External Debt, FDI and Copper Prices and their relationship with Tax Revenue Mobilization: The Case of Zambia

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Abstract

Tax revenue collection is enchanted territory for many nations. The woes that governments face in trying to raise resources for service provision via tax revenue cannot be overemphasized. This study assesses the relationships between tax revenue mobilization and three of its predictors in Zambia. The three predictors are external debt, FDI inflows and copper prices. Public outcry about public debt, the quality of foreign investments and the fact that Zambia's major export has historically been copper, make the three determinants important to study in this context. The study uniquely contributes to the role of prices of the country's major export (copper) on its tax revenue. Data for tax revenue (as a percentage of GDP) was obtained from the Zambia Revenue Authority website. Secondary data for the predictors came from the world development index database for the years 1995 to 2019. The ARDL approach is used to model the long and short run relationships between tax revenue and its three determinants in this study. The study finds a positive long run relationship between external debt and tax revenue. Copper prices only had a positive long run relationship with tax revenue at the 10% significance level. The FDI inflows show no relationship with tax revenue in both the short and long run. External debt and copper prices both had positive significant short run relationships with tax revenue. The study makes several recommendations for policy makers, tax revenue collecting authorities and practitioners as well as for scholarship.

Keywords
Tax Revenue, FDI, Copper, External Debt and Zambia.

1. Introduction

Every country needs tax revenue in order to finance its development programs. Tax collection is therefore crucial to a country's ability to provide social and other services. However, developing nations often collect consistently low taxes. This causes them to resort to debt for the provision of public goods. Other times, they encourage Foreign Direct Investment (FDI) inflows in order to increase economic activity and hence the tax base. Some of these countries are mineral rich. However, as Asfaha (2012) and Pedro (2006) highlight, most literature finds that mineral wealth is negatively correlated with economic growth and hence moves hand in hand with income inequality in developing nations.

Additionally, developing countries; especially in Sub-Sahara Africa (SSA) have often come under pressure for what some people term as 'reckless borrowing'. These countries between Marrakech in Morocco and Cape town in South Africa; the number dozens, often find themselves struggling to pay debt. Surprisingly, many are endowed with natural resources in the form of minerals. The Democratic Republic of Congo (DRC) and Zambia; for example, are among the top ten exporters of copper in the world. Copper therefore plays an important role in Zambia's economy (Unceta,

2021). The copper resources should be used to increase GDP and hence tax revenue collected. However, debt mounts in copper rich countries in SSA and Zambia even in times of rising copper prices. As a result, according to Mwanaumo *et al.* (2020), Zambia is sadly associated with inadequate infrastructure provision, inadequate power supply, water shortages, fuel shortage, poor healthcare services, a shaky school system and erratic telephone services.

It is common to hear political leaders calling for Foreign Direct Investment (FDI) to help kick start industries. A growing number of developing countries place high value on Foreign Direct Investment (FDI) from multinational enterprises' (MNEs). Bilateral tax treaties between developing countries and the MNEs' investor countries influence the amount of tax revenue collected after this investment (Janský and Šedivý 2019).

Some literature (Balima et al. 2016; Mahmood and Chaudhary 2013) reports on the relationship between two factors (debt and FDI) and tax revenue in countries outside SSA. Some (Ayyele 2015) focus on nations in SSA. However, scarce attempts are made to understand how and whether copper prices influence tax revenue in SSA in general and in Zambia particularly. However, lessons from resource rich nations like Zambia have potential for generalizability to other resource rich nations – hence the need to study them.

A descriptive summary of the relationships amongst copper output, copper prices and tax revenue mobilization in Zambia is provided by Simpasa et al. (2013). They state that; from 1930 to 1974, both copper prices and output were rising. Both plummeted from 1975 to 1999. This was followed by a rise from the year 2000. However, they estimate that government revenue from the mines was 4% of GDP on average from 1970 to 2000 and fell to 1.6% in the period after. Despite providing such useful information, the literature was not built on inferential statistics and therefore leaves a methodological gap.

To date, studies to do not focus on the role that FDI, external debt and copper prices together play on tax revenue mobilization in Zambia. This further leaves contextual and theoretical gaps. In order to fill the knowledge gap, this study assesses the relationships between tax revenue mobilization and three of its predictors (external debt, FDI and copper prices) in Zambia.

1.1 Objectives
The purpose of this study was to investigate the relationship between tax revenue mobilization and three of its determinants (External debt, foreign direct investment and copper prices) in the context of Zambia. The specific objectives included:
  (1) To determine the short and long run influence of external debt on tax revenue mobilization in Zambia
  (2) To investigate the short and long run influence of foreign direct investment on tax revenue mobilization
  (3) To determine the short and long run influence of copper prices on tax revenue mobilization.

