071 | 1.370 | ***0.171 |
| INF | | | | | 0.021 | 0.000 | 0.264 | ***0.792 |
| EXR | | | | | -0.0002 | 0.0004 | -0.523 | ***0.601 |
| CRP | | | | | 16.659 | 14.574 | 1.143 | ***0.253 |
| J-Stat (Prob) | 15.65 (0.68) | | | | 19.36 (0.31) | | | |
| Normality Test | -0.23 | | | | 0.42 | | | |
| AR(1) | 0.294 | | | | NA | | | |
| AR(2) | 0.115 | | | | 1.000 | | | |

*Table 1: Regression Results*
*Dependent Variable: LTDS  Significance: *1% **5%  ***10%*
*Source: Researcher's Extract from Output of Statistical Analysis (2022)*

➤ *Interpretation*

According to the probability value of the J-statistics, the study confirmed that both models 1 ($\rho$-value = 0.68) and 2 ($\rho$-value = 0.31) are valid because the probability values are greater than the chosen significant level of 10%. Accordingly, the study stated that with a probability of 10% at a 90% confidence level, the instruments used in this analysis are valid and exhaustive. The Arellano–Bond tests revealed no autocorrelation for both the first order and the second order. While for the AR(1) in the first differences, the Arellano–Bond test did not reject the null hypothesis for both models (Model 1: $\rho$-value = 0.294 > 0.05), whereas the test is not available for model 2, as predicted. In the case of AR(2) in the first differences, the null hypothesis stands for model 1 (Model 1: $\rho$-value = 0.115 > 0.05; Model 2: $\rho$-value = 1.000 > 0.05), which means that there is no presence of serial correlation in models 1 and 2.

Hence, the explanatory model will take the following expression:

$LTDS_{it} = \alpha_0 + \beta_1 LTDS_{it} + \beta_1 LCIED_{it} + \beta_2 LTXP_{it} + \beta_3 LVAT_{it} + \varepsilon_{it}$........................ Model 1

$LTDS_{it} = 0.616 LTDS_{it-1} + 0.083 LCIED_{it-1} + 0.024 LTXP_{it-1} + 0.08 LVAT_{it-1}$

The result of the regression analysis for model 1 is presented in table 1, with all the coefficients being positive and the probability values of explanatory variables LCIED and LTXP being less than the chosen significant level of 10% while the probability values of LVAT are greater than 10%. This confirmed that a year lag of LTDS ($\beta = 0.616$; $\rho$-value = 0.000 < 0.01), LCIED ($\beta = -0.083$; $\rho$-value = 0.004 < 0.01), LTXP ($\beta = -0.024$; $\rho$-value = 0.755 > 0.1), and LVAT ($\beta = 0.08$; $\rho$-value = 0.072 > 0.05) positively and significantly affect LTDS in the case of LCIED and LVAT; while LTXP positively and insignificantly affected LTDS respectfully. The coefficient values showed that a change in LCIED would yield a 61.6% change in LTDS; a change in LTXP would result in an 8.32% change in LCIED, while LTXP would change by 2.4% as a result of a change in LVAT.

➤ *Decision*

J-Statistics, having a value of 15.65 and a probability value of 0.68, which is greater than the chosen significance level of 10%, confirmed the validity and exhaustiveness of the model. Also, based on the probabilities of each of the measures of the explanatory variable, which is lower than the chosen significant level of 10% for LCIED and LTXP greater than 10% for LVAT, and assessing the significance of the effect of individual variables, hence, the study decided that LCIED significantly affect LTDS while LTXP and LVAT insignificantly affect LTDS of SSA countries. Therefore, from the probability of the J-statistics, the study rejects the null hypothesis and accepts the alternate hypothesis: "Tax revenue has a significant effect on Total Debt Service of Sub-Saharan African Countries."

Equally, model 2, expressed in addition to the effect of analyzed control variables INF, EXR and CRP, as shown in the analyzed statistical outcome, is expressed thus:

$LTDS_{it} = \alpha_0 + \beta_1 LTDS_{it} + \beta_1 LCIED_{it} + \beta_2 LTXP_{it} + \beta_3 LVAT_{it} + \beta_4 LINF_{it} +$

$\beta_5 LEXR_{it} + \beta_3 LCRP_{it} + \varepsilon_{it}$ ................................................................................... Model 2

$LTDS_{it} = 0.634 TDS_{it-1} + 0.075 LCIED_{it-1} + 0.075 LTXP_{it-1} + 0.098 LVAT_{it-1} + 0.021 INF_{it-1} - 0.0002 EXR_{it-1} + 16.659 CRP$

