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CAN REMITTANCES BOOST TAX REVENUES IN ZIMBABWE? A SECONDARY QUARTERLY TIME-SERIES ANALYSIS

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Abstract

The study applied the ordinary least squares (OLS) technique on quarterly time-series data to analyze if remittances can boost tax revenue in Zimbabwe. The main challenge faced in Zimbabwe is the insufficient tax revenues to finance growing public spending needs. Results indicate that the share of remittances both in the current and lagged period significantly influenced income tax revenue and the volume of manufacturing. Trade openness was found to be insignificant. Similar results were also observed for the variables when value-added tax to total revenue was the dependent variable. When lagged variables were taken into account, results showed that only remittances were significant. Thus, increased remittance inflows have significant potential to generate more taxes for the government through income and consumption taxes. The study recommends the creation of platforms, which stimulate and attract more remittances, such as reducing costs of sending remittances through formal channels. Secondly, good governance and quality institutions provide appropriate economic environment and growth policies. Economic growth fosters increased and sustainable tax due to an increased tax base.

Keywords: Monetary Policy, Optimal Currency Areas, Exchange Rate, Franc Zone

JEL Classifications: C02, C22, E62, F24, F31

1. Introduction

Zimbabwe has been grappling with fiscal space challenges as revenue collection rates have often fallen short of targets in most years post the dollarization era. For instance, in 2016, revenue outturn was US$3.5 billion, against a budget target of US$3.85 billion, which translates to an overall revenue shortfall of US$347.8 million (MoFED, 2017; RBZ, 2017). In addition, the 2016 revenue collections represented a 6.3 percentage point decline from revenue collected in 2015. Moreover, an expenditure overrun of US$902 million was incurred (US$4.9 billion against a target of US$4 billion). Thus, the revenue collections have been relatively low in relation to the government's spending appetite.

Enhancing government revenue mobilization is critical given the need to finance Sustainable Development Goals (SDGs) (Todaro and Smith, 2003; Nguyen *et al.* 2006; World Bank, 2017). For instance, building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation can be sustainably achieved through domestic funding, which mainly consists of taxes (Mahmood and Chaudhary, 2013; Kassim, 2016; Jeza *et al.* 2016). Against this background, the study explores if remittances can help to improve the fiscal situation in Zimbabwe. This is motivated by the fact that remittances are the most robust and stable source of foreign financial inflows compared to foreign direct investment (FDI) and official development assistance (ODA), which are highly volatile. Remittances are also mostly consumptive and thus help smooth private consumption (Clist and Morrissey, 2011). Although remittances are not directly taxed, they contribute to government taxes by increasing the consumption levels of recipient households (Tabasam, 2014). Given that remittances are generally consumptive, they are expected to significantly contribute to the value-added tax (VAT) collections. Thus, the potential tax benefits of remittances in Zimbabwe cannot be underestimated.

The major challenge faced in the fiscal space is the insufficient tax revenues to finance growing public spending needs in Zimbabwe. The relationship between remittances and tax revenue is unquestionably an issue of great practical importance. No study has investigated the impact of remittance inflows on the government's fiscal behavior in Zimbabwe. To the extent that remittances boost tax revenue for Zimbabwe, the findings of this study have policy implications in pursuing effective economic policies and institutional setup to incentivize the channeling of remittances through formal channels to generate more revenue in order to meet the developmental challenges of the economy. Furthermore, information about the impact of remittances on tax revenues will influence the priority that policymakers and advisors attach to reducing the costs of sending remittances through formal channels in order to improve the nation's fiscal position.
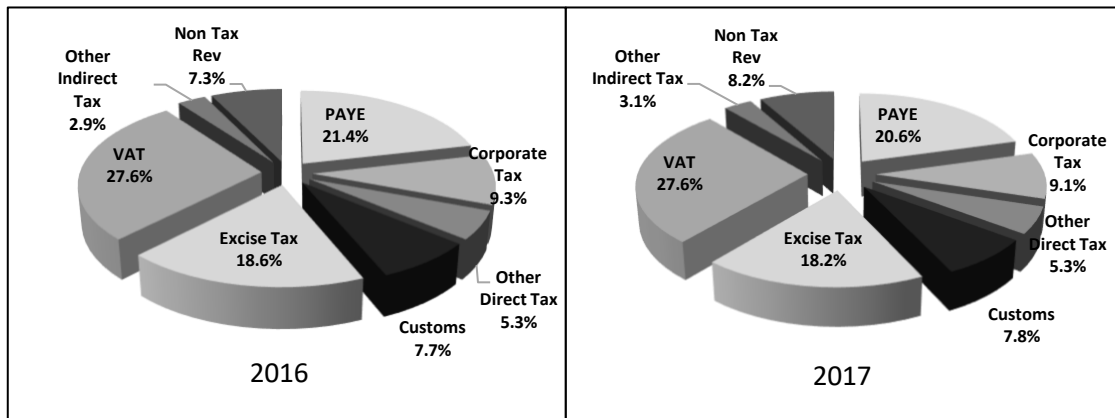
Thus, this study aims to explore and analyze the impact of remittance inflows on tax revenue generation in Zimbabwe. Specifically, the study intends to investigate the impact of trade openness on tax revenue and whether remittances can boost taxes in Zimbabwe and establish the effect of other variables on tax revenues in Zimbabwe. The working hypotheses for this paper are that remittances boost taxes in Zimbabwe, and trade openness has a positive impact on tax revenue. Other variables of interest which establish our third hypothesis are that increases in per capita income, trade, and service industry growth help increase taxes in Zimbabwe.