2. Literature Review
Scholars have attempted to propose theories of taxation and the number myriads. Yet, no single theory explains all the determinants of tax revenue. Some key extant theories are the benefit theory, the cost of service theory and the social-political theories on taxation (See (Minh *et al.* 2022)). The cost-of-service theory assumes that taxes must be based on the cost the government incurs in providing services to citizens. According to this theory, each citizen must pay tax according to the cost the government incurs in providing services to that citizen.

The problem with this theory is that is assumes a quid-pro quo relationship between government and the taxpayer when it comes to taxation. However, this goes against the definition of tax: A compulsory unrequited financial contribution imposed on citizens by their governments (Kaulu 2021). By presuming that taxpayers must pay according to the cost of services provided to them, the cost of service theory takes taxes as a price rather than a compulsory contribution by citizens. Further, the cost of service to a citizen is not easy to determine. For instance, valuing how much it costs to provide street lighting or national defense to citizen A is not an easy task. Public goods such as these ones are accessed by many people all at once with no clear distinction of who used what amount.

The benefit theory tries to provide a better alternative to the cost theory. Similar to the cost theory, the benefit theory uses the benefit received by a taxpayer as a basis for taxation. The validity of this theory is also questionable because

of the assumption that tax is a price paid for benefits received or to be received from the government. Just like the cost theory, it is also hard to determine the benefit per head for many services provided by the government.

Social-political theory addresses the weaknesses of both the cost theory and the benefit theory. The philosophy of social political theories is that political and social goals that cure ills of a society must drive taxes rather than the objectives of individuals. Based on this theory; social political goals of increasing external debt, FDI and copper prices must lead to an increased tax base as more funds are available within the Zambian economy for economic activity. All else being equal, this increased tax base must lead to increased tax revenue mobilization for the country.

The increased tax base can be explained by the exogenous growth model. This theory states that external influences (for example capital accumulation through external debt and FDI inflows and externally determined copper prices) influence economic growth. The increased economic growth coupled with a right social political philosophy should result in increased taxes to the government.

Extant empirical studies on determinants of tax revenue mobilization use these theories to varying degrees and find varying results. The differences in results are attributable to the methods used (for instance measurement of variables) for each study (Mauricio and Rodríguez 2018). This study adopts a combination of these theories in order to understand the relationships between copper prices, external debt and FDI in Zambia on one hand and tax revenue in Zambia on the other hand.

Several studies have been conducted on the effects of tax rates on FDI. However, very little attention is given to the study of the effects of FDI on tax revenues. Most extant literature is illusive about this relationship. It is often in the process of studying other relationships, that scholars have highlighted the nexus between FDI and tax revenue.
Some studies find a negative relationship between FDI and tax revenue (Castro and Camarillo 2014; Janský and Šedivý, 2019; Nunnenkamp *et al.* 2007) while others find a positive relationship (See for example (Corley-Coulibaly *et al.* 2011; Okey 2013)).
One study on China for instance (Wu *et al.* 2020) looks at the role FDI has in driving economic growth. Data from the local statistical city year book for the years 1998 to 2014 with triangulation with CEIC premium database were used. A total of 285 cities with 4,681 observations were considered. Regression modelling is used in the study. In order to incorporate the nonlinear relationship between FDI and economic growth, a squared term of the FDI to GDP ratio was used in the study. One of the findings is that FDI has a negative impact on city tax mobilization. The study provides insight into the role of FDI in tax revenue mobilization. However, this study did not focus on the direct relationship between FDI and tax revenue. It focused on the FDI-economic growth nexus. Further, it did not consider external debt and copper prices.

Mahmood and Chaudhary (2013) study the link between FDI and Pakistani tax revenue. Tax revenue and FDI inflows as percentages of GDP are used as dependent and independent variables respectively. The study employs an ARDL model. The data ranged from 1972 to 2010. They find that FDI and tax revenue in Pakistan relate positively in the long and short run. Apart from being carried out in a region that has a different social-political environment, the study did not consider external debt and copper prices.

While focusing on what determines tax revenue in South-East Asia, Minh Ha *et al.* (2022) use panel data analysis. A total of 34 countries in OECD were considered with data for the years 2001 to 2011. They also consider FDI among the determinants. This variable was measured as a percentage of GDP. They find that FDI positively affects tax revenue. This study was however in the context of Asia, thereby leaving a contextual gap.

Castro and Camarillo (2014) study the tax revenue determinants of thirty-four OECD countries. Panel data analysis is conducted on data from 2001 to 2011. The ratio of FDI to Gross fixed capital formation is used as a measure of FDI inflows in the study. They find a negative relationship between FDI inflows and tax revenue.

