THE EFFECTS OF EXCHANGE RATE DYNAMICS ON TAX REVENUE EFFORT: EVIDENCE FROM MALAWI 1990 to 2021

MASTER OF ARTS (ECONOMICS) THESIS

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UNIVERSITY OF MALAWI

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MASTER OF ARTS (ECONOMICS) THESIS

By

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DECLARATION

I, Khumbolane George Chavula, affirm that this thesis represents my own independent work and has never been submitted for similar purposes to this or any other university or institution of higher learning. Proper acknowledgements have been given for the use of other's work. All errors contained herein are the author's sole responsibility.

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Full Legal Name

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Signature

21 March 2024

Date

CERTIFICATE OF APPROVAL

The undersigned certifies that this thesis represents the student's work and effort and acknowledges where other sources of information are used. The thesis is submitted with our approval.

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Second Supervisor

DEDICATION

This one is dedicated to me for believing in my dreams and being able to withstand unsurmountable pressure during the process. I am forever grateful to God for this great opportunity in life, and may this stand in memory as a reference point for my future endeavours.

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Most importantly, I am forever indebted to God for all the grace and mercies bestowed upon me.

ABSTRACT

Exchange rate dynamics are critical determinants of tax revenue efforts yet to be explored. A review of literature in Malawi and sub-Saharan countries shows that there needs to be more literature on the subject matter. The study's primary objective was to analyze the extent to which exchange rate dynamics (devaluation policy and an exchange rate regime change) affect tax efforts. This study uses time series data from 1990-2021 using the Ordinary Least Squares (OLS) and Vector Autoregressive (VAR) estimation techniques to assess the effects of Exchange rate dynamics on tax revenue efforts. The study finds that factors such as Exchange rates, per capita Gross Domestic Product (GDP), agriculture share in GDP, and Trade openness significantly affect tax revenues in Malawi. The study also finds that changes in factors such as Exchange rates and Exchange rate regime Granger cause Tax revenues in Malawi, and the changes in exchange rates had a positive significant impact on tax revenue as there are traceable short-run effects of 2 to 4 years period. However, changes in the exchange rate regime had adverse significant effects on tax revenues for a short-run period of 0 to 2 years. The study further established the tax effort scores for Malawi and found that Malawi has been collecting taxes as expected from the economy's structural characteristics. The study recommends that the government continue considering the Exchange rates as a policy instrument guiding demand for goods and services both domestically and internationally, as well. Specifically, consider tax reforms in the form of an increase in the value-added tax (VAT) to outweigh the effects of the nominal devaluation in the currency, which helps regain the competitiveness of domestically produced goods.

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LIST OF ACRONYMS AND ABBREVIATION

ADF	Augmented Dickey-Fuller
AfDB	African Development Bank
DRMS	Domestic Revenue Mobilization Strategy
GBP	Great British Pound
GDP	Gross Domestic Product
IMF	International Monetary Fund
LDC	Less Developing Countries
MKW	Malawi Kwacha
MoF	Ministry of Finance
NRT	Non-Resident Tax
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PRGF	Poverty Reduction and Growth Facility
PIT	Personal Income Tax
RBM	Reserve Bank of Malawi
SDG	Sustainable Development Goals
SDR	Special Drawing Rights
VAT	Value Added Tax
VAR	Vector Auto-Regression
USD	United States Dollar
WDI	World Development Index

CHAPTER 1

INTRODUCTION

1.1 Background

Tax revenue effort is an index of a nation's performance in terms of tax collection in relation to its economic potential (African Development Bank, 2010). Tax revenue effort is found by dividing a projected tax potential of the country with the actual tax collection share, given the economy's structural characteristics. When the country is collecting taxes exceeding what is being projected by the fundamental features of its economy, the tax revenue effort ratio exceeds one. In contrast, (Macha *et al.*, 2018) a tax revenue effort ratio below one entails that a country is collecting less tax than its predicted potential. However, a taxing effort ratio of about one indicates that the country's revenue collection effort is as expected from the country's structural characteristics.

The United Nations mandate for developing countries is to raise at least 20% their Gross Domestic Product (GDP) their taxes to achieve the Sustainable Development Goals (SDGs) (Dickinson, 2014). Sub-Saharan Africa tax revenue statistics by the Organization for Economic Co-operation and Development (OECD) indicates that tax revenue slightly increased from 15% of GDP in 2015 to a mere 15.1% in 2018, Ofori & Obeng, (2021).

According to the Malawi Domestic Mobilization Strategy 2021-2026 (Finance, 2021), the structure of Malawi's significant taxes includes taxes on income such as Corporate Income Tax (CIT), which is taxable on income earned by corporates. Capital gains and other types of incomes such as interests or dividends are also included in the assessment of the tax. The realized gains or losses from foreign exchange fluctuations are either taxable or tax-deductible, respectively. Personal Income Tax (PIT) is scheduled under various tax rate structures which apply to different tax bands for individuals, partnerships and sole proprietors. The tax base covers all the capital, labour, and business income. Value Added

Tax (VAT) is consumption-based tax that applies to a large number of products and services, with the exception of those that are exempt from tax, zero-rated, and relief supplies as specified by the VAT Act. Customs and Excise tax is a levy on the import or export of goods in line with tariff rates specified in the Customs and Excise (Tariff) order. Non-tax revenue (NRT) refers to all government revenue not derived from taxes.

Malawi's exchange rate regime has involved pegging the Malawi Kwacha to one currency or a basket of currencies. From 1965 to 1973, the currency was pegged to the Great British Pound (GBP), thus known as the Malawi Pound. Between 1973 and 1975, pegging was to a trade-weighted GBP and USD basket. In 1975, the trade weighted basket was unpegged and pegging was to the International Monetary Fund's (IMF's) special drawing rights (SDR), maintained until 1984. However, the USD continued to dominate in the SDR pegged basket implying that the MKW appreciated whenever the USD appreciated, and whenever this happened, the Malawian exports were constrained. Devaluing of the Malawi Kwacha against the SDR by 15 per cent in 1982 and 12 per cent in 1983 followed. In 1984, the SDR peg was abandoned for a new peg, linking the Malawian currency to a trade-weighted basket of five currencies: the USD, French Franc, Japanese Yen, German Mark, and GBP. As a consequence, devaluations followed, including 15% in 1985, 10% in 1986, 20% in 1987, 15% in 1988, 7% in 1990, and 12% in 1992, Pauw, Dorosh, & Mazunda, (March 2013).

Research conducted by Munthali and colleagues in 2010 revealed that between 1994 and 1997, Malawi's exchange rate was managed through a float regime. Subsequently 1998, the managed float was abandoned and adopted was a flexible exchange rate policy, as prescribed by a three-year structural adjustment program, effectively reducing the currency's overvaluation. According to a study by Rodrik in 2007, currency undervaluation can facilitate economic growth, while currency overvaluation can hinder it. Additionally, Tanzi noted in 1989 that a much-overvalued exchange rate could result in a lower tax-to-GDP ratio for developing countries. However, due to economic uncertainty resulting from low foreign currency inflow and the nation's suspension from the IMF Poverty Reduction and Growth facility in 2000, Malawi abandoned this regime in 2004-2006.

The Malawi currency further weakened by 10% in 2011 and 48.8% in 2012, according to the Reserve Bank of Malawi (RBM) Bank Supervision Annual Report (2011, 2012). The RBM dumped the then-fixed exchange rate regime for a liberalized foreign exchange rate system. A study (Mundell, 1961) argues that the flexibility of exchange rates performs better as a shock absorber, allowing governments to pursue autonomous contra-cyclical monetary and fiscal policies. However, (Humphrey, 1978) argues that exchange rates volatility in a flexible regime imposes a welfare cost on the economy. As such, the Malawi currency continued to depreciate sharply by 104.7 per cent to USD by the end of 2012 due to floatation. This led to the abandonment of the regime for a managed system, and thus, in May 2022, the RBM further devalued the Malawi Kwacha by 25 per cent to control for forex shortages in the country, Kampanje, 15 August (2022).

1.2 Problem Statement

Malawi experienced a currency devaluation and regime floatation in 2012. This currency devaluation and regime change led to reforms in the tax regime. Currency devaluation is likely to enhance external competitiveness and restore the trade balance. Hence, increasing revenue solves the payment balance difficulties (Ayele, 2019). (Ofori et al., 2018.) it also reported that the decrease in the foreign exchange rates due to a devaluation has positive overall effects on revenue generation. On the other hand, (Munthali et al., 2010) found that in the long run currency devaluation of real exchange rates has insignificant currency effects on economic growth in Malawi. Nonetheless, empirical evidence is needed on whether the currency devaluation and change in the exchange rate regime affected the tax revenue effort in Malawi even after the upward trend in revenue from 2012 to 2021. While discussing literature on the tax revenue efforts in Malawi, Macha et al. (2018) found that Malawi was under-taxing, given the economy's structural characteristics. In addition, (Le *et al.,* 2012) estimate tax revenue effort using regression analysis as an empirical methodology to estimate the factors influencing tax revenue collection and identifying the impact of such variables on a country's taxable capacity. However, these studies have yet to consider the effects that currency devaluation, a change in the exchange rate regime, and a change in exchange rates have on tax revenue efforts in a particular developing country like Malawi. Thus, this study aims to analyze how much exchange rate dynamics, i.e.,

devaluation policy, an exchange rate regime change, and exchange rate changes, affect Malawi's tax revenue efforts.

1.3 Main Objective of Study

Overall, the study primary focus of the study was to trace the extent to which exchange rate dynamics i.e., devaluation policy, a change in currency regime, and a variation in exchange rates, affect tax revenue efforts in Malawi.

Specifically:

i. To examine the effects of a change in exchange rates on tax revenue efforts in Malawi.
ii. To examine the effects of a change in foreign exchange regime on tax efforts in Malawi.

1.4 Study Hypothesis

From the objectives stated above, the subsequent null hypothesis will be tested:

i. A change in Exchange rates (devaluation) does not affect tax revenue efforts.
ii. A change in the Exchange rate regime does not affect tax revenue efforts.

1.5 Significance of study

Exchange rate dynamics are a crucial factor not yet explored in regards to the determinants of tax revenue efforts. A review of literature in Malawi and sub-Saharan countries shows that there needs to be more literature on the subject matter. In analyzing the tax ratios in Malawi (Macha *et al*., 2018) regarding Tax efforts, it was found that Malawi was under-taxing given the structure of its economy. However, the study falls short in tracing the degree to which Exchange rate dynamics, i.e. devaluation policy, a change in foreign exchange regime and a change in exchange rates, affect tax revenue collection efforts and whether there is a causality effect between Exchange rate dynamics and Tax revenues, which this study intends to answer.

1.6 Organization of study

The study's structure is outlined as follows: Chapter 2 presents the exchange rate dynamics and tax effort overview in Malawi, the stylized facts on tax efforts, and the stylized facts of exchange rate dynamics. Chapter 3 presents the literature reviews, the theoretical literature review, which explores the theories regarding the effects of expenditure switching, the fiscal effects of a devaluation, the Monetary Transmission mechanism, and the empirical literature review. Chapter 4 presents the Methodology and data, the estimation strategy, variable description and data, and diagnostic tests. Chapter 5 presents the Empirical results and interpretations, descriptive analysis, diagnostic tests, VAR order determination, Granger causality test, Var stability test, OLS regression results and interpretation, and the impulse response function interpretation. Chapter 6 presents the conclusions and policy recommendations.

CHAPTER 2

OVERVIEW OF TAX EFFORTS AND EXCHANGE RATE DYNAMICS IN MALAWI

2.1 Summary

This Chapter overviews the stylized facts of tax revenue efforts and the dynamics of exchange rates in Malawi from 1990 to 2022. During the study period, it was observed that there had been tax reforms from 1985 to 1999 and from 2000 to 2010, which conceded with the exchange rate changes due to the regime changes from 1990 to 2021 and devaluations such as in 1990, 1992, 2011, and 2012.

2.2 Stylized Facts of Tax Efforts in Malawi

The Domestic Revenue Mobilization strategy (Finance, 2021) stipulates a significant increase in the domestic revenue performance in Malawi from contributing 14% in 2004/05 to at least 20% in the 2016/17 fiscal year. The 6 percent upward adjustment was also reflected in the tax to GDP ratio, from contributing 12% in 2004/05 fiscal year to 18% by 2016/17. However, if developing nations need to meet the Sustainable Development Goals (SDGs) by 2030 the United Nations estimates that at least 20% of the nation's GDP must be raised through taxes.