This paper contributes to scanty literature on remittances in Zimbabwe by using quantitative models to justify policy prescriptions and the basis for advocacy. The structure of this paper is as follows. Firstly, an overview of the Zimbabwean fiscal space is provided for the context of the discussion. This section is followed by a discussion of the theoretical and empirical literature. The methodology is described in Section 4, and results are presented with a summary of key findings in Section 5. Lastly, the policy recommendations are presented.

2. Overview of the Zimbabwean fiscal space

Government financing in Zimbabwe mainly comes from taxes, which are generally classified as direct and indirect taxes. Direct taxes include income tax, property tax, and corporate income tax whereas indirect taxes comprise general excise tax, customs, and import duties. Value-added tax (VAT), pay as you earn tax (PAYE), corporate tax, excise and customs Duty have been the major contributing tax heads to Zimbabwe's tax revenue. Figure 1 gives a breakdown of the contribution of different tax revenue heads to total taxes in 2016 and 2017.

Figure 1 indicates that VAT accounted for the largest share of government taxes in Zimbabwe, with 27.6% both in 2016 and 2017. This is followed by PAYE, which accounted for 21.4% and 20.6% of total government revenue in 2016 and 2017, respectively. The 0.8 percentage point reduction in the contribution of PAYE in 2017 compared to 2016 mainly reflects the job and income losses experienced in Zimbabwe on account of the slowdown in economic activity. Corporate tax was 0.2 percentage point lower in 2017 (9.1%), as most companies struggled from liquidity constraints and the influx of cheaper commodities from South Africa. Other tax heads did not record significant changes from 2016, with excise duty averaging 18.2% of total revenues.

Figure 1. A comparative analysis of the composition of revenues (2016 and 2017)
Source: MoFED (2017)

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Figure 2 shows the annual trends in the share of tax revenue and remittances to the gross domestic product (GDP). The share of tax revenues to GDP exhibited an increasing trend since the adoption of the multicurrency regime, with the share of tax revenues to GDP between 2009 and 2016 averaging 32.8% compared to a SADC average of 21.5%. Tax revenues to GDP ratio rose from around 15.1% in 2009 to 38% in 2015. In addition, the share of remittances to GDP exhibited a relatively similar trend by increasing from 3.4% in 2009 to 5.8% in 2015. The ratio later retreated to 4.7% in 2016. Share of tax revenue to GDP dropped from a high of 38.7% to 36.2% in the same year.
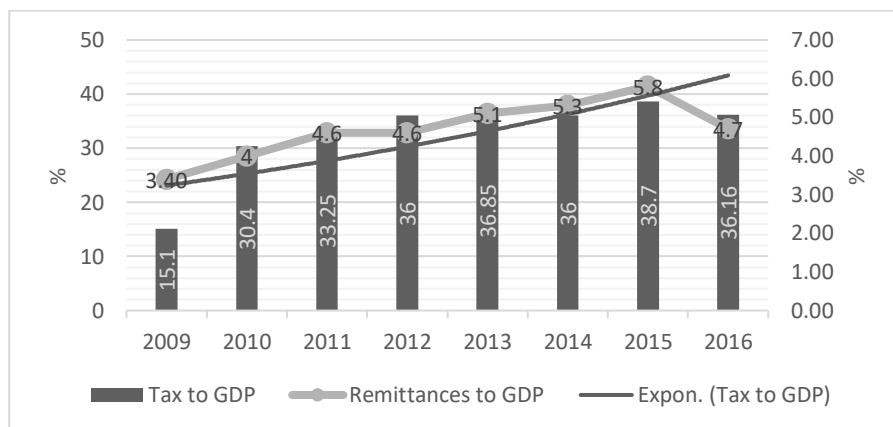
Figure 2. Annual trends in the share of tax revenue and remittances to GDP (2009 to 2016)
Source: Authors' compilation using data from ZIMRA (2017) and RBZ (2017)

The exponential curve in Figure 2 illustrates that the share of tax revenues to GDP has generally been going up. This improvement does not necessarily show the improvement in the fiscal situation, but it is because the country's GDP and/or economy are significantly undervalued

(Tanzi *et al.* 1981). Consequently, relying on these statistics hides some underlying factors. The correct reflection is that Zimbabwe is fiscally constrained. A detailed analysis of the post-dollarization era shows that the fiscal situation is precarious as the country continues to run excessive deficits as shown in Table 1.

Table 1. Trends in budget balance in Zimbabwe from 2009 to 2017

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Budget Balance (US$ millions)	36	196	22	-10	-246	-184	-393	-1,421	-1,707
Budget Balance to GDP (%)	0.4	2.0	0.2	-0.4	0.0	-1.0	-2.2	-8.2	-9.5

Source: Authors' compilation based on the data from from MoFED (2009 to 2018)

Table 1 shows that the budget deficit worsened from US$53 million in 2012 to a startling US$1.71 billion by the end of 2017. As a share of GDP, the budget deficit rose from 0.4% in 2012 to a staggering 9.5% in 2017. Worse for the economy is the fact that the deficit was mainly financed by domestic borrowings that gives rise to the domestic debt, which stood at approximately US$2.37 billion by the end of 2017. This represents 27% of GDP and 67.7% of total revenues. A potential threat arising from the ballooning domestic debt is the high likelihood of government default, which may reduce confidence in the financial sector and therefore potentially affect the government's future borrowing plans. If this trend continues, there is a high risk that the share of domestic debt to government revenue will soon surpass the 70% threshold as stipulated under the Public Finance Management (PFM) Act[1].

Table 2 illustrates recent tax revenue performance in the post-dollarization era. According to ZIMRA (2017), both the target and actual collections were low in 2009 since it was the initial year under the multi-currency regime, and collections covered only a part of the year. Over time, a rising trend in revenue collections is exhibited, which might be related to the increased efforts by Zimbabwe Revenue Authority to enforce tax compliance.