While there are varying gaps in the literature, these studies highlight the possibility that FDI may have short and long run effects on tax revenue. Hence it is hypothesized that:
> *H1: FDI has a positive short run relationship with tax revenue*
> *H2: FDI has a negative long run relationship with tax revenue*

Zambia is a copper rich nation and one of the major exporters of the commodity in Africa. Two thirds of the country's foreign exchange earnings came from copper mining exports from 1960 to 2018 (Chikalipah 2021). Normally, rising

copper prices should result in rising government tax revenues. This must particularly be the case when one considers the fact that command and control for natural resources belong to the government (Van Brauman and Mangano 2000). Private hands use these resources with permission of the government; often through licenses. However, lopsided sale of state-owned mines (Lungu 2008), institutional weakness (Unceta 2021), preferential tax treatment for strategic mining firms (Rakner 2017) and aggressive tax planning have inter alia led to low government tax revenue even in periods of rising copper prices. The dearth of literature on the subject highlights how complicit scholarship is in turning a blind eye to this challenge.

Meanwhile, the use of governance systems by mining firms to influence mining and tax policy in their favor is not a new trend. In 'Hit your man where you can', Gwaindepi and Siebrits (2020) discuss how mining representatives avoided lobbying but infiltrated policy making positions in the British cape colony in the 1800s and early 1900s. This, they did to sway policy in directions that favor their tax avoidance goals.

The closest extant literature on how copper prices influence tax revenue is on oil and mineral revenue and how these influence tax revenues. For instance, Keller (2022) studies the relationship between oil and tax revenues in the 2000s in oil rich nations. Synthetic control methodology is utilized. The findings suggest that during the 2000 oil price boom, oil rich nations experienced reduced taxation. This provides insight into the behavior of tax revenue during a rise in resource prices. However, it considered oil prices but not copper prices.

In an attempt to understand the determinants of tax revenue mobilization, Gwaindepi (2021) finds that mining has a negative relationship with government tax revenue. The study uses mineral rents as a percentage of GDP as a measure of mining. It focused on countries in Latin America (LAC) and Sub-Sahara Africa (SSA). While this study provides excellent insights into the relationship between mineral and tax revenues, it did not specifically consider the relationship between copper prices and tax revenue.

Another study by Morrissey *et al.* (2016) on tax revenue determinants focuses on developing countries. It measures the nexus between mineral exports and tax revenue using panel data analysis. It uses IMF and WDI data. A positive relationship is found between mineral exports and tax revenue. It too did not however consider the effect of copper prices on tax revenue. Hence it is hypothesized that:

> *H3: Copper prices have a positive short run relationship with tax revenue*
> *H4: Copper prices have a positive long run relationship with tax revenue*

Another variable of consideration in this study is external debt. Srebrnik and Strawczynski (2016) study the cyclicality of this variable and taxes. After regression analysis and Granger causality tests, they conclude that the relationship between external debt and taxes (particularly Value Added Tax) is procyclical. In their definition, procyclicality occurs when taxes are increased in challenging times and reduced in prosperous times. They suggest that this phenomenon holds for developing nations but the opposite is true for developed nations. While this study provides useful insights on the relationship between external debt and tax revenues, it did not specifically focus on revenue mobilization.

Further empirical evidence produced in extant literature about the debt-tax revenue nexus is conflicting. Minh Ha *et al.* (2022) find a positive relationship while Ndoye (2014) finds a negative relationship between debt and tax revenue. Boukbech *et al.* (2018) study the determinants of tax revenue among low middle income nations. The study uses panel data for the period 2001 to 2014 from 29 countries. They initially suggest that a negative relationship between debt and tax effort exists. They however later admit to theoretical ambiguity in the interpretation of this finding.

Once a government receives funds from loans, there is less immediate pressure to tax citizens. Funds obtained from loans fund public expenditure and trickle down to private citizens who engage in the supply of goods and services. When government runs out of funds for the provision of public goods, it starts collecting more taxes from those who are able to pay (ability to pay theory) in order to provide public goods in an equitable manner (benefits theory). To be precise, this study hypothesizes that:

> *H5: External debt has a negative short run relationship with tax revenue*
> *H6: External debt has a positive long run relationship with tax revenue*

A summary of some key literature and findings is shown in Table 1.

Table 1. Literature on external debt, FDI and copper prices and how they affect tax revenue.

Variable	Relationship with TRM	Related empirical studies and sign
FDI	(+) More FDI leads to economic growth and hence more tax revenue in the short run. (-) but if the country has weak institutions and policies (e.g., superfluous DTAs) or MNEs engage in Aggressive Tax Planning (ATP), funds may be externalized in the long run through income shifting or capital flight.	(+) (Mahmood and Chaudhary, 2013) (+)(Minh *et al.*, 2022) (+)(Corley-Coulibaly *et al.*, 2011) (+)(Okey, 2013) (-) (Nunnenkamp *et al.*, 2007) (-) (-) (Castro and Camarillo, 2014) (Janský and Šedivý, 2019) (-)(Wu *et al.*, 2020) (-)(Heller, 1975) (+/-)(Norbäck *et al.*, 2009)
External Debt	(-/+) Less tax revenue is needed in short run as debt is alternative finance but funds from debt increase production and expenditure (tax base) and hence tax revenue	(+)(Minh *et al.*, 2022) (+)(Teera, 2003) (-)(Ndoye, 2014)(-/+)(Srebrnik and Strawczynski, 2016)
Copper prices	(+) High copper prices increase the tax base in Zambia.	(-)(Gwaindepi, 2021)(used mineral rents) (+)(Morrissey *et al.*, 2016)(used mineral exports)