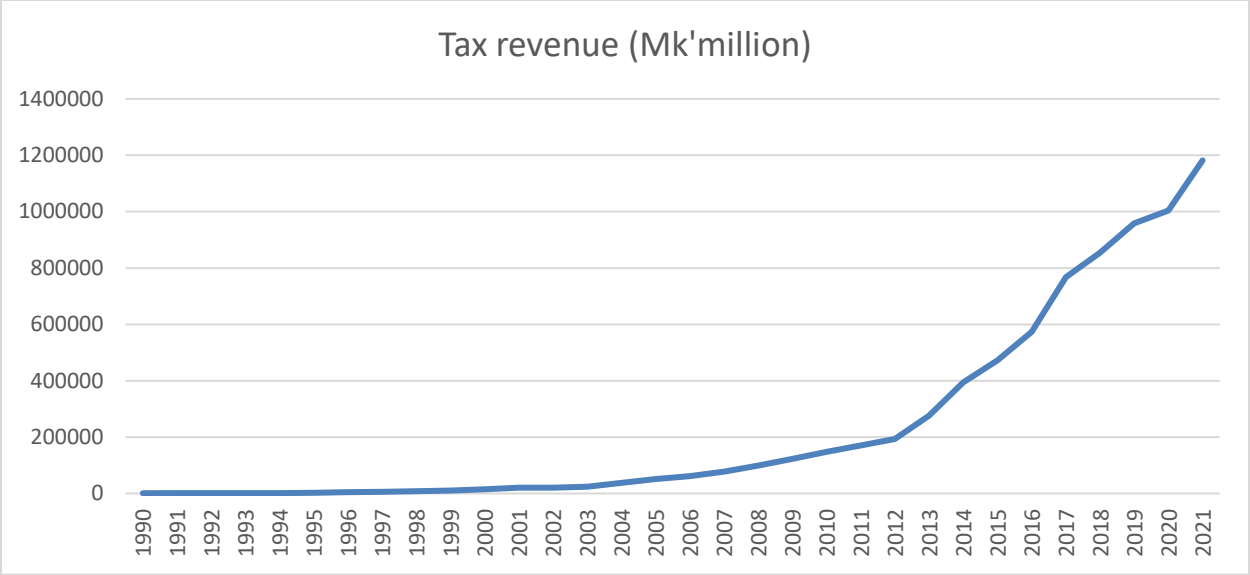

Figure 1: Tax revenue collection 1990-2021

Source: Computations by the author using Ministry of Finance (MoF) data

The significant taxes in Malawi comply with both direct income and consumption taxes. Regarding reliability between direct and consumption taxes, Malawi depends more on taxes such as Corporate Income Tax and PAYE than consumption taxes such as VAT. Figure 2 illustrates the revenue performance by tax type.

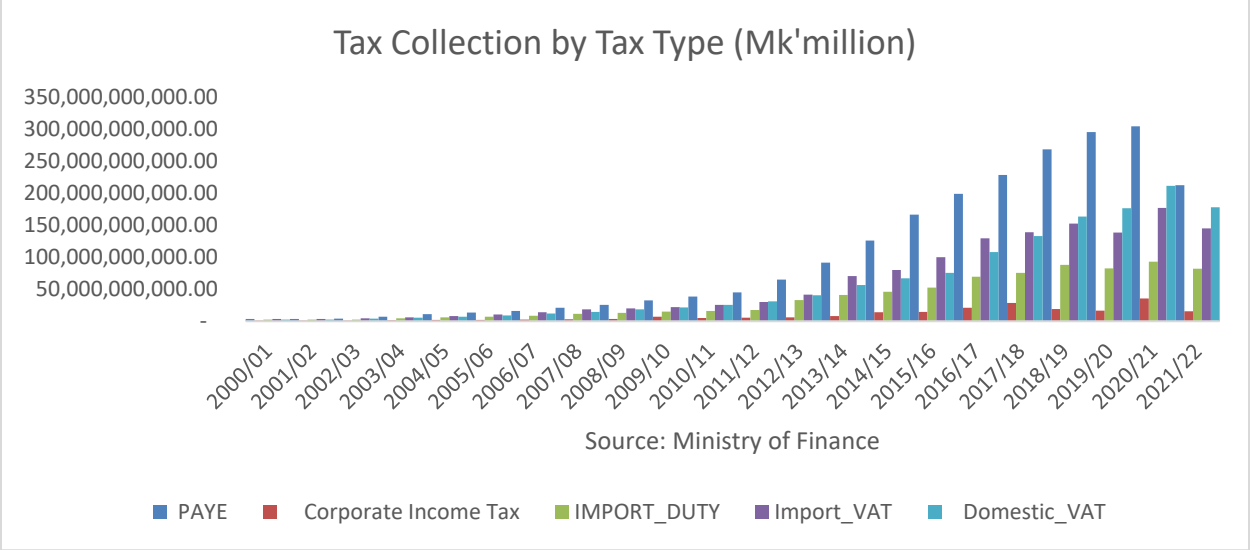

Figure 2: Tax revenue collection by Tax Type

Source: Author's computations using data from the MoF

2.2.1 Corporate Income Tax (CIT)

Companies are levied with Corporate income tax (CIT), and its tax base is the income earned by corporations. Income is defined as the whole amount of money received or accrued to a taxpayer from a source within Malawi or assumed to be in Malawi under Section 11 of the Taxation Act (Finance, 2021). The act also explains that gains from capital and other types of income from investments (interests and dividends). On the other hand, gains and losses from foreign exchange are taxable and deductible as follows; Companies incorporated in Malawi, 30% is the standard rate for corporate income and for foreign registered company branches is 35%. However, pension fund income is taxed 15%, while dividends are taxed 10%.

2.2.2 Pay As You Earn (PAYE)

PAYE is a type of personal income tax with several rate structures that are applied to various income levels for persons. On average, PAYE accounts for 27% of the total revenues collected (Finance, 2021).

2.2.3 Value-Added Tax (VAT)

VAT was adopted using the VAT Act of 2005; before this period, VAT was known as surtax. During its inception, VAT was levied at 17.5% and in the intent of providing relief to taxpayers and to achieve regional competitiveness VAT was later revised down to 16.5% in 2008 (Finance, 2021). VAT is a consumption tax, and therefore, it is imposed on the ultimate consumption of goods and services. As one way to expand the tax base, tackle inequalities, and improve inefficiencies of the VAT system, taxable categories under the VAT Act have been amended almost every fiscal year. VAT contributed at least 28% of the total revenues collected as of 2020 (OECD, 2022).

2.3 Malawi Tax System Reforms

Malawi's tax system has undergone significant reforms from 1964 to 1977, 1979 to 1984, 1985 to 1999, and 2000 to 2010.

2.3.1 Tax Reforms between 1964-1977

The reforms under this period corresponded to three distinct amendments of the Taxation Act: 1969 amendment Bill 14 which intended to encourage individuals to save by means of pension or provident fund. Bill 19 which intended the expansion of the tax base making spouse's and minor's income part of assessable income. Thus, using the same Bill 19, the Government introduced incentives such as investment allowances for companies. Nevertheless, the bill 14 amendment would allow a deduction of certain amounts by taxpayers from their income to contribute towards the stated fund. These amendments ensured that each individual was paying a fair share of their income to support Government public service delivery. Further, the computation of taxable income to include foreign exchange gains or losses was amended in 1968 under Bill 7. Using Bill 38 in 1970 Government introduced a sales tax named surtax, which applied a 5 per cent tax rate on duty paid for imports and sales of all goods manufactured domestically (Chafuwa *et al.*, 2017).

2.3.2 Tax Reforms between 1978-1984

In 1979/80, Malawi underwent an economic recession due to the global economic downturn. Characterized by heavy expenditure burdens towards the Government. Thus, on food imports and distribution, increased public debt servicing both internal and external, high expenditures on defense and transport costs (Shalizi & Thirsk, 1990). A drought had reduced food production. Foreign private lending declined sharply and rail access through Mozambique was terminated due to the war. Overall economic activity declined as such exerting extra pressure on revenues due to an increased need for public expenditure. This led to reforms in tax policy for the period. The reforms focused on raising tax rates, tax base expansion and the introduction of new taxes. Thus, in 1982 personal taxes were raised from 45% to 50% by the Government. Furthermore, individual income taxes were simplified, thus, the government merged the taxable income method and the chargeable method to achieve equity between individuals earning similar incomes (Chafuwa *et al*., 2017).

Bill 4 of 1981 was the most notable reform of this era, where incomes of members of parliament was deducted an allowance of pension premium to be contributed towards a pension scheme. An expansion of the industrial buildings definition to give investors more incentives towards investment was effected by the same bill. To boost economic growth the government lowered import tariffs on intermediate and capital goods. On Cost, Freight, and Insurance (C.I.F) the Government introduced a 3 per cent import levy to be collected on the value for all imported merchandise. And in 1982 and 1983, upward adjustments of 4 per cent and 5 per cent were implemented, respectively (Shalizi & Thirsk, 1990). Bill 21 of 1981 was used to introduce taxes on accomodation and refreshment and in 1984 the Government introduced an export levy.

There was also a shift in the surtax policy around this period, from 15% to 17% surtax on transactions done domestically and further adjustment to 20 per cent was effected in 1980. Another significant reform was in 1981, on capital and intermediate goods. Further, in 1984, the government effected an extension of 5 per cent of surtax to exempted capital and intermediate goods. Surtax import rates was raised to 30% from 25% in 1984 (Chafuwa *et al.,* 2017).

2.3.3 Tax Reforms between 1985-1999

The reforms during this period were recommended by the International Monetary Fund (IMF) and World Bank under the Structural Adjustment Loan Program; the objectives were efficiency improvements to the tax system by achieving efficient resource allocation towards production, trade, and investment. Secondly, an individual's ability to pay to be a determinant of the tax burden levied thus achieving equity in the tax system. The third objective focused on enhancing the quality of administration of taxes, necessitating institutional changes to the administration. The fourth aspect focused on creating sustainability in the tax system to produce required revenues that support Government expenditure on various public services. Finally, reforms intended towards creation of an investment conducive environment by converting trade taxes to consumption taxes (Chafuwa *et al*., 2017).

2.4.4 Tax Reforms Between 2000-2010

The 2000-2010 reforms linked to when IMF's Poverty Reduction and Growth Facility (PRGF) was being implemented by the Malawi Government. The 2000-2010 reforms emphasized strengthening domestic revenue generation (Chafuwa *et al.,* 2017). Tax reforms have been supported as an instrument for raising *tax yield*, where tax yield can be defined as an average return to the government in terms of tax revenue collection or productivity (Chipeta, 1998).

2.4 Stylized Facts of Exchange Rate Dynamics in Malawi

Before 2011 and 2012, Malawi's exchange rate regimes were either pegged to a basket of currencies or to a single currency, and when balance of payments arose devaluations were implemented. Implying that the country pursued a de facto pegged exchange policy (Pauw *et al.,* 2013). Currency management in Malawi has been followed to achieve the three primary objectives of (i) attainment of growth in real income, (ii) maintaining a viable balance of payments position, and (iii) attainment of stable domestic prices.