Table 2. Revenue performance against revenue targets from 2009 to 2016

	2009	2010	2011	2012	2013	2014	2015	2016
Tax revenue	1.05	1.92	2.5	3.65	3.64	3.82	3.87	3.85
Actual revenue	0.99	2.24	2.6	3.5	3.43	3.84	3.76	3.5
Tax gap	0.06	-0.32	-0.1	0.15	0.21	-0.02	0.11	0.35

Source: Zimbabwe Revenue Authority (ZIMRA, 2017)

A key highlight observed in Table 2 is the challenge of achieving set revenue targets. Figure 2 shows that revenue collections only managed to reach targets in 2010, 2011, and 2014. In 2009, 2012, 2013, 2015, and 2016, actual revenue collections missed target by 6%, 4.1%, 5.8%, 2.8% and 6.3%, respectively. The "tax gap", which is the difference between tax revenue that can be collected and what is collected, had been generally increasing.

In 2013, the revenue target had to be revised downwards by 12.2% from US$4.1 billion to US$3.64 billion (ZIMRA, 2017). This was done to cater to economic problem that was affecting collectability during that fiscal year. This tax gap has significantly narrowed vital investments in human and capital infrastructure, which is crucial for sustainable development. If this tax gap persists, it poses serious challenges for the government's ability to finance the Sustainable Development Goals. It is therefore vital to find ways of increasing the revenue base of the

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[1] Currently at 67.7% of revenues, the domestic debt ratio to government revenue is just 2.3 percentage point below the PFM Act requirements, which stipulates that "at no point should domestic debt exceed 70% of the previous year's revenue". However, government borrowing from the central bank is at 21.5%, which exceeded the PFM Act ceiling of 20%. The 2018 Monetary Policy has, however, put in place measures to constrain government borrowing to the required 20% of previous year's revenue.

treasury. In this regard, it is crucial to empirically find out if remittances can help boost the government's revenue generation capacity.

A total of US$5.24 billion was received in remittance inflows between 2009 and 2016, as shown in Table 3. This translates to an annual average of US$655 million or 4.8% of GDP, with the highest inflows recorded in 2015. Although remittances are not directly taxed, they indirectly contribute to taxes through consumption-based taxes.

Table 3. Trends in remittance inflows in Zimbabwe in US$ millions (2009 to 2016)

	2009	2010	2011	2012	2013	2014	2015	2016	Total	Average
Remittances (US$ millions)	294	403	552	649	788	837	939	779	5,241	655
% of GDP	3.4	4.0	4.6	4.6	5.1	5.3	5.8	4.7	4.8	4.8

Source: Zimbabwe Revenue Authority (ZIMRA, 2017)

3. Literature review
3.1. Effect of remittances on tax revenue

Remittances are a source of revenue to any nation, and the government is likely to tap into that source, thereby increasing tax revenue (Heller, 1975; Gupta, 2007; Bakhtiari *et al.* 2013; Balikcioglu *et al.* 2016). In support of this, Ebeke (2010) investigated remittances, value-added tax, and tax revenue in developing countries and found that remittances significantly increase government tax revenue. These positive effects on fiscal performance are only conditional on the presence of the value-added tax system in remittance-dependent countries. Tabasam (2014) explored the impact of financial capital inflows, including remittances, on tax revenue in Pakistan between 1975 to 2012. By using cointegration techniques, the results showed that remittances boost the per capita income of recipient households. This puts the recipients into higher tax brackets, thereby boosting the amount of income tax collected by the Pakistani government.

Similar results were obtained by Abdih *et al.* (2012b) in the Middle East, North Africa, and Central Asia using longitudinal data from 1990 to 2009. Using three-stage least squares (3SLS) and ordinary least squares - fixed effects (OLS-FE) models, the results confirmed that remittances are positively correlated with sales tax revenues. This was consistent with the fact that remittances are robustly stable and strongly related to household consumption, which in turn has a significant impact on sales tax revenue. The study showed that the inclusion of remittances in the analysis of debt sustainability changes the amount of fiscal adjustment which is required for debt to be on a sustainable path. The study postulated that if remittances are not taxed directly, then they may contribute to the debt sustainability indirectly through increasing tax base, government's seigniorage revenue, and the demand and purchase of government bonds. A study conducted by Chami *et al.* (2008) in Chile showed that when a government uses consumption taxation, remittances increase and, thus, this leads to an increase in tax revenues through private consumption.

A study by Singer (2012) explored the effect of remittances on government spending and total tax revenues. The study showed that remittances and government expenditures positively affect each other, and this can be explained by the positive effect of remittances on total tax revenues. The positive effect of remittances on total tax revenues was derived through regressions where remittances were instrumented by GDP per capita. This was accounted for the top ten remittance-sending countries in the world weighted with the inverse of the distance between the sending and receiving country, a concept derived from the augmented gravity model (Pasara and Dunga, 2020).

The positive fiscal impact of remittances was also supported by Jeza *et al.* (2016) and Mascagni (2016) for Ethiopia using data from 1961 to 2010. Following a two-step procedure by Engle and Granger (1987), the study found out that Ethiopia's tax revenue performance positively responded to remittance inflows, particularly through the consumption channel. Other variables incorporated in the tax regression included GDP per capita and trade openness. The positive remittance-tax revenue nexus was supported by Alabede (2016), who used a panel data set for eleven West African countries between 1990 to 2013. The study by Alabede (2016) also included

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aid inflows disaggregated into concessional loans and grants. The results indicated that loan aid has a more positive impact on tax revenue than grant aid. Bwire (2013) also obtained a positive remittances-tax revenue relationship for Uganda over the period from 1972 to 2008. The study found out that remittances increased public spending and hence taxation in Uganda by using cointegration techniques.