Note: (+) positive relationship with tax revenue (-) negative relationship

3. Methods

This study assesses the relationships between tax revenue mobilization and three of its predictors in Zambia. The three predictors are external debt, FDI inflows and copper prices. Public outcry about public debt, the quality of foreign investments and the fact that Zambia's major export has historically been copper, make the three determinants particularly important to study. Some studies have used debt service as a proxy for public debt. However, (Mauricio and Rodríguez 2018) argues against this practice. This study adopts the external debt stocks as a proxy for external debt. Data for Tax Revenue Mobilised (TRM) was obtained from the ZRA website. Secondary data for the predictors came from the WDI database.

As per Table 2, multi country studies use panel data analysis while single country studies usually use the autoregressive distributed lag (ARDL) model. This model is useful when the variables are stationary at level and/or first difference. Therefore, the ARDL approach is used to model the long and short run relationships between TRM and its three determinants in this study. Stationarity checks were conducted in order to ensure that the time series of external debt, FDI, copper prices and tax revenue were integrated of order 1 and 0 but not 2.

Table 2. Methodologies in existing literature

Authors	Country	Period	Findings	Methodology
(Mahmood and Chaudhary, 2013)	Pakistan	1972-2010	Positive effect of FDI on tax revenue	ARDL
(Amendolagine et al., 2021)	OECD countries	2000–2017		Panel data analysis
(Minh et al., 2022)	Southeast Asia	2000-2016		
(Castro and Camarillo, 2014)	34 OECD countries	2001-2011	Negative effect of FDI on tax revenue	
(Minh et al., 2022)	Southeast Asia	2000-2016	Positive effect of external debt on tax revenue	Panel data analysis
(Boukbech et al., 2018)	29 lower middle income countries	2001-2014	Negative effect of external debt on tax revenue	Panel data analysis

4. Data Collection

Tax revenue figures from 1995 to 2019 were obtained from Zambia Revenue Authority (ZRA). This is expected to be a reliable source of tax revenue figures because they are largely the regulator and enforcer of tax laws in the country considered in this study; Zambia. The figures for the FDI, external debt and copper prices were obtained from the World Bank open data repository. Specifically, the copper prices came from the pink sheet while the other two determinants came from the WDI database. This is considered appropriate as the world bank tracks the figures for these variables over the years under study; providing an adequate time series.

5. Results and Discussion
5.1 Numerical Results

The summary statistics are shown in Table 3. The average total tax collected in Zambia as a percentage of GDP for the years under study was 15.7%. The maximum was 17.5% while the minimum was 12.5%. A standard deviation of 0.013 suggests that the various TRM figures are close to the mean. The negative skewness (-0.780) suggests that large few losses (likely from large taxpayers) and frequent small gains in TRM are expected *ceteris paribus*. In terms of Kurtosis, TRM was found to be platykurtic. However, the value of 2.908 is close to 3.0 and suggests that TRM is mesokurtic; that is, has a standard normal distribution (For more on Kurtosis, see (Kallner 2018)). The Jarque-Bera test statistic had a p-value above 0.05. This implies normality in the TRM distribution. Similar data for the FDI inflows, external debt and copper price are also shown in the Table 3.

Table 3. Summary Statistics

	TRM	FDI Inflows	Debt	Copper Price
Mean	0.157	5.147	7.2E+09	4702.573
Median	0.160	4.820	5.3E+09	5149.739
Maximum	0.175	9.418	2.6E+10	8828.188
Minimum	0.125	1.552	1.7E+09	1559.478
Std. Dev.	0.013	1.963	6.6E+09	2459.438
Skewness	-0.780	0.321	1.8E+00	-0.025
Kurtosis	2.908	2.503	5.1E+00	1.472
Jarque-Bera	2.546	0.686	1.9E+01	2.436
Probability	0.280	0.710	9.3E-05	0.296
Sum	3.916	128.675	1.8E+11	117564.300
Sum Sq. Dev.	0.004	92.517	1.1E+21	145000000.000
Observations	25	25	25	25

The correlations among external debt, FDI, copper prices and TRM are shown in the Table 4. The findings suggest existence of a weak negative correlation between FDI and TRM. A strong positive correlation between debt and TRM was found. Additionally, a statistically significant negative correlation between FDI and debt was found; suggesting that the more debt the nation incurs, the less FDI it will need and vice versa.