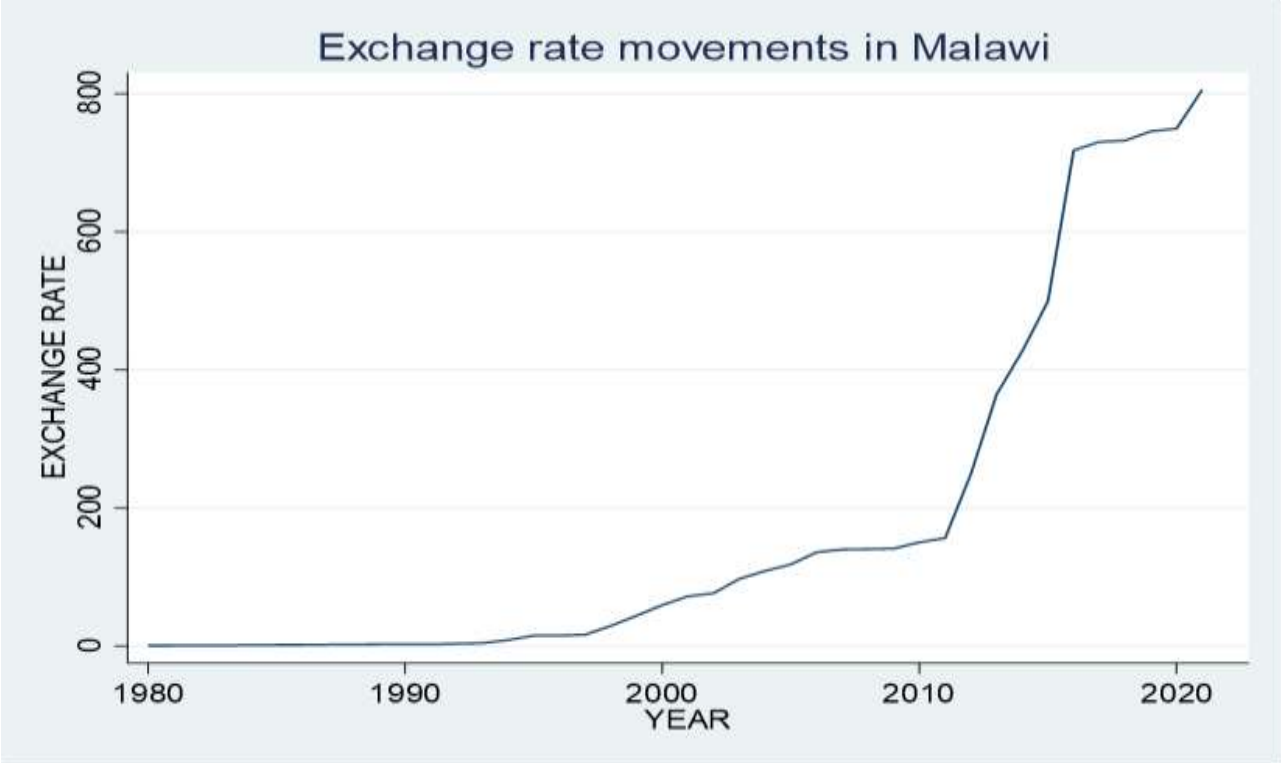

Figure 3:Exchange Rate Movements in Malawi 1980-2022

Source: Author's computations using Reserve Bank of Malawi data.

In February 1994, the regime of exchange rates adopted by the Reserve Bank of Malawi (RBM) was the float management. Factors that led to this change included suspending of the payments balance supported by the 1992/93 drought lagged effects and donors (Simwaka, 2006).

Due to seasonal fluctuations in the market for foreign exchange related to agricultural activities, the RBM frequently interferes in the market primarily to smoothen fluctuations. (Simwaka & Mkandawire, 2010) Around 60% of foreign currency earnings are accounted for by tobacco exports, implying that the appreciation of the Malawi Kwacha is usually anticipated during the tobacco market season (April-August). Thus, an increase in the availability of foreign currency on the market. And during the off-seasons a depreciation is anticipated due to a high demand for foreign exchange to importing farm inputs such as fertilizers.

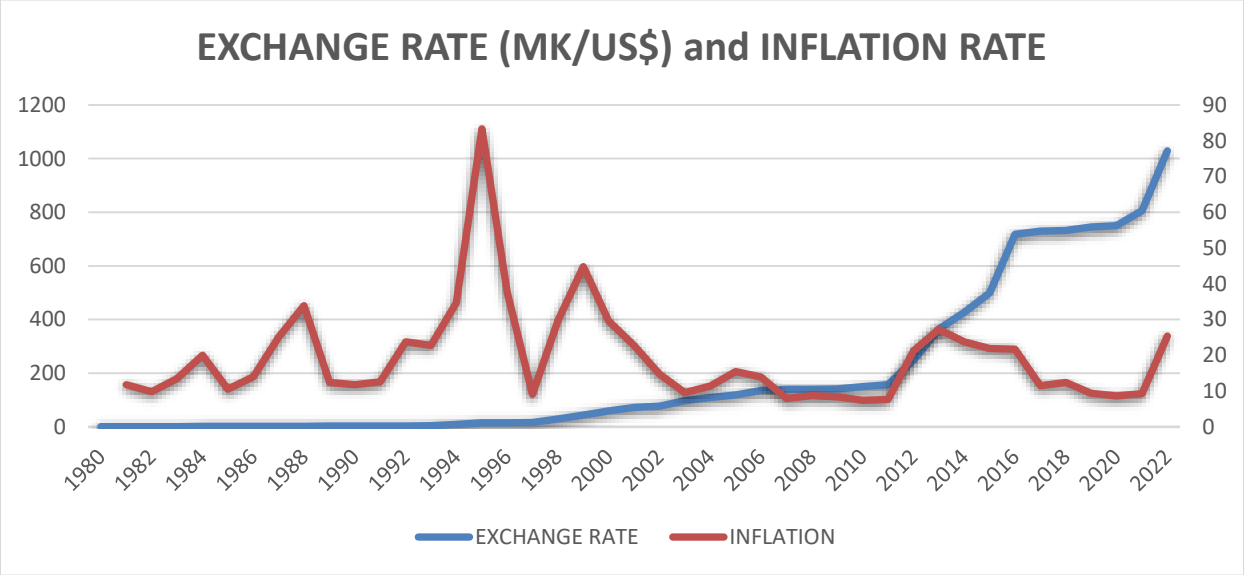

Figure 4:Exchange Rate and Inflation in Malawi

Source: Author's computations using Reserve Bank of Malawi data.

The reason Malawi clinged to a pegged regime before the flexibility of the exchange rates in May 2012 was the thought that devaluing the currency would be inflationary (Jombo *et al.*, 2014). As shown in Figure 2 above, periods of devaluation coincide with an increase in inflation. Recently, the Malawi Kwacha was devalued by 25.0 per cent in May 2022 to control foreign exchange shortages (Kampanje, 2022).

2.5 Tax Reforms After Devaluation and Floatation of the Malawi Kwacha in 2012

These tax reforms corresponded to the period in 2012 in which the Malawi government, through the Reserve Bank, made an adjustment of K167 to K250 to a dollar on the nominal exchange rates and a floatation of the exchange rates was effected (Malawi, 2012). To acknowledge the impact of this devaluation on the economy, the Government increased the PAYE threshold of zero per cent rate from MK12,000 to MK15,000. Further amendment to the Taxation Act to introduce a new structure for the taxation of pensions. An increase of corporate tax on phone operators from 30% to 33%. Value Added Tax (VAT) was removed on machinery, bread, financial services, and newspapers.

In 2014/2015, a reduction of corporate tax in the telecommunication sector for mobile operators from 33% to 30%. Removal of VAT on raw materials cast-off in the production of fertilizer and medicine. The introduction of US$ 15 per 1000 sticks excise tax rate for cigarettes whether imported or locally produced. Allowance of duty-free importation of goods such as ATMs, point-of-sale devices, and mobile banking vans to Malawian banks (Malawi, 2014).

In the 2016/17 fiscal year the government made several changes to the VAT Act to expand the revenue base, removing distortions in the production and supply chains and shifting reliance of domestic revenue from taxes that fall on labor and investment to taxes that mainly fall on consumption. VAT on Milk was introduced, later removed in 2017/18. In that fiscal year 2017/18, the tax-free income bracket was increased to MK30,000 from MK20, 000. The minimum wage was increased to MK25,000 from MK19,000 per month.

CHAPTER 3

LITERATURE REVIEW

3.1 Theoretical Literature Review

In examining exchange rate dynamics and tax efforts, contributions from various theories have been explored to relate these existing economic theories to the topic. This section explores theories regarding the effects of expenditure switching, the fiscal effects of a devaluation, and the Monetary Transmission mechanism.

3.1.1 The Expenditure Switching Effect

Nominal exchange rate change resulting into expenditure-switching effects is linked to the Keynesian approach to international macroeconomics. The argument in a study by (Obstfeld and Rogoff, 2000) stipulates that a country experiencing currency depreciation also experiences a decline in the relative price of its exports resulting from a redirection of world expenditure in favour of its products. Nonetheless, (Dornbusch, 1976) points out that this expenditure-switching towards domestic goods will likely trigger inflation. Moreover, because inflation erodes the purchasing power of money, (Bird & Jantscher, 1992) argues that inflation affects all aspects of economic activity, including tax revenues.

Consequently, (Seade, 1990) stipulates that a devaluation would expand the value of imports (at a given volume), increasing the taxable base and thus revenues. Similarly, (Adam *et al.,* 2001) stipulates in an example that depreciation of real exchange rates increases the domestic value of trade taxes relative to taxes levied on domestic production when taxes are levied ad valorem. However, (Engel, 2002) cites studies that have concluded on consumer price responsiveness to exchange rates, if prices are not responsive then a depreciating home currency, for example, does not increase the price that consumers pay for imported goods, hence no increase in the taxable base and revenues. (Humphrey,

1978) emphasizes the importance of price stickiness of nominal goods. Moreover, (Engel, 2002) further states that relative price changes can ably duplicate the movements in comparative prices occurring in price-adaptable economies. As an illustration, a country experiencing a productivity boom would likely also see a decrease in the cost of its products, which would induce a switch in expenditure in the direction of the domestic product.

However, the extent to which optimal monetary policy is affected might be influenced by the magnitude of the effect of switching expenditures, as such the expenditure switching effect becomes an essential ingredient in international macroeconomics (Engel, 2002) and how it influences the taxable base from pass-through effects to inflation. Literature by Mundell (1968) stresses the role played by changes in the nominal exchange rate can be used to communicate variations in the business cycle between nations through expenditure switching effects.

3.1.2 Fiscal Effects of Devaluation

As this study sets out to examine the extent to which devaluation policy affects tax revenue effects, the research on the financial implications of devaluation, as explored by Reisen, (1989) provides valuable insights. Reisen casts serious doubt on the presumption that budget deficits can be reduced by devaluation. Instead, it suggests that in the short run a devaluation's automatic fiscal response will likely be harmful for an inward-oriented public enterprises problem debtor. Despite expectations, Reisen's findings indicate that a tax receipts rise followed by a new inflow of foreign finance (arising from a devaluation) will be a small compensation as compared to the rise in the local currency costs of foreign debt servicing.

The author considers a country that has run up excessive debt capital stock and has lived up on imports. To improve its current account and standing in international capital markets, resources must be shifted from the enormous domestic sector to the industries that compete with imports and exports. Hence a sustained real exchange rate devaluation becomes

unavoidable. A longer-lasting real devaluation of the domestic currency can only be allowed by an adjustment equation.

The world price level, P*, multiplied by the nominal exchange rate, E, and divided by the home price level, P, gives the definition of the real exchange rate, *e*,:

$$e = \frac{EP^*}{P} \quad \text{..... (1)}$$

Long-run Purchasing power parity (PPP) is defined by $e = 1$.

The real exchange rate's behavior with sluggish price adjustment (Inertia), can be illustrated this way:

$$\frac{\dot{e}}{e} = u(1 - \hat{e} - e), \text{ u} > 0 \text{..... (2)}$$

Alterations in the exchange rates can be denoted by the dotted variable, meanwhile $\hat{e}$ becomes the sustainable devaluation of the actual rate. Stated differently, equation (2) stipulates the gradual adjustment process of the actual exchange rate in relation to a level different from long-run PPP by $\hat{e}$.

The theory suggests that a proportional rising real interest rate payment are immediate consequences of a real devaluation. However, its impact on the noninterest part of the government budget is much more difficult to determine.

In general, what affects the budget are the various changes in the tax bases induced by changes in wages, corporate income, and import and export volumes (volume effect) and the changes in prices resulting from the devaluation (price effects).

3.1.3 The Monetary Policy Transmission Mechanism

The mechanism for Monetary Policy Transmission analyzed here is mainly associated with the works of (Taylor, 1995) which illustrates an easy outline for assessing the mechanism for monetary transmissions: defined as the process which changes in real GDP and inflation are transmitted through the decisions made by monetary authorities. The framework presented here explains the key role played by changes in exchange rates in the mechanism

for transmission. . The most distinctive characteristic of this outline is its emphasis on financial market prices such as short-term interest rates, bond yields, and exchange rates.

3.1.3.1 The Interest Rate Transmission Channel

What is crucial in the study of the monetary transmission mechanisms is the distinction between real and nominal interest rates, hence the basis for this analysis (Taylor, 1995). Thus there are two key assumptions that guide the two variable relationship underlied in most price models for financial markets: rigidities in wages and prices of goods and rational expectations. If there are rational expectations present the belief is that changes in prices of goods over short horizons will also change slowly because of the goods prices slow adjustment process. Hence, a nominal interest rate rise would result in a actual rate of interest change, throughout the time of adjustment of prices and expectations.