The evidence from these studies suggests that developing countries like Zimbabwe stand a chance to widen their fiscal space from remittance inflows. Since remittances boost tax revenue performance for developing countries, Zimbabwe can benefit more by establishing formal channels via which remittances can come through. Further, Abdih *et al.* (2012a) investigated how remittances affect the sustainability of government debt based on the Lebanese fiscal data. The main result of the study shows that the inclusion of remittances in the traditional analysis of debt sustainability changes the amount of the fiscal adjustment which is needed to place debt on a sustainable path. The study argued that fiscal sustainability can be attained when remittances positively influence domestic revenues since the tax base would have grown. An empirical confirmation of the effect of indirectly taxing remittances was done by Abdih *et al.* (2012a), who empirically confirmed this relationship of indirect taxes on remittances by employing a panel model for North African, Middle Eastern, and Central Asian economies. They concluded that although remittances are usually not directly taxed, an increase in the flow of remittances expands the government revenue via trade-based and consumption-based taxes.

Another study by Chami *et al.* (2008) investigated the link between remittances and public finance for the Chilean economy using a dynamic general equilibrium model. The results of the study showed that taxation of labor income undesirably makes government rely more on inflation to appropriate resources as the level of remittances increases. This is the result of remittances reducing the labor supply and, therefore, the tax base. In contrast, when the government taxes consumption, an increase in remittances boost tax revenues through private consumption, and the government policy in this case is relatively less distortionary.

Ziesemer (2011) studied using data for 52 countries on how remittances impact GDP per capita growth, emigration, tax revenue, savings, and education expenditure by the public sector using 2000 as the base year. Results indicated that there is a positive correlation between remittances, savings rate, education expenditure, and GDP per capita. The results also show that when remittances increase, tax revenue and emigration decrease, and this directly reduces labor force growth.

After analyzing these three recent papers, the main conclusions are twofold. Firstly, it can be concluded that migrants' remittances might increase government tax revenue even when they are not directly taxed by the government. Secondly, as remittances enter the receiving country through family transfers, they indirectly affect the fiscal policy and debt sustainability through the activities of the households, who receive these remittances, and according to Abdih *et al.* (2012b), it is in such context that remittances are dissimilar to natural resources. Though governments may own the latter and derive revenue, they suffer from diminishability and excludability issues. In the case of the former, they directly enter into the production process.

3.2. Trade openness impact on tax revenue

Gaalya *et al.* (2017) investigated the impact of trade openness on the tax revenue by mainly focusing on East African countries. Their study used panel data using the fully modified ordinary least squares and dynamic OLS methodology. The results showed that the average tariff rate, which was used as a proxy for trade openness, positively influences total tax, indirect tax, and trade tax. Further, the findings indicate the negative relationship between trade openness and the average tariff rate squared, and this illustrates a "Laffer effect" for the three tax categories.

After using a gravity model to analyze the relationship between trade openness and tax revenue, a study by Addison and Levin (2006) indicated that trade flow increased due to trade openness, thereby supporting the hypothesis that trade openness stimulates volume of trade and economic growth. This leads to multiplier effects, such as increased income taxes as a result of a wider tax base due to higher income per capita.

Moreover, Agbeyegbe *et al.* (2006) investigated the link between trade liberalization, exchange rates, and tax revenue using panel data for 22 countries in Sub-Saharan Africa. The study period was from 1980 to 1996, and they used the generalized method of moment regressions to test this relationship. The results indicated that the relationship between tax revenue and liberalizing trade is sensitive to proxies employed for the latter. On a more general level, the two indicators are not strongly linked. They are, however, more associated with higher income tax revenue. In addition, there was some relationship reflected between higher rates of inflation and currency appreciation to lower tax revenues and its related components.

3.3. Other factors affecting taxes

Bikas and Andruskaite (2013) observed two groups of factors that influence VAT: rates and basis and other variables of economic activities, conditioning tax basis, and compliance of tax regulations. Hence, VAT income is determined by many factors, and these include the situation of the economy of a country as measured by the GDP (Mumvuma *et al.* 2003; Okey, 2013; OECD, 2007). In addition, higher living standards are usually measured by GDP per capita, increased awareness of tax payments are coupled with low tax fraud, and higher consumption implies that the relationship should be revised (Kostial and Gropp, 2000; Mukhtar, 2012). VAT income fundamentally depends on the level of consumption in the country since VAT is a consumption tax. Thus, variables that influence VAT income, such as government and household consumption, should be examined. Furthermore, VAT income is also determined by the level of exports and imports (Nwosa *et al.* 2012). If the export growth rate is zero, the growth of exports could have a negative impact on tax (Ezemenari *et al.* 2008).

According to Amin *et al.* (2014), who did a study in Pakistan on the factors affecting tax collection in that country, corruption, political stability, and level of GDP play a significant role. Similar to Zimbabwe, the roots of corruption in Pakistan date back to the period when the British government rewarded land and titles to those people who were loyal, and this was the root cause of nepotism and corruption. As noted by Transparency International (2011), the collection of taxes is negatively affected by corruption in a country. Corruption in the tax system in Pakistan led to a 50 percent revenue loss in the form of uncollected taxes. A complex tax structure and fixed corruption contracts between the tax administrator and the taxpayer stimulated corruption. Other factors such as political instability also add to the corruption basket since politicians seek to implement policies that do not promote tax revenue collection as a way of consolidating their power. Thus, political stability will significantly contribute towards the establishment of proper structures which do not divert tax revenue away from corrupt government accounts.