Extracted from table 1, model 2 regression analysis result showed positive coefficients of variation except for EXR, which resulted in a negative coefficient. The probability values of the entire explanatory variables are greater than the selected significance level at 10%, this confirmed that a year lag of: LTDS ($\beta = 0.634$; $\rho$-value = 0.000 < 0.01), LCIED ($\beta = 0.075$; $\rho$-value = 0.485 > 0.1), LTXP ($\beta = 0.075$; $\rho$-value = 0.617 > 0.1), LVAT ($\beta = 0.098$; $\rho$-value = 0.171 > 0.1), INF ($\beta = 0.021$; $\rho$-value = 0.792 > 0.1), EXR ($\beta = -0.0002$; $\rho$-value = 0.601 > 0.1) and CRP ($\beta = 16.659$; $\rho$-value = 0.253 > 0.1), all positively and insignificantly affected LTDS. The value of the coefficients specified that a change in LCIED would yield a 63.4% change in LTDS; a change in LTXP would yield an equal chance of a 7.5% change in LCIED, while LTDS would change by 9.8% due to a change in LVAT. Model 2 is positively moderated by 2.1% and 1665.9% INF and CRP, respectively, and negatively moderated -by 0.02% by EXR.

➤ *Decision*

At a significance level of 10% and degree of freedom of 90%, the value of J-statistics is 19.36 and the ρ-value of 0.31, which is greater than the chosen significance level of 10%, confirmed the validity and thoroughness of the model. Likewise, based on the probability values of each of the measures of the explanatory variables, which are greater than the chosen significance level of 10%, and estimating the significance of the effect of the individual variables, this study decided that all positively insignificantly affected while EXR negatively and insignificantly affected LTDS of Sub-Saharan African countries.

Thus, from the probability of J-statistics, which confirmed the validity and exhaustiveness of the model, the study rejected null hypothesis eight and accepted the alternate hypothesis, which means that "Inflation, exchange rate and corruption have significant control on the effect of tax revenue on Total Debt Service of Sub-Saharan African Countries"

## 5. Discussion of Findings

Models 1 and 2 evaluated the effect of the lag of custom, import and export duties (LCIED), lag of taxes on export (LTXP) and lag of Value Added Tax (LVAT), controlled in model 2 with Inflation (INF), Exchange Rate (EXR) and Corruption (CRP) on the lag of Total Debt Service (LTDS) of SSA countries. The probability values of J-statistics from the output found both models to be valid without serial correlation. The regression analysis result specified that each of the measures of tax revenue has positive coefficients for models 1 and 2, excluding EXR with negative coefficients. The *p*-value of model 1 implies that all explanatory variables positively and significantly affect LTDS except LTXP, which has an insignificant effect on LTDS in SSA countries. Thus, the study rejects null hypothesis seven, which states that tax revenue has no significant effect on the total debt service of SSA countries, and accepts the alternate hypothesis.

Also, the coefficients and *p*-value of model 2 regression results moderated with INF, EXR, and CRP implies that all the explanatory variables positively and insignificantly affected LTDS affected, while EXR positively and insignificantly affected LTDS of SSA countries. Therefore, the study rejects the null hypothesis eight and accepts the alternative that inflation, exchange rate and corruption have significant controlling effects on tax revenue and total debt service of SSA Countries. This result is in consonant with the findings of Iliyasu & Gambo (2022); Hooper *et al.* (2022); Iiyambo & Kaulihowa (2020), positive relationship between government expenditure and revenue; Isah et al., 2022; Efuntade *et al.* (2021). While Ayadi & Ayadi 2008 found debt service, the impact was positive but insignificant, and Vaggi & Frigerio's (2021) findings balanced the effects.

The results indicate that with a stable stream of revenue from taxes, the debt financing capability of the government would be enhanced in line with the findings of Akintoye and Onuoha (2019), who concluded that revenue would be sustained with tax education. The economic implication is that the higher the revenue, the higher the debt servicing capability of nations in SSA, except in the instance of revenue mismanagement. Thus, the findings of this study indicate that tax revenue plays a pivotal role in the debt servicing of nations. Striking balance in tax generation and debt financing would ensure debt reduction. Conversely, there is evidence that revenue generation does not match the required public expenditure needs, which leads to a reduction in capital-based expenditure for recurrent expenditure.

## 6. Conclusion and Recommendations

The study found that total debt service is positively and significantly affected by CIED, VAT, and TXP, but the impact of TXP was insignificant. The outcome was found to be positive and insignificant, with controlled variables in model 2 being positively moderated by INF and CRP, while EXR negatively moderated the effect of tax revenue and total debt service of SSA countries. It was, therefore, recommended that:

- Debt service financing should be from the productiveness of borrowed fund, monitored through debt repayments polices inserted into improving tax revenue and through improved debt service restructurings.
- Taxes and debt financing serve the same purpose and lead to the same outcome: debt reduction. Debt Management Offices (DMOs) should be more deliberate and strategic in effective and efficient debt management, as taxes are effective in financing public spending.

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