3.1.3.2 The Exchange Rate Transmission Channel

The relationship between nominal exchange rates and real exchange rates has to be made a further distinction, thus because when wages and prices adjust slowly, a rise in the nominal exchange rates usually leads to a short-run rise in the real exchange rates. It is then assumed that over the long run convergence of the real exchange rate will be to its equilibrium value as prices and/or nominal exchange. (Obstfeld & Rogoff, 1995) emphasize that the effects of aggregate supply and demand work through the channel of exchange rates. Implying that a monetary expansion lowers domestic interest rates on the demand side, bringing about a decline in the value of the home currency through the foreign interest parity condition. While on the supply side, the monetary expansion which in turn caused the domestic currency's real depreciation affects a rise in inflation directly by raising the domestic prices of imported goods. (Taylor, 1995) cites that the effectiveness of this channel depends on among other things, the degree of liberalization to flows of capital, the regime of currency, and pass-through effects of exchange rates. (Cevik & Teksoz, 2012) This channel is more effective when small open economies pursue flexible exchange rate regimes.

3.2 Empirical Literature Review

According to a research on the tax revenue effort determinants in under developing nations, (Gupta, 2007) found that variables such as openness in trade, agriculture's GDP share, foreign aid and per capita GDP affect performance of revenues significantly in an economy. (Ofori, 2018.) Among the crucial elements of tax revenue (as a share of GDP) is taxes on international trade, which include export duties, and duty on imports. Aside from these traditional factors (Ofori, 2018.) also cites trade uncertainties as a factor across borders affecting the movement of products and services and one of those uncertainties is exchange rate volatility, however, since volatility of currency is not seen over time, the study opts for the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) as a way to calculate exchange rate volatility.

While analyzing Ghana's overall tax system revenue productivity using the tax buoyancy and elasticity method, (Kusi, 1998) found that tax reform, successive devaluations of the exchange rate, and import liberalization improved the overall tax system's revenue productivity in Ghana. However, (Brafu-Insaidoo & Obeng, November 2019) suggested that using the methods of buoyancy and elasticity to measure a country's tax effort does not directly evaluate the impact of the country's economic structure and characteristics in inducing government tax collection. Conversely, the study proposes using the Stochastic Frontier Framework as suggested by (Aigner, Lovell, & Schmidt, 1977).

Further analysis by (Tanzi, 1989), suggests that the result of devaluation (with or without trade openness) on the fiscal balance in the presence of a large public debt is a controversial and complex issue and that given the structure of taxes for many developing countries, the positive effects of devaluation on tax receipts can be important. Conversely, (Agbeyegbe *et al.*, 2006) argue that trade liberalization primarily impacts taxation of goods and services mainly through alterations in the tax base for imports, thus the collection of excise taxes, VAT, and sales taxes from imports would increase if there was a true devaluation of the currency. The economic incidence of the taxes determines whether this increase in collections is proportionate to GDP. Empirical evidence primarily confirms this theory, showing that the tax burden through price adjustments is largely shifted to consumers.

Thus, suggesting that an increase in the comparative price of imported goods is a result of the pass-through effects cause by exchange rate depreciation on prices of goods. Hence changes in tax revenues are proportional to the ultimate cost changes. Nonetheless, increased costs have an opposing effect whether revenues would overall increase or decrease will depend on the size of the elasticities. (Keen R. D., 2013) cites the idea that tax changes can, to some degree, mimic the effect of a devaluation.

In terms of exports (Agbeyegbe *et al*., 2006) argues that a rise in exports at the expense of consuming domestically would arise from a genuine decline in exchange rates, thus this tendency would dampen revenues and offset the rises caused by the readjustment effect, in difference to tariffs on foreign trade. Exchange rates are considered in this regression because of their crucial role in economic growth. The size of the elasticity supply of exports, will determine the dominance of the revaluation effect.

CHAPTER 4

METHODOLOGY AND DATA

4.1 Introduction

This chapter presents the methodologies employed in this study. The chapter specifies the OLS model that was used to estimate the determinants of tax revenue effort. It specifies the VAR model utilized to trace the dynamic effects from fluctuations in exchange rates on tax revenue effort. The chapter further describe the data used in the analysis, variables of interest, and the tests of diagnosis conducted in this analysis.

4.2 Estimation Strategy

4.2.1 OLS model specification

The OLS model is selected as the primary estimation technique and thus will be used to develop Malawi's tax revenue effort index. The model is chosen based on its ability to provide unbiased estimates of regression coefficients. OLS was deemed suitable for this study as it aligns with the research objective of examining the consequences of fluctuations in exchange rates on tax revenue efforts, thus examining the linear connection between tax revenue initiatives and exchange rates. The study will have to approximate the factors of tax revenue efforts and isolate the impacts of each variable on the taxable capacity of the country, then we will relate the actual revenues collected to the estimated taxable capacity. The estimated tax-to-GDP ratio using regression analysis, takes into account the country's specific macroeconomic, institutional, and demographic features to help in computing the *Taxable capacity*.

This study follows the recent literature adopted by (McNabb & Tagem, 2021) which estimates Tax revenue effort in accordance to the production function. This is specifically modeled by the following:

$T_t = f(X_t\beta)$…… (1)

Where T_t is a country's (observed) tax revenue at time t. $f(X_t\beta)$ signifies the production function, with X representing the inputs vector, and is accustomed to generating tax revenue, whilst β is the constraints vector to be estimated. The equation delineates the situation in which tax policy is effortlessly (competently) implemented to maximize T i.e. prospective revenues, and the absence of unforeseen shocks to the tax regime.

(Mawejje & Sebudde, 2019) The production function in (1) defines the maximum tax levels in GDP that could be attained provided that there are no stochastic shocks to the collection, the policy was perfectly enforced and the policy maximizes efficiency. While the model proposes that tax collection is seamlessly competent, we use the stochastic frontier analysis (SFA) techniques as proposed by these studies (Mawejje & Sebudde, 2019), (Langford & Ohlenburg, 2016) and (McNabb & Tagem, 2021). However, the stochastic frontier empirical study was pioneered by Aigner, Lovell, & Schmidt (1977). The SFA approach stipulated by a study Mawejje and Sebudde, (2019) presupposes that accumulated tax revenue is beneath potential due to inadequacies in revenue collection,ξ_t, as shown in equation (2).

$T_t = f(X_t\beta).\xi_t$…… (2)

Where $0< \xi_t < 1$.

ξ_t=1 implies the optimal amount of revenues the tax authority collects given the country's specific characteristics i.e. economic, institutional, and demographic characters. (Mawejje & Sebudde, 2019) When $\xi_t < 1$, it informs that the inefficiencies constrain the tax authority from collecting ultimate tax revenues. Tax collection and technical inadequacies are presumed to be precisely positive such that $T_t > 0$, and $\xi_t>0$. Tax collection is also subject to stochastic shocks, e^{v_t} such that

$T_t = f(X_t\beta).\xi_t.e^{v_t}$…….. (3)

Equation (3) illustrates that (a) a random error process or stochastic shocks as defined by e^{v_t} and (b) technical inefficiencies, denoted by ξ_t, are causes of any expected deviations from potential revenue collection.

By following the approach in (Aigner, Lovell, & Schmidt, 1977). The study (Mawejje & Sebudde, 2019) derives a standard econometric description of a production stochastic frontier by considering the natural logarithms of the production function in equation (3) above, given that $\xi_t = e^{-u_t}$, we obtain the following 'base' equation:

$q_t = \propto + x_t'\beta + v_t - u_t$ ..... (4)

Where q_t is the total tax revenue, $x_t =$ (Exchange rates, per capita GDP, Public debt, industry's share, Agriculture share of industry, Inflation, Devaluation, Regime, openness to trade) is the vector of explanatory variables influencing tax revenue effectiveness, and $v_t - u_t$ is a compound error term with both the stochastic (random) error, $v_t \sim N[0, \sigma_v^2]$, and the inefficiency term, $u_t = -\ln(\xi_t)$; $u_t \sim N^+[0, \sigma_u^2]$. The inefficiency term also represents the movement from the maximum probable output attributable to the inefficiencies, which is autonomous of v_t. The stochastic term v_t and the inefficiency term u_t are uncorrelated.

Following (Miljkovic & Shaik, 2010), the classical time series linear regression model can be appraised using the Ordinary least squares method (OLS) and the Cobb-Douglas production function for the actual tax collection can be defined as:

$q_t = \propto + \sum_{i=1}^{8} \beta\, x_{it} + \delta Devaluation + \gamma Regime + v_t + u_t$ ..... (5)

The Potential Tax collection will be obtained from the following estimated regression equation:

$\widehat{q_t} = \widehat{\propto} + \bar{X}'\beta + \delta Devaluation + \gamma Regime + \widehat{\mu_t}$ ..... (6)

Where Tax Revenue Effort is measured as:

Tax effort = $\frac{Actual\ Tax\ collection}{Potential\ Tax\ Collection}$ .....(7)

4.2.2 VAR model specification

The Var model is used in estimating the immediate term responses of the model to monetary shocks such as devaluations and a change in the currency regime, the study follows the works of (Mangani, 2012) and estimates a VAR model during the period under investigation, there are notable monetary shocks such as the 2012 devaluation and a change in the exchange rate regime, which informs the change in exchange rate preceding this period. The relationship of the variables selected for the var model are specifically

addressing the research questions and the dynamic relationship among the candidates in the var model

$q_t = \propto \ + \sum q_{t-p} + \sum lnEX_{t-p} + \sum Devaluation_{t-p} + \sum Regime_{t-p} + \ \varepsilon_{t1}$………………………... (8)

$lnEX_t = \propto \ + \emptyset \sum lnEX_{t-p} + \theta \sum q_{t-p} \ + \sum Devaluation_{t-p} + \ \sum Regime_{t-p} + \ \varepsilon_{t2}$………………. (9)

$Devaluation_t = \propto \ + \emptyset \sum Devaluation_{t-p} + \delta \sum lnEX_{t-p} + \theta \sum q_{t-p} \ + \sum Regime_{t-p} + \ \varepsilon_{t3}$…... (10)

$Regime_t = \propto + \emptyset \sum Regime_{t-p} + \theta \sum q_{t-p} \ + \sum Devaluation_{t-p} + \delta \sum lnEX_{t-p} + \ \varepsilon_{t4}$………… (11)

(Simwaka & Mkandawire,2008) VAR models are employed to detect dynamic reactions of an economy to specific impulses. VAR discloses the evidence vis-à-vis the dynamic features of the economy being examined (Kim, 2003). The outcomes can enlighten policymakers and economic analysts how economic variables such as exchange rates and prices react to policy changes or other eventualities over time.

4.3 Variable Description and Data

4.3.1 OLS model

The regress and adopted in the model is total tax revenue stated as a ratio to GDP, as specified by Langford & Ohlenburg, (2016). The Data for the Tax revenue statistics was acquired from the Ministry of Finance and Economic Affairs.

Langford & Ohlenburg, (2016) also investigates a wide span of independent variables that could attainably impact tax ability and effort, steered by the theoretical and empirical literature to date; (IMF, 2011) specifies an important review of the array of candidates examined to date and an outline of the fundamental theoretical perceptive for each.

Table 1 establishes the broad set of variables investigated, the assumption is that these variables enter the model (x, v_t, and u_t). The 'economic' and 'demographic' variables are acquired from the World Bank's World Development Indicators (WDI).

Table 1: Summary of Explanatory Variables to be Tested (OLS model)

Description and Source	Trialed Location in Specification: X u_t v_t
Tax Revenue – Ministry of Finance	
Economic factors	
GDP per capita – WDI	x
Agriculture value added as % GDP – WDI	X
Share of industry	x
Trade Openness (% of GDP)	x
Inflation (annual CPI inflation, %)	x
nominal exchange rate, annual % change	x
Public Debt (% of GDP)	x
Devaluation (dummy)	x
Regime(dummy)	x

4.3.1.1 Dependent Variable

Tax revenue as a percentage of GDP

According to Pessino & Fenochietto, (2010), the regressand selected is the log of revenue collected by the government, including social contributions. The source: World Bank Development Indicators (WDI).

4.3.1.2 Independent Variables

a) GDP per capita

The regression includes this variable as a proxy for Malawi's development levels. A higher level of income is assumed to trigger huge demands for public goods and services, and thus it raises the general aptitude to pay, as such expectations are of higher tax payments and collections, Bahl, (1971). The expected indicator for the per capita GDP coefficient is positive, Piancastelli, (2001).

b) Agriculture Value Added

This variable is measured as a portion of GDP and represents the easiness in collection of taxes. The value added is the net production of the agriculture sector after all outputs have been added up and subtracted from the transitional inputs. The relevance of agricultural sector in lowering the level of commercialization and industrialization makes it a subsistence sector. This implies a lesser taxable capacity (Bahl, 1971).