Earlier results by Legeida and Sologoub (2003) indicated a strong positive correlation between income per capita and tax collection in Ukraine. Further, an increase in tax revenue is considered responsive to inflation changes. Indirect taxes stimulate inflation, which lowers the purchasing power of income and ultimately tax collection. Inflation has an inverse impact on direct and on indirect taxes in Pakistan. According to Omolo's (2012) finding on Kenya, tax base influences tax revenue. If the government has a narrow tax base, the revenue shrinks, and if it broadens, the revenue increases. Also, change in tax rate affects tax revenue (Konings, 2001; Knack, 2000; Gwenhamo, 2009). In addition, Omolo (2012) found that change in oil price influences the tax revenue. Therefore, if there are any changes in the product's price on which the country depends, the revenue changes accordingly. This argument was highlighted by Epaphra (2014) in his research on the revenue implications of trade liberalization in Tanzania as well.

The main conclusions of the remittance-taxation literature are twofold. Firstly, avoiding indirect taxes by the government is likely to increase migrants' remittances. Secondly, remittances indirectly affect fiscal policy and sustainability of debt through activities of remittance-receiving households, primarily through their consumption and saving decisions. It is in this regard that Abdih *et al.* (2012a) stressed that remittances are different from natural resources in that they not only enter directly into the economy but do not also require capital injection for extraction or procession and do not diminish in value. Remittances provide a pragmatic solution to sustainable revenue generation in Zimbabwe given the number of citizens in the diaspora community, and it can be a significant indirect fiscal stimulus.

4. Methodology

The ordinary least squares (OLS) methodology is employed in investigating the fiscal impact of remittance inflows in Zimbabwe. The choice of OLS over other estimation techniques, such as the general method of moments (GMM), was made due to its proven ability in providing the best linear unbiased estimator (BLUE) in linear regressions (Gujarati, 2004). The model specified builds on the earlier discussed theory on the fiscal impact of remittance inflows supported by empirical studies.

The study estimates two basic regression models and considers two dominant tax heads, which have a link with remittances, income tax, and VAT revenue heads. Additionally, three measures of remittances are considered; namely, current period remittances, one period lagged remittances, and remittance squared. Extrapolating from the empirical literature by Legeida and Sologoub (2003), Omolo (2012), Bikas and Andruskaite (2013), Amin *et al.* (2014), Tabasam (2014), other control variables, which affect taxes, were added, including economic growth and trade openness. Accordingly, the following empirical models were specified as shown in Equation 1 and 2:

$$INCTAX_t = \alpha_0 + \alpha_1 REMT_t + \alpha_2 REMT_{t-1} + \alpha_3 REMT_t^2 + \alpha_4 TOPEN_t + \alpha_5 VMIG_t \qquad (1)$$

$$VAT_t = \alpha_0 + \alpha_1 REMT_t + \alpha_2 REMT_{t-1} + \alpha_3 REMT_t^2 + \alpha_4 TOPEN_t + \alpha_5 VMIG_t + \mu_t \qquad (2)$$

where; $INCTAX_t$ is the share of income tax revenue to total taxes, VAT_t is the share of VAT revenue to total tax revenue, $REMT_t$ is the share of remittances to Volume of Manufacturing Index (VMI), $REMT_{t-1}$ is the share of one period lagged remittances to VMI, $REMT_t^2$ is remittances squared, $VMIG_t$ is the growth rate of the Volume of Manufacturing Index (VMI), which measures economic growth on a quarterly basis, $TOPEN_t$ is trade openness, μ_{1t} and μ_{2t} are the error terms [assumed to be normally distributed and independent and identically distributed (IID)], α_0 is a constant, and $\alpha_1, \alpha_2, \ldots, \alpha_5$ are linear slope coefficients.

Pre-estimation tests were conducted to ensure the robustness of the model. These include stationarity tests and multicollinearity tests. In the case of the former, a variable is generally integrated of order k, if it becomes stationary after differencing k times. To identify any trend(s) in the data, stationarity is vital in avoiding spurious regressions. Spurious regressions arise in time series regressions where one often obtains a very high R^2 (above 0.9) even though there is no meaningful relationship (Gujarati, 2004). Furthermore, dealing with non-stationary time series data is likely to inflate the results with a high likelihood of inconsistency and a low Durbin Watson (DW) statistic. The most common unit root tests are the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests. Given that these tests provide the same results this study uses the conventional ADF test for stationarity testing. For uniformity, the decision on stationarity is concluded using probability values, where a p-value less than 5% indicating stationarity.

Multicollinearity is a test to assess the randomness of explanatory variables – that is, a test for correlation between independent variables in a model. Auxiliary regressions and pair-wise correlation matrices are commonly used to check for multicollinearity. This study uses the pair-wise correlation matrix to detect serious multicollinearity. The underlining idea with the pair-wise correlation method is that the absolute correlation coefficients between two independent variables should not exceed 0.8; otherwise, multicollinearity would be a serious problem. If serious multicollinearity is detected between variables, then one of the highly correlated variables should be dropped.

4.1. Diagnostic tests

In the same vein, post-estimation tests were conducted before results could be reliably interpreted. These include the heteroskedasticity test, autocorrelation test, normality test, and model specification test. Heteroscedasticity is when variances are unequal. Although OLS estimators are unbiased and consistent even in the presence of heteroscedasticity, they are not efficient and estimated standard errors are inconsistent (Gujarati, 2004). Put differently, the

consequences of heteroscedasticity are that the OLS estimators will no longer be BLUE. This inflates the standard errors and provides wrong confidence intervals and significance tests results. The study uses the Breusch-Pagan Godfrey approach in testing for heteroscedasticity. The errors are said to be homoscedastic if the probability value of the F-statistic or chi-square exceeds 0.05. In OLS estimation, weighted least squares method is used to correct the problem of heteroscedasticity. Alternatively, the white heteroscedastic-consistent variances and standard errors method are used to see whether heteroscedasticity is a serious problem (Gujarati, 2004).