Table 4. Correlations among TRM and its determinants

	Log TRM	Log FDI Inflow	Log Debt	Log Copper Price
Log TRM	1.0000			
Log FDI Inflow	-0.3720*	1.0000		
Log Debt	0.6483***	-0.5616***	1.0000	
Log Copper Price	-0.2033	0.0873	-0.0500	1.0000

Before carrying out time series analysis, stationarity tests must be done. This is particularly essential for ARDL models which require that none of the variables be integrated of order I (2). They can however be I (0) or I (1) or both. The ADF test was used with the PP test for robustness. The results of these tests for stationarity are shown in Table 5. None of the variables are integrated of order I (2).

Table 5. Stationarity Tests (ADF and PP)

	With Constant		With Constant & Trend		Without Constant & Trend	
	t-Statistic	Prob.	t-Statistic	Prob.	t-Statistic	Prob.
Panel 1: ADF						
Log TRM	-2.181	0.218	-2.048	0.547	-0.153	0.620
Log FDI inflows	-3.020**	0.047	-2.988	0.156	-0.591	0.450
Log Debt	0.303	0.973	-0.393	0.982	1.106	0.925
Log Copper price	-0.828	0.793	-1.599	0.763	0.558	0.830
Δ Log TRM	-5.163***	0.000	-3.608*	0.056	-5.295***	0.000
Δ Log FDI inflows	-7.224***	0.000	-7.728***	0.000	-7.369***	0.000
Δ Log Debt	-3.288**	0.028	-3.770**	0.037	-3.225***	0.003
Δ Log Copper price	-3.705**	0.011	-3.590*	0.053	-3.688***	0.001
Panel 2: PP						
Log TRM	-2.1814	0.2175	-1.8128	0.6667	-0.2851	0.5726
Log FDI inflows	-2.9844*	0.0508	-2.9055	0.1782	-0.4964	0.4904
Log Debt	-0.1492	0.9327	-0.3925	0.9818	0.8916	0.8945
Log Copper price	-1.0132	0.7316	-1.8808	0.633	0.4514	0.8042
Δ Log TRM	-6.3007***	0.0000	-11.0015***	0.0000	-6.4707**	0.0000
Δ Log FDI inflows	-7.8098***	0.0000	-12.718***	0.0000	-7.9356**	0.0000
Δ Log Debt	-3.283**	0.0278	-3.7332**	0.0403	-3.215**	0.0026
Δ Log Copper price	-3.7054**	0.0111	-3.5903*	0.0531	-3.6875**	0.0008

Note: Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests with 10% (*), 5%(**) and 1%(***) significant levels.

To estimate the long and short run relationships between the determinants (external debt, FDI and copper prices) and the outcome (TRM), the ARDL approach is used. This requires finding the optimum lag structure. All the information criteria show that the best length is one as shown in Table 6.

Table 6. VAR Optimal Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-23.3654	NA	0.0001	2.3796	2.5771	2.4293
1	44.8722	106.8067*	1.39e-06*	-2.162801*	-1.175415*	-1.914476*
2	58.0639	16.0594	0.0000	-1.9186	-0.1413	-1.4716

The bounds test results are shown in Table 7. When TRM, FDI, Debt and copper prices are used as outcome variables respectively, the F statistics are 5.3606, 5.1266, 2.8288 and 4.9267. The values for TRM and FDI are higher than the upper bound critical value at 5% (5.07) suggesting the existence of two cointegration vectors.

Table 7. Bounds Test

Variable	Log TRM	Log FDI	Log Debt	Log Copper Price
F-Statistic	5.3606	5.1266	2.8288	4.9267
Optimum lags	(1, 0, 1, 0)	(1, 0, 1, 0)	(1, 1, 1, 1)	(1, 1, 1, 1)
Best trend specification	Constant & trend	Constant & trend	Constant & trend	Constant, no trend
Critical Values	10%	5%	1%	
Upper Bound I(1)	3.47	4.01	5.17	
Lower Bound I(0)	4.45	5.07	6.36	
Diagnostics				
R2	0.7236	0.4717	0.9679	0.9666
Adj. R2	0.6261	0.2852	0.9507	0.9520

Note 1: Note: 10% (*), 5%(**) and 1% (***) significant levels.

For robustness, the Johansen cointegration test was also run and the results are in Table 8. These indicate the presence of at least one cointegration equation. This suggests that long run association exists between tax revenue mobilization and the studied antecedents (debt, FDI and copper prices).

Table 8. Johansen cointegration test

Cointegration equations	Eigenvalue	Statistic	Critical Value at 5%	Prob.**
Trace statistic				
None *	0.775006	51.49501	47.85613	0.0219
At most 1	0.42765	17.1863	29.79707	0.6263
At most 2	0.147817	4.352211	15.49471	0.8732
At most 3	0.028849	0.673281	3.841466	0.4119
Maximum eigenvalue				
None *	0.775006	34.30871	27.58434	0.0059
At most 1	0.42765	12.83409	21.13162	0.4676
At most 2	0.147817	3.67893	14.2646	0.8916
At most 3	0.028849	0.673281	3.841466	0.4119

The results of the long and short run estimates are shown in Table 9. These suggest that FDI has a positive influence on TRM in the short and long run but these are not statistically significant. External debt has a positive short and long run relationship with TRM. These are statistically significant. In the short run, a percentage increase in external debt is expected to result in a 0.1931 percent rise in mobilized tax revenue (TRM). A percentage rise in external debt is expected to result in a 0.1597 percent rise in TRM in the long run. The results also indicate that copper prices have a positive influence on TRM. This result is significant at the 5% level in the short run but only at the 10 percent level in the long run. A percentage rise in copper prices is expected to result in a 0.122 percent rise in tax revenue in the short run. In the long run, the corresponding rise is 0.1808 percent.