Agriculture value added is important in determining the tax capacity and effect. For example, Gupta, (July 2007) and Pessino & Fenochietto, (2010) have found a negative relationship between agriculture's share in GDP and tax revenue performance. As such the expected regression coefficient sign is negative, Piancastelli, (2001); Amoh, (2019).

c) Trade Openness

Gupta, (July 2007) has expressed ambiguous concequences of trade openness on revenue mobilization. He argues countries which start to open their economies with the decrease of importation and exportation taxes, and exports growth (mostly VAT zero-rate), revenues are reduced. Furthermore, several countries (Malawi inclusive) when beginning to open their markets exempt their exports from income tax.

However, other authors for example Keen & Simone, (2004) argue that improvements in the customes procedure brought about by trade openness could be a consequence for a rise in revenue. Moreover, on numerous instances, reducing tariffs and taxes on exports arises with compensatory procedures and revenues are not reduced, abruptly. Thus, in the intermediate tenure, the expectation is that collection rises as there is more revenue from VAT on importations and extra activity in the economy. Imports plus exports as a percentage of GDP are used to represent the degree of openness of an economy's trade.

d) Inflation

Inflation is a very important variable to be considered in this regression, as most countries as well as Malawi do not regulate their tax regimes for the general increase in prices otherwise they do so partially. Amoh, (2019) Considers that when inflation rises to

considerable levels, its influence towards the tax regime cannot be reduced by increasing public spending. In assessing tax effort, it is important to take inflation into consideration as it disturbs the taxpayer's income position through the elements of tax rate and tax base. Following the literature by Ghura, (1998), the coefficient's anticipated sign is negative.

e) Nominal exchange rate

IMF defines *nominal exchange rates* as the value of one currency stated in relations of another. And Gaalya, (2015) cites that a decrease in import volumes can be a result of currency depreciation. And because reliance on tariff revenues has been a tendancy for many low-income countries, depreciation is anticipated to raise the tax base through tariff revenue increase. However, lower tariff revenues could be a result of currency appreciation could lead as the tax base is reduced by the appreciation. Khattry, (2002) expects an inverse relationship between exchange rates and trade taxes. However, Hisali,(2012) finds that a rise in tax performance in Uganda could be a result of exchange rate depreciation and appreciation. A direct correlation is projected between tax revenue performance and the exchange rate.

f) Public Debt

According to Ghura, (1998), for emerging economies tax revenues are significantly affected by a high dependence on public debts. Thus in obtaining funds to preside over a nation or tackle budget shortfalls in many emerging economies, such governments solicit donor support and depend on borrowing (internal and external) or tax revenue, Amoh, (2019). However IMF (2011) literature describes that the course of the concurrent relation with public debt is hypothetically ambiguous – high debt may be an indication for low tax collection, or boost high tax collection – as such results differ.

g) Devaluation (Dummy)

The variable Devaluation is a dummy, where the value 1 is assigned the years that Malawi has experienced a devaluation and 0 otherwise. The expected sign is positive, as devaluations leads to a rise in the tax base for international trade taxes.

h) Regime (Dummy)

The variable Regime is a dummy, where 1 is assigned to the period of the flexible currency regime and 0 for the fixed or managed currency regime. The expected relationship is positive.

i) Share of Industry

This variable is calculated as a portion of GDP and represents the ease of tax collection. (Macha, Lado, & Nyansera, 2018) found a direct correlation between Share of industry and Tax revenues.

4.3.2 VAR model

The relationship of the regressors selected for the VAR specification is precisely addressing the research questions and the dynamic linkage between the regressors in the VAR. The analysis used time series data 1990 to 2021 from the Reserve bank of Malawi, and The Ministry of Finance and Economic Affairs.

Table 2: Variables in the Model

Category	Variables
Policy Instruments	Regime Devaluation Tax Revenue Effort
Objective Variables	Exchange Rates

4.3.2.1 Objective Variables

The objective variable tax revenue is specified by Pessino & Fenochietto, (2010) which excludes social compensations and natural resource revenues. The data for the Tax revenue statistics was sourced from the Ministry of Finance.

The target variable Exchange rate as looked at by Gaalya, (2015) suggests that the expectation from an exchange rate depreciation is a decrease in import volumes. And because there is a heavy reliance on tax revenues by many low-income countries, a

depreciation is anticipated to lead to a rise in tariff revenue. Conversely, a lower tariff revenue might be triggered by currency appreciation. An inverse correlation between exchange rates and trade taxes is anticipated by Khattry (2002). However, Hisali,(2012) observes that a rise in tax performance in Uganda could be caused by exchange rate depreciation and appreciation. As such a direct correlation is anticipated between tax revenue performance and the exchange rate.

4.3.2.2 The Policy Variables

a) Devaluation (Dummy)

The variable Devaluation is a dummy, where the value 1 is assigned the years that Malawi has experienced a devaluation and 0 otherwise. The expected sign is positive, as devaluations leads to a rise in the tax base for international trade taxes.

b) Regime (Dummy)

The variable Regime is a dummy, where 1 is assigned to the period of the floating regime for exchange rates and 0 for the fixed or managed float regime. The expected relationship is positive.

4.4 Diagnostic Test

4.4.1 Autocorrelation/serial correlation

To check the variables are interrelated through time, the analysis will run the Phillips-Perron (PP) Unit root test, which uses nonparametric statistical procedures to eliminate the serial correlation in the error terms without including lagged difference terms (Gujarati, 2004).

4.4.2 Heteroscedasticity

The concept of heteroscedasticity is based on the premise that a traditional econometric model should have a constant variance. To test for heteroscedasticity, we will have to use the Breusch-Pagan-Godfrey (BPG) asymptotic, large-sample (Gujarati, 2004).

4.4.3 Normality Test

The theory underlying this test is that a distribution of a sample variable approximates a normal distribution as the sample size increases or gets larger. As such we will invoke the Shapiro-Wilk test where we test the null hypothesis that the data follows a normal distribution.

4.4.4 Multicollinearity Test

Before the Econometric Model is estimated, it is important to verify for multicollinearity and the presence of an exact linear connection between the variables. If multicollinearity is present, then the regression coefficients will hold large standard errors, which signifies the coefficients cannot be predicted with great exactness (Gujarati, 2004). The use of the Variance inflation factor will be applied.

4.4.5 The Ramsey RESET test

This test is used to assess whether the model has been accurately specified. Thus, specification errors may happen due to the oversight of relevant variables. Another cause for model misspecification is the choice of a wrong functional form. As such it is important to check for specification errors as any interpretations and deductions resulting from such models would be biased, inconsistent, and misleading. The null proposition to be tested: The model has no omitted variables.

4.4.6 VAR order determination

The criteria considered are the log-likelihood (LL), Likelihood Ratio (LR), degrees of freedom (df), p-value, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Hanna-Quinn Information Criterion (HQIC), and Schwarz Bayesian Information Criterion (SBIC). The use of the AIC and the Schwarz Bayesian Information Criterion (SBIC) helps one in choosing the model with the least values of these benchmarks, thus the lesser the value of Akaike or Schwarz statistics, the healthier the model (Gujarati, 2004).

4.4.7 Granger Causality Test

According to (Gujarati, 2004) the Granger causality test presupposes that the information pertinent to the forecast of the particular variables, in this case, Exchange rate dynamics and tax revenue, is confined solely in the time series data on the variables. The test would involve approximating the subsequent regressions:

$q_t = \propto + \sum q_{t-p} + \emptyset \sum lnEX_{t-p} + \sum Devaluation_{t-p} + \sum Regime_{t-p} + \varepsilon_{t1}$ (8)

$lnEX_t = \propto + \emptyset \sum lnEX_{t-p} + \theta \sum q_{t-p} + \sum Devaluation_{t-p} + \sum Regime_{t-p} + \varepsilon_{t2}\ldots$ (9)

$Devaluation_t = \propto + \emptyset \sum Devaluation_{t-p} + \theta \sum q_{t-p} + \delta \sum lnEX_{t-p} + \sum Regime_{t-p} + \varepsilon_{t3}\ldots.$ (10)

$Regime_t = \propto + \emptyset \sum Regime_{t-p} + \theta \sum q_{t-p} + \sum Devaluation_{t-p} + \delta \sum lnEX_{t-p} + \varepsilon_{t4}\ldots..$ (11)

Where it is presumed that the disruptions ε_{t1}, ε_{t2}, ε_{t3} and ε_{t4} are uncorrelated. Because we have four variables then we are looking at a quadrilateral causality.

4.4.8 VAR Stability Test

The criteria behind this test are to check whether the eigenvalue stability condition is met, thus if the VAR model is constant, then the impulse-response functions and forecast-error variance decompositions have known interpretations. (Gujarati, 2004) states that a small eigenvalue (about the extreme eigenvalue) normally specifies near-linear dependencies in the data.

CHAPTER 5

EMPIRICAL RESULTS AND INTERPRETATION

5.1 Introduction

This chapter organizes results attained from engaging the methodologies described in Chapter Four. The impulse response function (IRF) results obtained from the VAR model are presented in the Appendix I. The chapter contains data for the descriptive statistics and the results from the OLS and VAR models. The segment on outcomes and explanations also includes diagnostic tests as required to estimate time series models.

5.2 Descriptive Analysis

Table 2 below provides an overview of the descriptive analysis of the study. Where the summary tables postulate an outline of the central tendency, variability, and range of the variables of concerned in the study. The period under consideration in this study is from 1990-2021, making a total of 32 observations for each variable in the dataset.

Table 3: Descriptive Statistics

OVERALL STATISTICS					
VARIABLE	**MEAN**	**Std. Dev**	**Min**	**Max**	**Observations**
Total Tax	236,221.4	348,657.7	844.55	1,181,841	32
Exchange Rate	236.3296	276. 5163	2.730013	805.899	32
Trade Openness	46.305	8.824617	27.71655	63.50354	32
Agri Share of GDP	30.56785	5.717664	21.62944	44.7828	32
Inflation	19.84052	15.1893	7.411591	83.32577	32
GDP per Capita	325.3766	149.9348	116.6429	634.8357	32
Devaluation	.125	.3360108	0	1	32
Public debt	919977.8	1433237	4303.4	5813211	32
Share of Industry	17.56789	3.218397	14.6462	28.37159	32
Regime	.34375	.4825587	0	1	32

Source: Author's computations using data from the Ministry of Finance, RBM, NSO, WDI, and IMF.

The dependent variable, q_t, is portrayed by the variable Total Tax. Which encompasses all direct and indirect tax revenues across the 32 observations, the average Total tax is approximately 236,221.4 with a standard deviation of 348,657.7. The range of values varies from a minimum of 844.55 to a maximum of 1,181,841.

The mean exchange rate is approximately 236.3296, with a standard deviance of 276.51. The exchange rate during the period under review range from a lowest value of 2.73 to a maximum of 805.89. Trade openness is approximately 46.30, with a standard deviation of 8.82. The trade openness index during the period under review ranged from a minimum of 27.71655 to a maximum of 63.50. The average share of agriculture in GDP is approximately 30.56% with a standard deviation of 5. 71. The share ranges from a flow

value of 21.62% to a ceiling value of 44.78%. The average inflation rate is 19.84%, with a standard deviation of 15.1893. the inflation rates vary from a least value of 7.4% to a maximum value of 83.3%. The mean GDP per capita is approximately 325.37, with a standard deviance of 149.9348. The per capita GDP during the period under review extended from a smallest value of 2.73 to a ceiling of 634.83. From the dataset, the periods that are associated with devaluations are approximately 12.5% with a standard deviance of 0.33. The devaluation takes values between 0 and 1, 0 for the periods without devaluation and 1 for the periods with devaluation. The mean Public Debt in the period under review is approximately 919977.8, with a standard deviation of 1433237. The Public debt ranged from a minimum value of 4303.4 to an extreme value of 5813211. The mean share of industry in the economy is approximately 17.56% with a standard deviation of 3.21.

The share varies from a least value of 14.64% to an extreme value of 28.37%. From the dataset, the periods that are associated with the flexible regime are approximately 34.3% with a standard deviation of 0.48. The regime variable takes values between 0 and 1, 0 for the periods with a fixed exchange rate regime or managed floating exchange rate regime and 1 for the periods with a flexible exchange rate.

5.3 Diagnostic Tests

5.3.1 Unit-root Tests

For series to be said it is integrated of order zero i.e. I(0), the series has to be stationary in levels. However, if the series demonstrates non-stationarity but becomes stationary when differentiated once, then it is said to be integrated of order one denoted as I(1). Similarly, if the series needs to be differentiated two times for it to be fixed, then the series is said to be integrated of order 2, I(2). (Gujarati D. , 2004) states that regardless of the point of measurement, a time series that is stationary will continue to remain constant, thus, its mean, variance, and autocovariance (at various lags) are time-invariant. A non-stationary series will have a time-varying mean or a time-varying variance, or both.