Another important residual test is autocorrelation, which occurs when time-series data is influenced by its own historical values. The consequences are the same as those of heteroscedasticity, that is, it results in inefficient OLS estimator,s which provide unreliable confidence intervals and affects hypothesis testing. Several tests can be used to test for autocorrelation, which includes Durbin Watson (DW) and Breusch-Godfrey (BG) test. The study uses the Breusch-Godfrey (BG) over the DW test statistic as the latter is often bounded with some regions of inconclusiveness. The assumption of no autocorrelation is rejected if the probability value of the F-statistic or Chi-square is less than 0.05. If the residuals are serially correlated, then the problem is mitigated by using the generalized least squares (GLS) method.

The normality assumption is vital in enabling the derivation of the probability distributions of the estimates, which simplifies the task of establishing confidence intervals and hypothesis testing (Gujarati, 2004,). The Jacque-Berra (JB) formal test was used in testing the normality assumption. The residuals are said to be normally distributed if the probability value of the Jacque-Berra test statistic exceeds 0.05. In addition to the aforementioned tests, it is important to ensure that the OLS model is correctly specified if correct conclusions are to be drawn to reliably guide policymakers. In this regard, the study uses the Ramsey Regression Specification Error Test (RESET) to check for correct model specifications. The model is correctly specified if the probability value of the F-statistic exceeds 0.05. Biased and inconsistent results would be obtained if the model is misspecified. If a model is misspecified, alternative models should be sort. The coefficient of determination (R-squared) is used to diagnose the fitness of the model while the adjusted R-squared is used as a quality checker of R-squared. Generally, a model is a good fit if both R-squared and its adjusted value are at least 50%. The probability of the F-test is also used in testing the validity of the model. The significance of the OLS coefficients is checked using p-values.

4.2. Data

The study used quarterly data from 2009Q2 to 2017Q4, which adds up to thirty-five (35) time-series observations[2]. Data on income tax and VAT revenue was obtained from ZIMRA, which reports tax revenue performance monthly and quarterly. Thus, the data on each quarter is readily available from ZIMRA. The Ministry of Finance and Economic Development (MoFED) reports tax revenue on a monthly and quarterly basis in its Quarterly Economic Outturn Updates. The data on remittances and the Volume of Manufacturing Index (VMI) were obtained from the Reserve Bank of Zimbabwe (RBZ) monthly and quarterly reports. The Zimbabwe Statistics Agency (ZIMSTAT) reports data on VMI on a monthly and quarterly basis.

5. Results

Descriptive statistics are presented first in this section, and it is followed by pre-estimation tests, diagnostics tests and regression results.

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[2] Time-series regressions require that the number of time observations should be at least twenty-five (25) to allow for robust regressions and reliable results. From the central limit theorem (CLT), it follows that for $T > 25$, any variable, say X, tend to follow a normal distribution with mean zero and variance one, that is, $X \sim N(0,1)$.

5.1. Descriptive statistics

Table 4 presents a summary of the descriptive statistics for the variables used in this study.

Table 4. Descriptive Statistics (T=35)

	VAT	INCTAX	REMT	REMT(-1)	TOPEN	VMIG
Mean	23.75	16.87	7.16	7.71	67.09	4.42
Median	24.00	12.70	6.80	5.70	69.48	4.13
Maximum	27.60	19.60	13.30	19.00	109.52	11.45
Minimum	22.90	13.40	2.70	0.90	35.92	0.67
Std. Dev.	7.98	5.56	2.16	4.97	18.96	8.02
Skewness	-0.02	0.69	1.11	1.11	19	0.50
Kurtosis	3.09	2.52	4.87	3.13	2.36	3.20
JB	0.02	3.25	13.05	7.63	0.84	1.91
Prob	0.99	0.20	0.00	0.02	0.66	0.39
Obs.	35	35	35	35	35	35

Source: E-views 9 regression output from authors' computations

Table 4 shows that the average share of VAT to total tax revenue was 23.75% which ranged from 22.9% to 27.6%. In addition, the share of income tax to total tax revenue averaged 16.87%, with the highest being 19.6% and the lowest 13.4%. The average rate of remittances to the Volume of Manufacturing Index (VMI) was 7.16%, while the economy registered an average growth rate of 4.42% as measured by the quarterly change in the Volume of Manufacturing Index (VMIG). The mean trade openness was 67.09%, with the highest being 109.52% and the lowest 35.92%. This finding translates into a range of 73.6% and a standard deviation of 18.96. In terms of variation, the data exhibited a reasonable degree of variation as the standard deviations were below respective means except for VMI growth (VMIG), which had a higher standard deviation of 8.02 compared to a mean of 4.42. The descriptive statistics also show that VAT, remittance-squared, and VMI growth are negatively skewed while remittances and its lagged value trade openness are positively skewed. Table 5 indicates the stationarity results using the probability values of the ADF test statistic at the % level of significance under the null hypothesis that there is a unit root against the alternative hypothesis of no unit root.

Table 5. Stationarity tests results

Variable	ADF p-value Level	Variable	ADF p-value First Difference	Order of Integration
VAT	0.0503	DVAT	0.0000***	One
INCTAX	0.1826	DINCTAX	0.0000***	One
REMT	0.3480	DREMT	0.0002***	One
REMT(-1)	0.1630	DREMT(-1)	0.0000***	One
TOPEN	0.5360	DTOPEN	0.0000***	One
REMTSQ	0.4634	DREMTSQ	0.0000***	One
VMIG	0.0334**			Zero

Source: E-views 9 regression output from authors' computations

Table 5 shows that only VMI growth (VMIG) is stationary in levels and statistically significant at 5% level, and therefore, integrated of order zero. Generally, a variable is integrated of order k if it becomes stationary after differencing k times. All the other variables are stationary after first differencing and statistically significant at 1%. Thus, they are integrated of the first order as shown in the last column of Table 5. The pairwise correlation matrix was used to detect serious multicollinearity among the explanatory variables, and the results are shown in Table 6. Multicollinearity was checked on the stationary data to avoid spurious regressions as well.