Table 9. ARDL (1, 0, 1, 0) with regressing determinants on TRM using AIC

Variable	Coefficient	SE	t-statistic	p-value
Panel 1: Long run estimates				
Log FDI Inflows	0.0103	0.0520	0.1989	0.8447

Log Debt	0.1597	0.0507	3.1497	0.0058
Log Copper Price	0.1808	0.0871	2.0761	0.0534
Panel 2: Short run estimates				
Δlog FDI Inflows	0.0070	0.0353	0.1986	0.8449
Δlog Debt	0.1931	0.0453	4.2615	0.0005
Δlog Copper price	0.1220	0.0460	2.6500	0.0170
ECM (-1)	-0.6768	0.1347	-5.0226	0.0001
Diagnostic tests(P-value in brackets)				
Durbin–Watson statistic	1.6433			
Adjusted R^2	0.5914			
R^2	0.6447			
$\chi 2$ SERIAL Breusch-Godfrey LM test	1.384(0.2394)			
$\chi 2$ White	24(0.4038)			
$\chi 2$ NORMAL	3.0491(0.2177)			
$\chi 2$ ARCH	1.7279(0.1887)			
$\chi 2$ RESET	3.89(0.0275)			
F-statistic	12.0947 (0.0001)			

5.2 Graphical Results

This study assesses the relationships between tax revenue mobilization and three of its predictors in Zambia. Figure 1 shows the graphical representations of the time series of the predictors and the outcome variable. Figure 1(a) is the graph of the log of Tax Revenue Mobilization (TRM). The variable values in Figure 1 are shown in logged form in order to standardize the scales for comparison among variables. TRM generally fell from 1996 to the time of the global financial crisis in the 2007-2008 period. After that it began rising to its original level. Figure 1(b) shows that recent years have seen FDI levels falling. External debt was at its lowest in the period 2006 to 2008 as shown in Figure 1(c). This is likely due to the country reaching the Highly Indebted Poor Countries (HIPC) initiative completion point in April 2015. This initiative resulted in much of Zambia's external debt being canceled. There was however exponential growth in debt from 2010 onwards. This reflects the country's increased amount of borrowing in this period. Figure 1(d) shows that copper prices were at their lowest in the early 2000s. They however rose to reach their peak in 2011 for the period under consideration.
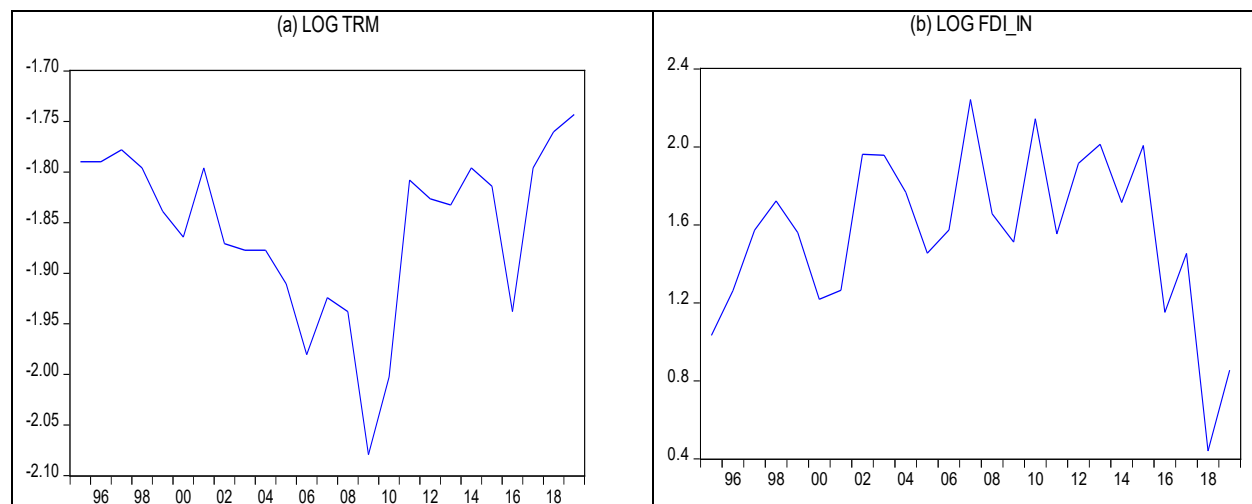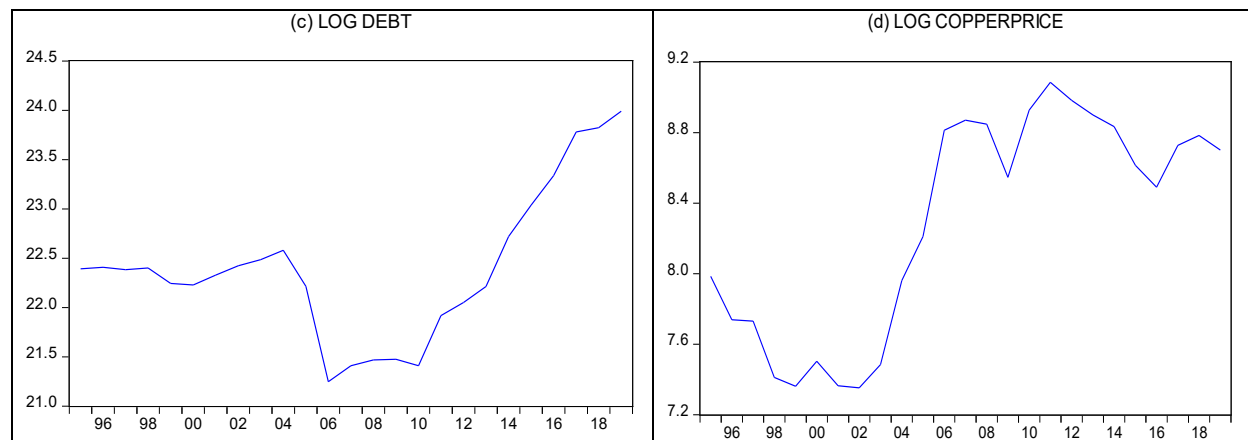
Note: ED is external debt, FDI_IN is Foreign Direct Investment inflows, CP refers to copper prices and TRM are the total tax revenue mobilized. LOG in front of variables is the logarithmic value of the respective variable.