The study adopts the Augmented Dickey-fuller (ADF) test, the Phillips-Perron (PP), and the Dickey-fuller Generalized Least Squares (DF-GLS) Unit root tests. To check whether

the variables are correlated through time. the unit root test was conducted on the residuals from the model and used nonparametric statistical approaches as a precaution of the serial correlation in the error terms without introducing lagged difference terms (Gujarati, 2004).

Table 4: Unit-Root Test Results

VARIABLE	ADF Test Statistic	PP Test Statistic Z-(rho)	DF-GLS (optimal lag =9)	Order of Integration
Residuals	4.234	4.547	-3.038	I(0)
5% Critical Value	-2.983	-12.692	-2.962	I(0)

The null hypothesis (H0) of the conduct of the test is that the variable follows a Random walk without drift, d=0. The results are interpreted by comparing the test statistics against the critical values obtained at a 5% confidence level. Thus, assuming that the test statistic is larger than the critical values obtained at the 5% confidence level, you fail to refute the null hypothesis (H0) and determine that a unit root is present, indicating non-stationarity. However, if the test statistic is less than the critical values, we refute the null premise and conclude that the variables are stationary. The results, therefore, show that the variable is non-stationary at I(0), thus we fail to refute the null supposition that the series ensues a random walk without drift, d = 0.

Table 5: Results after First-Difference

VARIABLE	PP Test Statistic Z-(rho)	Order of Integration
D.Residuals	-24.461	I(1)
5% Critical Value	-12.660	I(1)

After first differencing the Variable, the Phillips-Perron test was chosen on the basis that it is the overview of the Dickey-Fuller test practice but does not require the errors to be serially uncorrelated or homogenous. As such the t-statistic obtained from the first differencing of the variable is lower than the critical value obtained at a 5% level of

confidence, implying that we refute the null proposition and conclude that the variable (residuals) does not follow a random walk without drift, d = 0 at first difference hence the variable is stationary at I(1).

5.3.2 Heteroscedasticity

The concept of heteroscedasticity is based on the premise that a traditional econometric model should have a constant variance. As such to test for heteroscedasticity we will have to use the Breusch-Pagan-Godfrey (BPG) test which is an asymptotic, large-sample test (Gujarati, 2004).

Table 6: Breusch-Pagan-Godfrey Test

Chi2(1)	Prob>Chi2
0.03	0.8569

They test the assumption of a constant variance within the model. The null proposition H(0) is that a constant variance exists. The results are interpreted by comparing the Probability value (P-value) to a chosen level of significance (eg 0.05). Thus, if the p-value is lower than the significance level, we reject the null supposition of constant variance and conclude that there is evidence of heteroscedasticity. Conversely, if the p-value is more than or equal to the level of significance, we fail to refute the null proposition and settle that there is no significant evidence of heteroscedasticity. In this case, we fail to refute the null premise.

In this case, the p-value of 0.8569 is greater than the significance level of 0.05. Therefore, there is no enough evidence to refute the null proposition of constant variance in the error terms at the chosen level of significance.

5.3.3 Normality Test

The theory underlying this test is that a distribution of a sample variable approximates a normal distribution as the sample size upsurges or gets larger. As such we will invoke the Shapiro-Wilk test where we test the null premise that the data follows a normal dispersal. In testing the hypothesis, the p-value is used to evaluate whether there is enough indication to reject the null hypothesis.

Table 7: Shapiro-Wilk Test

Variable	Observations	W	V	z	Prob>z
Residuals	32	0.93440	2.188	1.626	0.05200

The test statistic W is 0.93440 and the rule of thumb for this test stipulates that the value of W should range between 0 and 1, with the value closer to 1 indicating stronger evidence for normality and a value closer to zero otherwise. In this case, therefore, at the 0.05 level of significance, we fail to reject the null hypothesis since the p-value of 0.05200 is greater than the level of significance.

5.3.4 Multicollinearity Test

Before the Econometric Model is estimated, it is imperative to also examine for multicollinearity thus checking the presence of an exact linear relationship between the variables. If multicollinearity is found to be present then the regression coefficients will have big standard errors which implies the coefficients cannot be projected with great accuracy (Gujarati, 2004). The use of the Variance inflation factor will be applied.

Table 8: VIF Multicollinearity Test

VARIABLE	VIF
Lnexchange rate	21.23
lnGDP per capita	12.62
lnPublicDebt	9.58
lnShare of Industry	5.32
lnTrade Openness	4.31
Agri. share of GDP	4.12
Regime	3.44
Inflation	2.43
Devaluation	1.74
Mean	**7.20**

(Gujarati, 2004) states that VIF indicates how the variance of an estimator is overstated by the existence of multicollinearity. As a rule of thumb, if the VIF of a variable surpasses 10, the variable is vastly collinear. In this case, we interpret the mean VIF of the model, as 7.20

which suggests a moderate level of multicollinearity in the overall model. And hence for the study, we adopt the "Do nothing" approach.

5.3.5 The Ramsey RESET test

This assessment is used to check if the model has been properly described or not. Thus, specification imprecisions may come about due to the oversight of pertinent variables. Another cause for model misspecification is the choice of a wrong functional form. As such it is important to check for specification inaccuracies as any interpretations and deductions derived from such models would be biased, inconsistent, and misleading. The null hypothesis to be tested: The model has no omitted variables.

Table 9: Ramsey RESET Test

F (3,19)	Prob>F
3.03	0.0545

Based on the results obtained, at the significant level of 0.05, we accept the null hypothesis. Suggesting that there remains no strong indication of omitted variables in the model. Thus, the P-value is slightly bigger than the significance level hence the failure to reject the null hypothesis.

5.3.6 VAR order determination

The criteria considered are the log-likelihood (LL), Likelihood Ratio (LR), degrees of freedom (df), p-value, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Hanna-Quinn Information Criterion (HQIC), and Schwarz Bayesian Information Criterion (SBIC). The LR test suggested var models of order 2. The SBIC, HQIC, AIC, and FPE preferred orders different from the LR test, suggesting that the ideal lag length order for the VAR models is 1.

The use of the AIC and the Schwarz Bayesian Information Criterion (SBIC) helps one in choosing the model with the lowest values of these criteria, thus the lesser the value of Akaike or Schwarz information, the healthier the model. This implies that including the lagged terms up to lag 1 offers a good fit to the data and improves the model's performance.

The P-value of 0.000 indicates that including lags continues to significantly improve the model.

Table 10: Summary of VAR order determination

LAG	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-85.9808				.004735	5.99872	6.05849	6.18555
1	35.1942	242.35	16	0.000	4.3e-06*	-1.01295*	-.714113*	-.078818*
2	49.8308	29.273*	16	0.022	5.0e-06	-.922052	-.384146	.759385

*Optimal lag

5.3.7 Granger Causality Test

In explaining the Granger-causality test results, we would reflect upon the often-asked question in macroeconomics: is it that exchange rate dynamics i.e. devaluations, and changes in exchange rate regime cause an increase in tax effort (Exchange Rate Dynamics →Tax effort), or is the tax effort causing exchange rate dynamics. Therefore, the Granger causality test examines the causal linkage between the variables by testing the null hypothesis (H0) that a specific variable does not Granger-cause another variable.

Table 11: Granger-Causality

MODELS	EXCLUDED	Chi2	Df	Prob>Chi2	GRANGER-CAUSALITY
lnTaxrevenue	lnExchangeRate	33.978	2	0.000	Granger causality
	Devaluation	1.6955	2	0.428	No Granger-causal effect
	Regime	6.4471	2	0.040	Granger causality
	All	37.976	6	0.000	Granger causality
lnExchangeRate	lnTaxrevenue	3.8934	2	0.143	No Granger-causal effect
	Devaluation	.12067	2	0.941	No Granger-causal effect
	Regime	2.1671	2	0.338	No Granger-causal effect
	All	9.7233	6	0.137	No Granger-causal effect
Devaluation	lnTaxrevenue	5.7074	2	0.058	No Granger-causal effect
	lnExchangeRate	7.2875	2	0.026	Granger causality
	Regime	.6117	2	0.736	No Granger-causal effect
	All	11.981	6	0.062	No Granger-causal effect
Regime	lnTaxrevenue	3.5538	2	0.169	No Granger-causal effect
	lnExchangeRate	3.3162	2	0.191	No Granger-causal effect
	Devaluation	3.2425	2	0.198	No Granger-causal effect
	All	8.2076	6	0.223	No Granger-causal effect

The most important statement to keep in mind when carrying out the Granger-causality test is whether statistically, one can sense the course of causality when temporally there is a lead-lag linkage between two variables (Gujarati, 2004).

If causality is recognized, it proposes that one can use a variable to forecast the other variable than merely the past of that other variable. In this case, it shows from the results that Tax revenue can be better predicted by considering the lagged values of the excluded variables. Thus, taken together, they have significance in explaining the variation in Tax revenue variable beyond what is captured by its own previous values and the previous values of the other variables within system.

However, the variables Exchange rate and Regime provide some evidence to suggest that granger causality exists between the variables and the variable Tax revenue. This evidence is found by comparing the p-values 0.000 and 0.040 to the level of significance 0.05 respectively. From the causality analysis, there is also evidence to suggest that the variable Exchange rate Granger causes variations in the variable devaluation, as the p-value (0.026) is less than the 0.05 level of significance.

In conclusion, the null hypothesis is that all the variables in the model do not Granger cause the Tax revenue variable. By comparing the P-value (0.000) against the level of significance (0.05), which is less than the significant level, we reject the null hypothesis and settle that there is Granger causality from the excluded variables as a group to Tax revenue.

5.3.8 VAR Stability Test

The outputs from the Eigenvalue stability condition test specify that all the eigenvalues in the VAR model lie inside the unit circle. (Lutkepohl, 1993) shows that stability in the estimated VAR model is attained if the modulus for each eigenvalue of matrix A is strictly less than one. In this case, therefore, the VAR model satisfies the stability condition.

Thus, the model does not exhibit unstable behavior, and the dynamics of the variable are well-behaved over time. Appendix III indicates virtually that the eigenvalues lie within the unit circle.

5.4 Ordinary Least Squares Regression Results

Having fulfilled the diagnostic tests that are required for the Ordinary least squares model, the study then estimates the regression to determine which variables contribute to tax collection in Malawi, appropriating into account the fundamental features of the economy. The tax effort scores are then computed by dividing the actual tax collection by the potential tax collection, where the tax potential is a linear prediction from the estimated regression model. Table 12 below displays the regression outputs from the model.

Table 12: OLS Regression Results

R-squared Adj R-squared F (9,22) Prob>F	0.9949 0.9928 476.84 0.0000					
VARIABLE	**Coefficient**	**Std. Error**	**t-Statistic**	**P>|t|**	**[95% conf. interval]**	
Exchange Rate	1.22571	.1419591	8.63	0.000	.9313043	1.520115
Trade Openness	-.7906634	.3655807	-2.16	0.042	-1.548831	-.0324955
Agri Share of GDP	-.0364094	.012724	-2.86	0.009	-.0627974	-.0100214
Inflation	-.0063131	.0037012	-1.71	0.102	-.0139888	.0013626
GDP per Capita	1.156759	.2174502	5.32	0.000	.7057945	1.607723
Devaluation	.1214008	.1311739	0.93	0.365	-.1506373	.3934389
Public debt	-.2313661	.1148659	-2.01	0.056	-.4695834	.0068512
Share of Industry	-.7828079	.5131165	-1.53	0.141	-1.846946	.2813306
Regime	.1558546	.133583	1.17	0.256	-.1211796	.4328889
Constant	7.909777	3.501765	2.26	0.034	.647561	15.17199

Source: OLS regression output from stata

5.4.1 Interpretation of Results

Table 9 above presents the outcomes of the OLS regression model. From the results, the R-squared of 0.9949 means that roughly 99 percent of the variations in the Tax revenue variable are described by the variations in the explanatory variables. At the 5 per cent level of significance the overall F statistic (476.84) is statistically significant implying that the model was well specified. The F-statistic tests the premise that all the gradient coefficients are instantaneously equal to zero, hence we fail to accept the null hypothesis subsequently because the p-value of the model is less than the recommended 5 percent level.