Table 6. Pair wise correlation matrix

	DREMT	**DREMT (-1)**	**DTOPEN**	**DREMTSQ**	**VMIG**
DREMT	1				
DREMT(-1)	0.2652	1			
DTOPEN	0.4573	0.5439	1		
DREMTSQ	0.1095	-0.1418	-0.1184	1	
VMIG	0.1716	0.0839	0.1565	-0.193	1

Note: The pair-wise correlation matrix is symmetrical and thus only values on the lower diagonal are presented.

Source: E-views 9 regression output from authors' computations

The results in Table 6 show that all the pair wise correlation coefficients are below absolute 0.8 which implies the absence of serious multicollinearity. As a rule of thumb, serious multicollinearity is detected when $|x| \geq 0.8$. These results imply that the explanatory variables are not moving in a systematic fashion and therefore their individual effects on the independent variable are significantly isolated.

5.2. Diagnostic test results

The diagnostic tests are carried out to check for normality, heteroscedasticity, and autocorrelation, which are specific tests for the error terms. In addition, the model misspecification test results help to determine the predictability power of the explanatory variables on tax revenue. The tests results are presented in Table 7.

Table 7. Diagnostic test results

Test for	**Test statistic**	**p-value (Model 1)**	**p-value (Model 2)**
Heteroscedasticity	Breusch-Pagan-Godfrey	0.7103	0.2536
Autocorrelation	Breusch Godfrey	0.6672	0.2509
Normality	Jarque-Bera	0.7032	0.9291
Model misspecification	Ramsey RESET	0.5570	0.1591

Source: Authors' computation

The diagnostic test results presented in Table 7 show that both models satisfy the classical linear regression assumptions, as the error terms are homoscedastic, free from autocorrelation, and are normally distributed. The results also show that both models are correctly specified and thus fit to predict VAT and income tax performance in Zimbabwe. The diagnostic test results show that there are differences in the variances of the error terms, which means that the error terms are not heteroscedastic. In other words, the error terms are homoscedastic. This is shown by the probability values of the Breusch-Pagan-Godfrey test statistic of 0.7103 for Model 1 and 0.2536 for Model 2. Since both probability values are greater than the conventional significance level of 0.05, the implication is that there is no heteroscedasticity in the error term specifications.

The autocorrelation test results mirror those of heteroscedasticity in the sense that the probability values of the Breusch-Godfrey test statistic of 0.6672 for Model 1 and 0.2509 for Model 2 are greater than 0.05. This result indicates that the successive error terms are uncorrelated or free from autocorrelation. The normality tests results reveal that the error terms are normally distributed[3]. This is indicated by the probability values of the Jacque-Bera test statistic of 0.7032 for Model 1 and 0.9291 for Model 2, which are both greater than 0.05. This implies that the error

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[3] The error term is said to be normally distributed when it has mean of zero and variance of one, that is, $\mu \sim N(0,1)$

terms are normally distributed, and the significance testing and confidence intervals obtained from the results are highly reliable. The normality test results for Model 2 shows that the probability value of the Jarque-Bera test statistic is 0.9291, which is greater than 0.05. This implies that the error term in Model 2 is normally distributed and, thus, the results for hypothesis testing and confidence intervals are reliable.

In addition, the model misspecification results based on the Ramsey RESET test statistic indicate that both models are correctly specified since probability values of the F-statistics of 0.557 for Model 1 and 0.1591 for Model 2 are greater than 0.05. Thus, both VAT and Income Tax models passed the necessary diagnostic tests results, and the results can be considered parsimonious[4].

5.3. Regression results

Two basic regressions were carried out corresponding to Equations 1 and 2 in the methodology section. Model 1 as presented in Table 8 presents the results for the impact of remittances on income tax while model 2 presents the VAT regression results.

Table 8. Regression Results for Model 1 and 2

	Model 1: (Dependent Variable: Income Tax to Total Tax Revenue (DINCTAX))	Model 2: (Dependent Variable: VAT to Total Tax Revenue (DVAT))
DREMT	1.0825*** (0.0000)	2.0854*** (0.0000)
DREMT(-1)	0.0511*** (0.0010)	0.1005*** (0.0048)
DREMTSQ	0.1087** (0.0128)	1.0081*** (0.0000)
DTOPEN	0.7774* (0.0843)	0.4421 (0.2086)
VMIG	0.0842** (0.0414)	0.0911** (0.0479)
R-squared	0.8624	0.9078
Adjusted R-squared	0.8387	0.8925
F-statistic	36.3462	59.1350
Prob (F-statistic)	0.0000	0.0000
DW-statistic	1.9817	1.9942

Notes: ***, **, * means significance at 1%, 5% and 10% respectively. Numbers in parentheses indicate the p-values.

Source: Authors' computations

The results in Model 1 showed that income tax revenue significantly and positively responds to remittance inflows in Zimbabwe. However, the magnitude of the effect weakens over time, as revealed by the coefficient of remittance squared term (0.1087). The F-statistic (36.35) value and its probability value (0.0000) show that the estimated model is statistically fit to predict tax revenue in Zimbabwe. This argument is supported by the R-squared value, which indicate that the explanatory variables account for 86.24% of variations in income tax revenue.