Figure 1. Time series of ED, FDI, CP and TRM

This study has assessed the influence that external debt, FDI inflows and copper prices have on tax revenue mobilization in Zambia. External debt was found to have a positive long and short run relationship with tax revenue. This means that the more debt a nation incurs; the more tax it will collect. Therefore, hypothesis six (H6) was supported while hypothesis five (H5) was noted supported. This is similar to the finding of Minh Ha *et al.* (2022) but differs from that of Ndoye (2014). The finding of this study also supports the ability to pay theory because once funds are borrowed, public expenditure leads to increased funds in the economy for businesses that supply the government. Since the government is under pressure to service debt, it then increases tax collection efforts; following those who have money and ability to pay. Copper prices only had a positive long run relationship at the 10% significance level. Therefore, at the 5% level, hypothesis five (H4) was not supported.

Copper prices were found to have a positive short run relationship with tax revenue. Therefore, hypothesis (H3) was supported. This implies that in the short run; as copper prices rise, tax revenue collected also rises in Zambia. This supports the benefit theory and ability to pay theory. As copper mines benefit more from using transport infrastructure and security provided by the government, they pay more taxes as copper prices rise and more revenue trickles in. The mine contractors also experience more revenue which they pay taxes on.

The FDI inflows showed no relationship with tax revenue in both the short and long run. This differs from the findings of Mahmood and Chaudhary (2013) and Minh Ha *et al.* (2022) who used ARDL and panel data modelling respectively. These studies find a statistically significant relationship between FDI and tax revenue. It also goes against the endogenous growth theory. More FDI inflows should result in increased economic growth. The reason for there being no relationship between FDI and tax revenue in Zambia is possibly because the use of preferential tax treatment to attract foreign investors. This involves offering tax incentives to would be investors. However, as investors make profits over time, illicit financial flows and loopholes in the tax system make it possible for disinvestment and capital flight. The funds are later reinvested back in Zambia through newly registered foreign companies so that more tax incentives are obtained. This goes on into the long run such that FDI has no effect on tax revenue for the government. Although the coming of what Popkova and Haabazoka (2019) call the "Cyber Economy" can help in tracking down these tax evasion and avoidance schemes, governments of developing nations need to up their industry 4.0 capabilities.