The results above show that variables such as Exchange rates, openness in trade, per Capita GDP, and Agriculture Share of GDP have statistically significant relationships with Tax revenue at the 5 percent level of significance since the P-value for these variables is less than the recommended 5 percent significance. These findings are consistent and provide practical support to the theoretical underpinnings as raised, for example by (Bahl, 1971), (Piancastelli, 2001), however, the results on the Agriculture Value Added are different from findings by (Pessino & Fenochietto, 2010), and (Gupta, 2007). At the 10% level of significance the variable public debt is statistically significant, implying that the variable has a statistical relationship with Tax revenue at that level of significance. The variables Exchange rate and GDP per Capita have positive coefficients which infers that a rise in the exchange rate and per capita GDP increases collection of tax revenue. The variables openness in trade, public debt and Agriculture Share of GDP have negative coefficients implying that a rise in trade openness, public debt and agriculture share of GDP will reduce tax revenue collection.

Thus, a unit rise in exchange rates is linked with a 1.22-unit increase in Tax revenue, holding all other variables stable. The coefficient is statistically significant ($p<0.05$), suggesting a positive significant relationship. Further, a unit rise in per capita GDP is linked with a 1.15-unit increase in the tax revenue, holding all other variables fixed. A unit rise in Trade openness is accompanied by a decrease of 0.79 units in tax revenue, all things equal. The coefficient is statistically significant ($p=0.042$), indicating a significant relationship. A one-unit upsurge in Agriculture's share of GDP is accompanied by a decrease of 0.003

units in tax revenue, all things being equal. The p-value of 0.009 indicates a significant relationship. A one-unit rise in Public debt is allied with a decline in tax revenue by 0.23 units. At the 5 percent level of significance (p=0.056), the variable portrays marginal statistical significance, however, it is statistically significant at the 10 percent level of significance.

Table 13: Tax Revenue Effort Scores 1990-2021

YEAR	SCORE
1990	1.01
1991	1.01
1992	1.02
1993	1.01
1994	0.98
1995	0.97
1996	0.99
1997	0.99
1998	1.00
1999	1.00
2000	1.01
2001	1.01
2002	0.95
2003	0.96
2004	0.99
2005	1.01
2006	0.97
2007	0.98
2008	1.01
2009	1.01
2010	1.01
2011	0.99
2012	0.98
2013	1.01
2014	1.02
2015	1.00
2016	1.00
2017	0.99
2018	0.99
2019	1.00
2020	0.99
2021	1.00

Source: Author's computations from the estimated tax potential in the regression

The average tax effort score for Malawi is 1.00, which implies that Malawi collects enough revenue provided the fundamental features of the economy. These results stand different from those obtained from the study by (Macha, Lado, & Nyansera, 2018) who found that Malawi was under-taxing provided the essential features of the economy and the average tax effort score for Malawi was 0.9. From the table Malawi has its least tax effort score in 2002, and a peak score in 1992 and 2014 respectively.

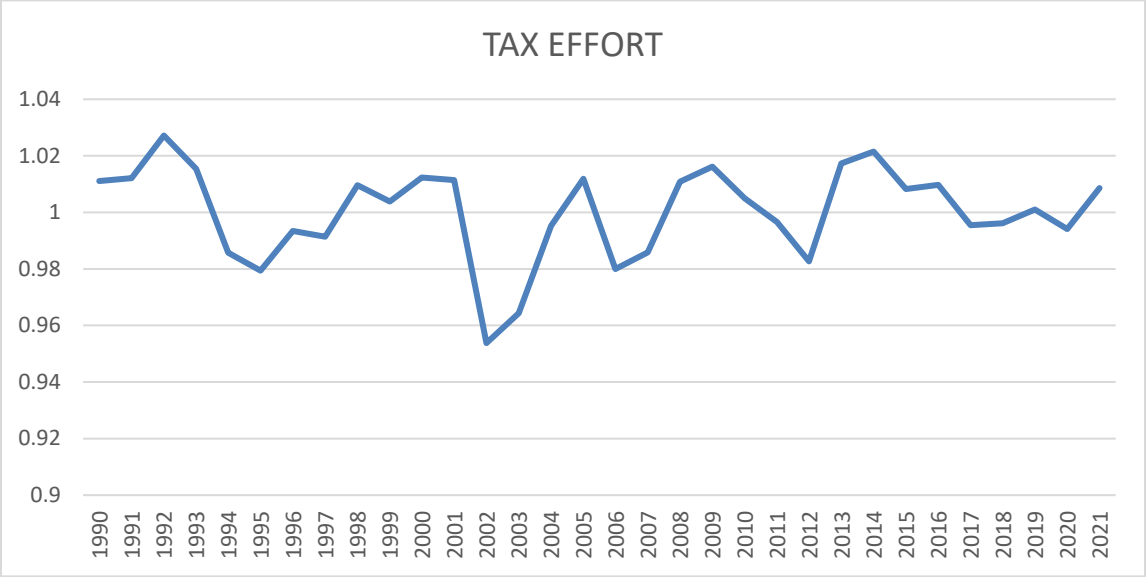

Figure 5: Tax Effort Trend

5.5 VAR Regression Output

The VAR output analysis (see Appendix IV) reveals that the second lag of the exchange rate variable has a highly substantial negative impact on the variable tax revenue. Similarly, (Agbeyegbe, et. al 2004) finds that exchange rates are negative and significant, suggesting that an exchange rate appreciation depresses tax revenue, which is also consistent with (Tanzi, 1989) hypotheses. Nonetheless, the analysis through the Granger-Causality test indicates a unidirectional relationship, indicating that fluctuations in the exchange rate significantly affect tax revenue. Furthermore, analysis suggests that while the variable devaluation has a progressive influence on tax revenue, the floating exchange rate regime has a negative impact, but neither has a statistically substantial effect on revenues from tax. The negative influence of the floating regime on tax revenue is unidirectional, whereas the direction of the link between devaluation and tax revenue is unclear.

5.6 Impulse Response Function Interpretation (VAR model)

The graphical presentation is found in Appendix I. The Impulse response function (IRF) of the VAR model locates the reaction of the response variable in the VAR system to impulses in the error terms such as ε_{t1} and ε_{t2}. Thus, the assumption in IRF is that suppose ε_{t1} in the tax revenue equation fluctuates by a value of one standard deviation. Such an impulse or alteration will change the tax revenue in the present as well as in the periods ahead. But since tax revenue also plays a role in the other regression (say the exchange rate regression), the fluctuation in ε_{t1} will also have an influence on the exchange rate regression. Thus, the IRF locates the influence of such impulses for numerous periods ahead. The intervals of the IRF are within the 95% confidence interval and the responses were observed for a period of 8 years.

The shocks from changes in the exchange rate ie lnexchangerate variable had significant short-run and long-run effects on tax revenue effort. The shocks from changes in the regime had small to no substantial short-run influences on tax revenue effort. Similarly, the shocks from the variable devaluation had no significant effects on tax revenue effort. In observance of the Granger causality results, the most important reflection one can attain on the impulse responses is that the variable Tax revenue effort responded to Exchange rate innovations intensely than any other variable in the approach, and the responses naturally continued to be substantial for anything between 2 to 4 years. While the results of the regime change showed negative significant impacts ranging between 0 to 2 years, and devaluation effects were ambiguous. However, the Granger causality results also show that the variable tax revenue significantly responds to all variable innovations or shocks in the system as a group.

CHAPTER 6

CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 introduction

This Chapter summaries the study's examination results and makes inferences and policy endorsements built on the findings. The direction of further research is also offered in this Chapter. The main sections following this introduction summarize the findings, policy recommendations, study limitations, and the direction for more exploration.

6.2 Summary of Findings

The study was established to empirically analyze the extent to which exchange rate dynamics, i.e. devaluation policy and an exchange rate regime change, affect tax efforts in Malawi. This study was carried out over a sample period from 1990 to 2021. Specifically, it examined the effects imposed on tax revenue efforts by exchange rate changes in Malawi, the effects of a devaluation on tax efforts in Malawi, and the effects exchange rate regime changes impose on tax efforts in Malawi. Throughout the study timelines, it was observed that there had been tax reforms from 1985 to 1999, and from 2000 to 2010, there were also exchange rate changes caused by exchange rate regime changes from 1990 to 1997, 1998 to 2003, 2004 to 2011, 2012 to 2016, and 2017 to 2021. There were also notable devaluations during the study period such as those in 1990, 1992, 2011, and 2012.

To compute the tax effort scores for Malawi, the study adopted an ordinary least squares model which considered the structural features of the economy. The tax effort scores were arrived at by dividing the actual tax revenue collections by an estimate of tax revenue potential from the model. The study further adopted a Vector Autoregression (VAR) model to examine whether tax efforts are affected by a change in exchange rates. Since the individual constants in the VAR model are not easy to interpret, the experts of this practice often approximate the so-called impulse response function (Gujarati, 2004). The impulse

response function being the centerpiece of the VAR analysis was implemented to trace out the consequences of the exchange rate shocks aimed at numerous periods in the future.
Before estimating both models, stationarity tests were conducted on the variables, for the OLS model the variables were not fixed in levels but became fixed after first differencing, and for the VAR model, the stability test showed that the variables were all stable as their eigenvalues all lied within the unit circle. The residuals of the OLS model were tested whether they were normally distributed using the Shapiro-Wilk test and it was established that they followed a normal distribution. The OLS model was also tested whether there were omitted variables by means of the Ramsey Reset test and the results showed that the model had no absent variables. The OLS model was further tested for heteroskedastic and Multicollinearity as these are common problems in times series data and the model had no heteroskedasticity but proved to have multicollinearity in some variables, the study adopted a "do nothing" approach in the presence of multicollinearity.

The VAR orders recommended by the VAR model choice criteria were as follows; the LR test suggested var models of order 2. The SBIC, HQIC, AIC, and FPE preferred orders different from the LR test, suggesting that the ideal lag length order for the VAR models is 1. The use of the AIC and the Schwarz Bayesian Information Criterion (SBIC) helped in choosing the model with the lowest values of these criteria, thus the lesser the value of Akaike or Schwarz statistics, the healthier the model hence the delay order for the model was 1. The model was also subjected to the Granger causality test to determine whether exchange rate dynamics ie devaluations and changes in exchange rate regime cause an increase in tax effort (Exchange Rate Dynamics →Tax effort), or if the tax effort Granger causes exchange rate dynamics. The results showed that a change in the regime of exchange rates and the exchange rates Granger causes a change in tax revenue but tax revenue does not Granger cause the exchange rate changes, the regime, and devaluation. However, the results further showed that Exchange rates Granger causes devaluation, which is as expected from economic theory. The impulse response function (IRF) which is a centerpiece of the VAR analysis was used in tracing the effects of a change in exchange rates in the short-run and long-run, effects of devaluation, and effects of an exchange rate regime change. The results showed that changes in exchange rates had a positive significant

impact on tax revenue as there are traceable short-run effects of 2 to 4 years period. And the exchange rate regime changes had negative substantial effects on tax revenues for a short-run period of 0 to 2 years. While the effects of devaluation were ambiguous.

6.3 Policy Implications

Given that exchange rate innovations have positive effects on tax efforts, the government should continue considering the exchange rates as a policy indicator in guiding domestic and foreign claims for goods and services, and income distribution in the country. The government needs to specifically take into consideration tax reforms that align with the timing of recognition of foreign exchange advances and losses on external currency-denominated properties. The domestic revenue mobilization strategy cites broadening the tax base as a strategic objective, hence tax reforms aligned to the timing of recognition of foreign exchange gains or losses would contribute to the attainment of this objective through an effective tax rate on external currency-denominated properties. The government needs to further tighten the customs declaration procedures to ensure that all export earnings are repatriated to Malawi. When undertaking devaluations, the government needs to take into consideration whether there are significant pass-through effects of changes in exchange-rate to the overseas prices of domestic exports (and vice versa) and to consider Tax reforms in the form of an increase in the VAT, to out-way the effects of the nominal devaluation in the currency which helps to regain competitiveness of domestically produced goods.

6.4 Direction of Further Research

Due to the unavailability of data this study only focused on a few structural characteristics of the Malawian economy in regards to the determinants of tax revenue, other characteristics such as corruption were not included in the model, however, such characteristics would account for inefficiencies in the tax system which in turn might reduce the tax effort score for Malawi. Furthermore, an analysis of the impacts of exchange rate dynamics on specific taxes for example PAYE and VAT would help inform policy in terms of which specific taxes are related to the exchange rate changes since it has been

established from this study that exchange rate innovations produce positive effects on tax revenues.