Model 2 shows that when VAT is used as the dependent variable, the fiscal effect of current period remittances is approximately double that on income tax. The results also show that the continued inflows of remittances (captured by the squared term) and economic growth (captured by the growth in Volume of Manufacturing Index) stimulate tax revenue in Zimbabwe. Moreover, Model 2 reveals that the model fitness, as indicated by the R-squared, increases to 90.79% when VAT is used as the dependent variable. This suggests that remittances have a stronger impact on VAT than income tax. Remittances boosting VAT more than income tax is in line with theoretical predictions.

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[4]According to Feldstein (1982), a useful model is not the one that is 'true' or 'realistic' but one that is parsimonious, which means plausible and informative.

The results in both models reveal that economic growth (as measured by the growth in Volume of Manufacturing Index) bolsters both income and VAT tax revenues in Zimbabwe. A unit increase in economic growth (VMIG) increases tax revenues by 0.08 units in Model 1 and 0.09 units in Model 2. This suggests that economic growth stimulates tax revenues regardless of how taxes are measured. In terms of significance levels, the effect is consistent as the coefficient of economic growth is significant at 5% in both models. The effect of an expanding economy on tax revenues came as expected and is consistent with previous findings (Alabede, 2016). Thus, the tax base widens as the economy grows, which increases per capita incomes and benefits the fiscus through increased consumption taxes.

The results showed that remittance inflows significantly boost taxes in Zimbabwe, with a unit increase in remittances raising income taxes by about 1.08 units and VAT revenue by approximately two-folds (2.08 units). The positive fiscal impact of remittances is statistically significant at the 1% level. The results also indicate that past remittances [REMT (-1)] increase both income tax and VAT revenue in Zimbabwe. The fiscal impact is however marginal as shown by small coefficients of 0.05 units (Model 1) and 0.10 units (Model 2). This means that income tax and VAT revenue go up by 0.05 units and 0.10 units for every unit increase in past remittances. This result is significant at 1%. The results also note that the continued inflow of remittances (as captured by the remittance-squared term, REMTSQ) engenders higher income tax and VAT revenue in Zimbabwe. Specifically, a unit increase in remittance-squared increases income tax and VAT revenue by 0.10 units and 1.0 units, respectively. The results indicate that the positive fiscal impact of remittances weakens with time, as shown by relatively small coefficients (0.10 for income tax regression and 1.0 for VAT regression). Thus, the magnitude of the remittance-induced fiscal impact decreases over time. This may be explained by the fact that remittance recipients are likely to channel remittance money into productive projects than consumptive ventures whenever they are sure of receiving more remittances.

6. Conclusion

The fiscal situation is tight for the Zimbabwean government as the economic performance has been sluggish amid the shrinking formal sector leading to a significant decline in revenue generation. Since tax rates were already relatively high, increasing tax revenue by increasing tax rates is likely to lead to negative welfare effects for both producers and consumers. Consequently, the government should consider fiscally-prudent-welfare-optimizing options to improve total taxes without hurting the average economic agent. Thus, this study investigated the effects of remittances based on two tax heads: income tax and VAT. The OLS methodology was applied on quarterly time series data for the period 2009Q2 to 2017Q4.

Results indicated that remittances increase both income and VAT. In other words, income tax and VAT revenue in Zimbabwe positively respond to remittance inflows. However, the positive fiscal effect slows down with time, as evidenced by a relatively low magnitude of the aid-squared term. Therefore, although the positive fiscal impact of remittances can be sustained for a longer term, it becomes relatively marginal over time. This finding suggests a possible diminishing effect of remittances on tax revenue in Zimbabwe. The possible explanation for this is that remittances are likely to be channeled to productive investment ventures than consumption in the long term. Also, the results revealed that remittances help increase current tax revenues. This suggest that remittances have a lagged effect in increasing taxes in Zimbabwe. This lagged tax response is yet marginal. The implication of the finding on remittances and taxes in Zimbabwe is that remittances foster higher tax revenue mobilization in a nation.

The findings from both models indicated that tax revenue responds significantly and positively to the level of economic growth. Thus, growing the economy offers a long-lasting solution to increasing taxes in Zimbabwe. This is in line with the recommendation by Tanzi *et al.* (1981) that the most sustainable way of improving the fiscal space in any nation is to grow the economy. The idea is that growing the economy increases aggregate demand and thus widens the tax base for governments.

The study established notable findings on the remittances-taxation nexus, which are crucial for policy purposes. First, the results revealed that income tax and VAT revenue in

Zimbabwe significantly and positively respond to remittance inflows. Thus, increased remittance inflows have a significant potential to generate more taxes for the government through income and consumption taxes. The positive fiscal impact is much stronger for VAT revenue than income tax. This is explained by the fact that remittances are mostly used for consumption and thus tend to contribute more to indirect tax through VAT than direct taxes through income taxes. The policy recommendation stemming from this finding is that the Zimbabwe Revenue Authority (ZIMRA) can generate more taxes if the government creates a platform that attracts more remittances. This can be done through, for instance, reducing the costs of sending remittances through formal channels. The current transaction costs are relatively high such that individuals opt to send remittances through informal channels, such as buses or in-kind as parcels. It is also vital for the government of Zimbabwe to realize the importance of good governance and institutions. This suggests the need to improve policies, governance, and institutional quality to generate more taxes.

The results also suggested that economic growth fosters more tax revenue in Zimbabwe. The policy implication of this finding is that the most sustainable way to generate more taxes is to grow the economy, which will then increase the tax base. Future studies can examine whether the remittance-taxation nexus is causal by using advanced econometric techniques such as the vector auto regression (VAR) model. Related to this, integration techniques such as the Johansen and Juselius (JJ) methodology can be used to establish if the fiscal impact of remittances is sustained over time. This study used the squared term of remittances to decide on the long-term fiscal effect of remittances, yet, cointegration techniques such as the JJ can provide better informed and robust results.

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