5.3 Proposed Improvements
While several governments consider attracting more FDI as a useful tool to raise future tax revenues, the tool is not significant for Zambia. Self-sustaining measures are recommended. For example, more Zambian private sector investments could be encouraged. Tax incentives such as Preferential Trade Area, DTA, and tax holidays that are supposed to attract FDI must also be revisited in order to ensure that they do indeed lead to increased benefits to the nation (this should be a subject of future studies). The results of this study however suggest that any costs of offering incentives to attract FDI can be used for a better purpose because FDI inflows do not have a significant relationship with tax revenue. The sociopolitical benefits of attracting FDI therefore need to be analyzed and if not feasible, FDI

attraction policies must be discouraged. The findings further show that incurring external debt leads to increased long and short run tax revenue. Hence, the major recommendation is that debt should be incurred but should be well managed. Preferably, debt must be incurred for capital projects that bring in revenue in future. Strict controls on debt acquisition and disbursement as well as audit must be implemented. The government can then fund revenue expenses using tax revenue collected from income from capital projects. Funding revenue expenses using external is a recipe for disaster. A rise in copper prices was found to cause a rise in tax revenue in the short run. Better management of revenue collected in buoyant short run times must be encouraged. Smoothing revenues may be useful. Here more tax revenue must be collected in good times and used efficiently with saving or investing the rest. Less tax revenue must be collected in difficult times when prices plummet. Government expenditure in difficult times can be financed by the savings or dividends from investments made in buoyant times.

5.4 Validation

Diagnostic tests are summarised in panel two of Table 9. The model passed various diagnostic tests including the Breusch-Godfrey test of serial correlation, Jarque-Bera test of normality, ARCH and white test of heteroscedasticity, RESET test of linearity and *CUSUM* and *CUSUM of square* tests of model stability. In terms of model stability, Figures 2 and 3 show the results of the CUSUM and CUSUM of square tests. All the plots fall with the 5% critical boundaries confirming stability of the estimated model parameters over the period estimated.
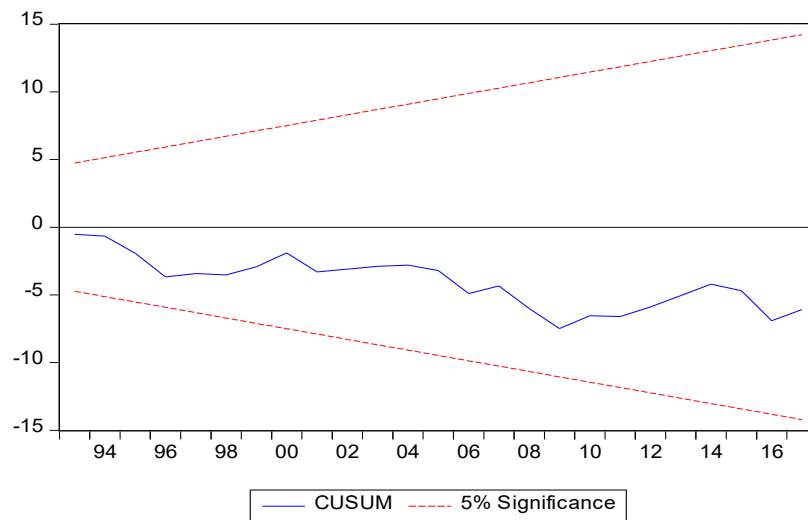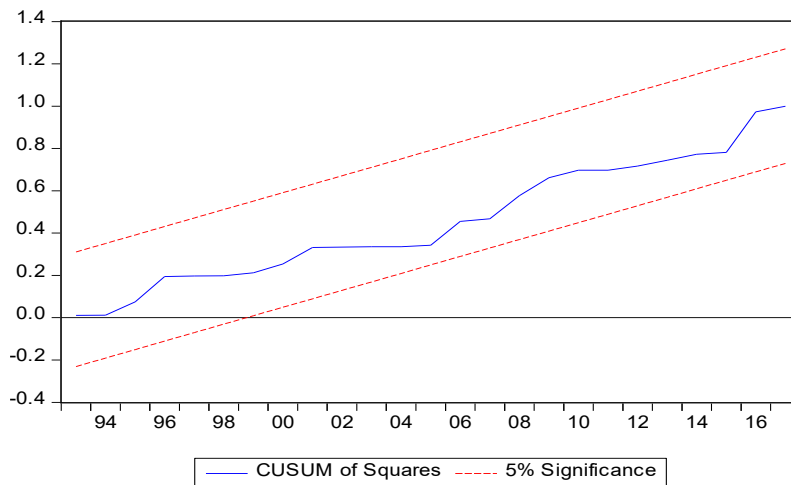

Figure 2. CUSUM Test of Model Stability

Figure 3. CUSUM of Squares Model Stability Test

6. Conclusion

This study assessed the relationships between tax revenue mobilization and three of its predictors in Zambia. The three predictors are external debt, FDI inflows and copper prices. Public outcry about public debt, the quality of foreign investments and the fact that Zambia's major export has historically been copper, make the three determinants particularly important to study. Data for tax revenue was obtained from the ZRA website. Secondary data for the predictors came from the WDI database. The ARDL approach is used to model the long and short run relationships between tax revenue and its three determinants in this study. External debt was found to have a positive long run relationship with tax revenue. Copper prices only had a positive long run relationship at the 10% significance level. The FDI inflows showed no relationship with tax revenue in both the short and long run. External debt and copper prices both had positive significant short run relationships with tax revenue. The study makes several recommendations for policy makers, tax revenue collecting authorities and practitioners as well as for scholarship.

Acknowledgements

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Biography

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