6.5 Conclusion

This study has analyzed the extent to which dynamics in exchange rates ie devaluation policy, regime changes in exchange rates, and a change in exchange rates affect tax revenue efforts in Malawi via a time series data set from 1990 to 2022. The results suggest that factors such as Exchange rates, per capita Gross Domestic Product (GDP), share of agriculture in GDP, and openness of trade significantly affect tax revenues in Malawi. Further the study suggests that changes in factors such as Exchange rates and Exchange rate regime Granger causes Tax revenues in Malawi and that exchange rate fluctuations have a significant outcome on tax revenue as there are traceable short-run effects of 2 to 4 years period. These findings have important implications on revenues collected from international trade taxes and the reforms for the tax regime.

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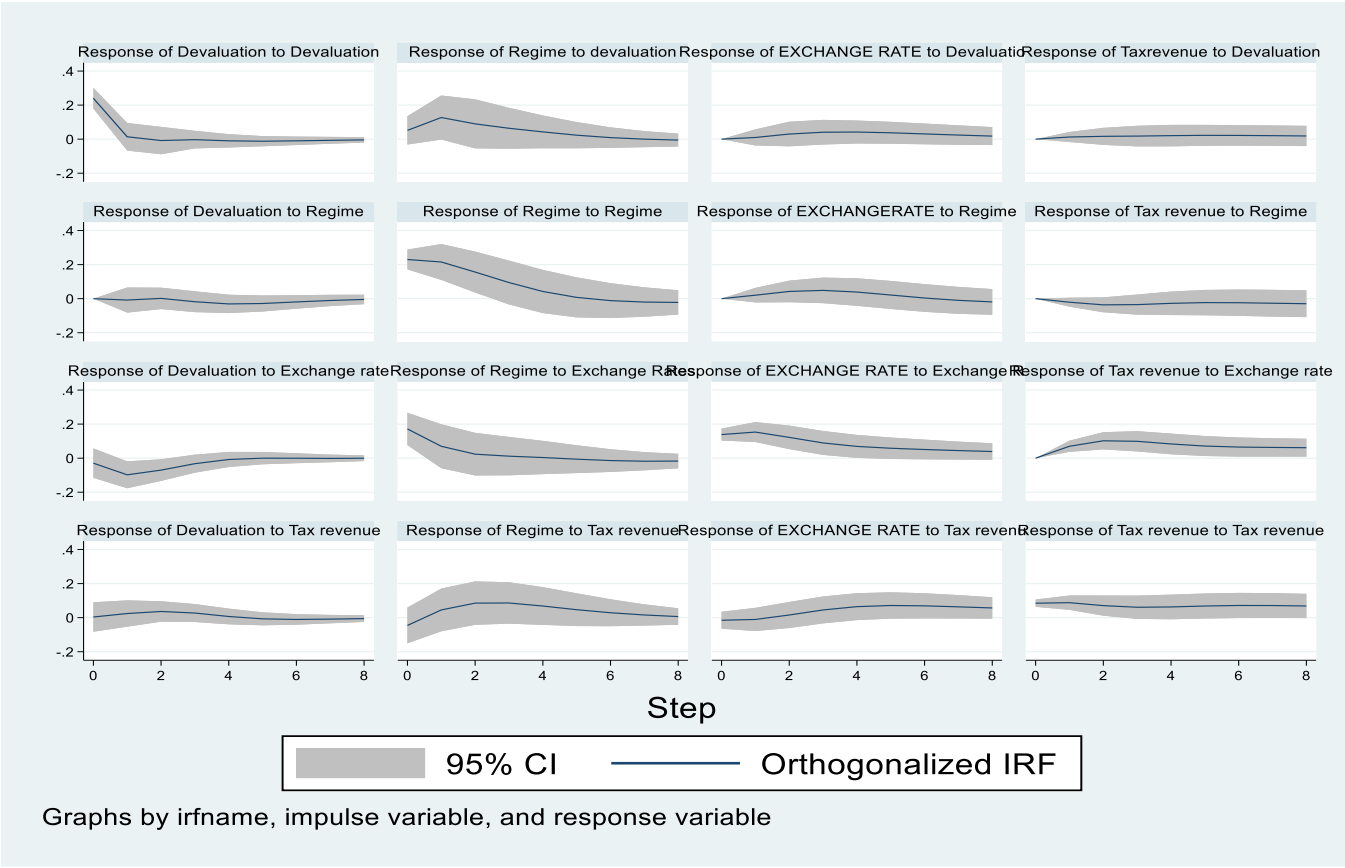
APPENDICES

APPENDIX I: Impulse Response Function (Graphical analysis)

The graph below shows responses to one standard deviation change or shocks in the error terms of the variables in the VAR system. The time after shock is in years.

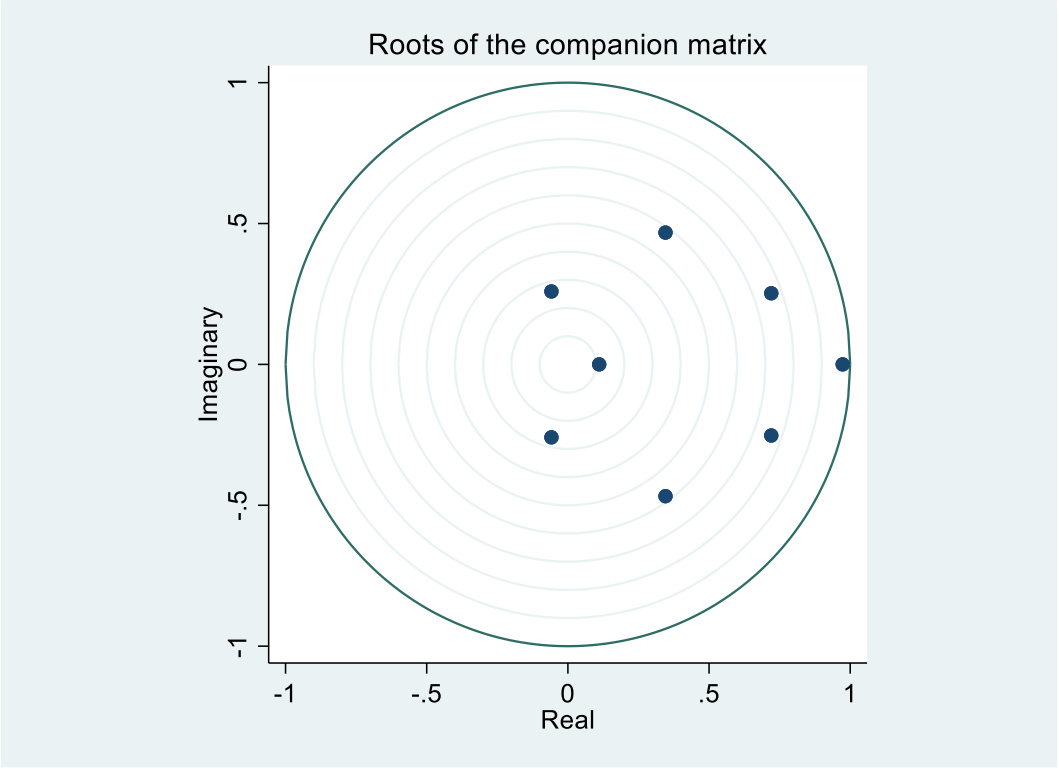


APPENDIX II: Granger Causality Test Output

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
lnTaxrevenue	lnEXCHANGERATE	33.978	2	0.000
lnTaxrevenue	Devaluation	1.6955	2	0.428
lnTaxrevenue	Regime	6.4471	2	0.040
lnTaxrevenue	ALL	37.976	6	0.000
lnEXCHANGERATE	lnTaxrevenue	3.8934	2	0.143
lnEXCHANGERATE	Devaluation	.12067	2	0.941
lnEXCHANGERATE	Regime	2.1671	2	0.338
lnEXCHANGERATE	ALL	9.7233	6	0.137
Devaluation	lnTaxrevenue	5.7074	2	0.058
Devaluation	lnEXCHANGERATE	7.2875	2	0.026
Devaluation	Regime	.6117	2	0.736
Devaluation	ALL	11.981	6	0.062
Regime	lnTaxrevenue	3.5538	2	0.169
Regime	lnEXCHANGERATE	3.3162	2	0.191
Regime	Devaluation	3.2425	2	0.198
Regime	ALL	8.2076	6	0.223

APPENDIX III: Eigenvalue Stability Condition Test



APPENDIX IV: VAR Regression Output

```
. varbasic  lnTaxrevenue lnEXCHANGERATE Devaluation Regime, lags(1/2) step(8)

Vector autoregression

Sample: 1992 thru 2021                          Number of obs     =         30
Log likelihood =   49.83078                     AIC               =  -.9220523
FPE            =   5.04e-06                     HQIC              =  -.3841462
Det(Sigma_ml)  =   4.24e-07                     SBIC              =   .7593846

Equation             Parms      RMSE     R-sq       chi2     P>chi2
------------------------------------------------------------------
lnTaxrevenue             9    .101572   0.9985   19408.27   0.0000
lnEXCHANGERATE           9    .166688   0.9919   3659.091   0.0000
Devaluation              9    .289287   0.3491   16.09021   0.0411
Regime                   9    .352836   0.6247   49.94314   0.0000
------------------------------------------------------------------
```

	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
lnTaxrevenue						
lnTaxrevenue						
L1.	1.096036	.1412279	7.76	0.000	.8192345	1.372838
L2.	-.2812585	.1142533	-2.46	0.014	-.5051909	-.0573262
lnEXCHANGERATE						
L1.	.6313796	.1110009	5.69	0.000	.4138219	.8489374
L2.	-.3782443	.125309	-3.02	0.003	-.6238455	-.1326431
Devaluation						
L1.	.0721547	.0606453	1.19	0.234	-.0467079	.1910173
L2.	.0338596	.0555988	0.61	0.543	-.075112	.1428312
Regime						
L1.	-.090064	.0574976	-1.57	0.117	-.2027573	.0226293
L2.	-.0272827	.0563719	-0.48	0.628	-.1377695	.0832042
_cons	.973326	.3440681	2.83	0.005	.2989649	1.647687
lnEXCHANGERATE						
lnTaxrevenue						
L1.	.0998737	.2317659	0.43	0.667	-.3543791	.5541266
L2.	.1036671	.1874985	0.55	0.580	-.2638232	.4711574
lnEXCHANGERATE						
L1.	1.000963	.182161	5.49	0.000	.6439337	1.357992
L2.	-.3262894	.2056418	-1.59	0.113	-.72934	.0767612
Devaluation						
L1.	.0230285	.0995236	0.23	0.817	-.1720342	.2180911
L2.	.0250243	.0912419	0.27	0.784	-.1538065	.2038552
Regime						
L1.	.0886434	.0943581	0.94	0.348	-.096295	.2735817
L2.	.0223013	.0925106	0.24	0.810	-.1590161	.2036188
_cons	-.6048582	.5646424	-1.07	0.284	-1.711537	.5018207
Devaluation						
lnTaxrevenue						
L1.	.1508785	.4022287	0.38	0.708	-.6374751	.9392322
L2.	.2640164	.3254027	0.81	0.417	-.3737612	.9017941
lnEXCHANGERATE						
L1.	-.6469395	.3161396	-2.05	0.041	-1.266562	-.0273173
L2.	.0522088	.3568904	0.15	0.884	-.6472835	.7517012
Devaluation						
L1.	.0659235	.1727227	0.38	0.703	-.2726068	.4044539
L2.	-.0239662	.1583499	-0.15	0.880	-.3343263	.2863939
Regime						
L1.	-.0352925	.1637579	-0.22	0.829	-.3562522	.2856672
L2.	.1138735	.1605517	0.71	0.478	-.200802	.4285491
_cons	-1.616028	.9799343	-1.65	0.099	-3.536663	.3046083
Regime						
lnTaxrevenue						
L1.	.9190365	.4905885	1.87	0.061	-.0424994	1.880572
L2.	-.6105825	.3968858	-1.54	0.124	-1.388464	.1672995
lnEXCHANGERATE						
L1.	-.5868932	.3855878	-1.52	0.128	-1.342631	.168845
L2.	.144676	.4352906	0.33	0.740	-.708478	.9978299
Devaluation						
L1.	.3281695	.2106657	1.56	0.119	-.0847277	.7410668
L2.	-.1535299	.1931355	-0.79	0.427	-.5320686	.2250088
Regime						
L1.	.9368337	.1997316	4.69	0.000	.545367	1.3283
L2.	-.0515717	.195821	-0.26	0.792	-.4353738	.3322305
_cons	-1.392435	1.195202	-1.17	0.244	-3.734988	.9501177