UNIVERSITY OF CAPE COAST

DETERMINANTS OF TAX REVENUE: EVIDENCE FROM GHANA

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BY

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THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS OF THE FACULTY OF SOCIAL SCIENCES, UNIVERSITY OF CAPE COAST, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR AWARD OF MASTER OF PHILOSOPHY DEGREE IN ECONOMICS

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature ……. Date…….……

Name: James Aggrey

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature…….. Date ……...

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Name: Dr. Christian Ahortor

ABSTRACT

Most developing countries face the problem of raising tax revenue to carry out public sector spending. Tax revenue is necessary for economic growth and development. Unfortunately tax revenue generation has been low in Ghana. This study therefore examined the determinants of tax revenue with evidence from Ghana using quarterly data from 1988 to 2008. The tax effort function is used by regressing government expenditure, real gross domestic product and financial deepening on tax revenue. The study employed Auto Regressive Distributed Lag (ARDL) approach to cointegration.

Results from the analysis showed that government expenditure is vital in generating tax revenue in the long run while it has a negative effect in the short run on tax revenue for the period selected for the study. It implied that government expenditure is a good policy instrument in raising tax revenue in the long run. Also, real gross domestic product exhibited a positive effect on tax revenue in the short run while it showed a negative impact on tax revenue in the long run over the study period. Furthermore, the study revealed that, financial deepening had a negative impact on tax revenue when both the short run and long run dynamics were employed.

The study recommends that the government of Ghana increases government expenditure in the productive sectors that would impact positively on all forms of taxes that would ultimately lead to increase in tax revenue. Also, the number of years of tax holidays and tax exemptions should be reduced so as to increase tax revenue that would enhance economic growth and development.

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DEDICATION

This work is dedicated to all my children, especially Oheneba for his encouragement and his ambition for higher education.

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LIST OF ACRONYMS

ADF	- Augmented Dickey - Fuller
AERC	- African Economic Research Consortium
AIC	- Akaike Information Criteria
ARDL	- Auto Regressive Distributed Lag
BIC	- Bayesian Information Criterion
CUSUM	-Cumulative Sum of Recursive Residuals
CUSUMSQ	-Cumulative Sum of Squares of Recursive Residuals
CERDI	- Centre D'etudes et Researches Sur le development International.
DF	- Dickey Fuller
ECM	- Error Correction Model
FDI	- Foreign Direct Investment
FID	- Financial Deepening
FINSAP	-Financial Sector Adjustment Program
GDP	- Gross Domestic Product
GOV	- Government Expenditure
GRA	-Ghana Revenue Authority
HIPC	- Heavily Indebted Poor country
HMRC	- Her Majesty's Revenue and Customs
IGF	- Internally Generated Fund
IMF	- International Monetary Fund
MCC	-Millennium challenge Corperation
NLC	- National Liberation Council

OECD	- Organization for Economic Development and Co-operation.
ODA	- Official Development Assistance
PNDC	- Provisional National Defense Council
RGDP	- Real Gross Domestic Product
TR	- Tax Revenue
VAT	-Value Added Tax
T/Y	- Tax Ratio

CHAPTER ONE

INTRODUCTION

Background to the Study

Taxes play an essential role in economic planning and development. They are the main source of public revenue. Thus, domestic revenue mobilization is important to sustainable development finance – only self-sufficiency will allow the development of fully-functioning states. Tax revenue is mainly derived from the economic activity of that sovereign state which is payable by taxable persons to carry out public projects. Economic policies are based on expected tax revenue and the tax policy is a fundamental component of economic policies for every country. Nations are vigorously looking for ways to generate tax revenue to finance essential expenditures without recourse to public sector borrowing.

Many sub-Saharan African countries face difficulty in raising domestic revenue in the form of taxes to finance public projects. Low per capita incomes, reliance on subsistence agriculture, poorly structured tax systems, and weak tax and customs administrations all contribute to difficulties in raising tax revenues.

Governments all over the world use tax revenue to develop their economies by providing developmental projects such as education, health, infrastructure, and social security. Toye (1978) asserted that the link between taxation and economic development is a link between a universal desire and a form of government action that is believed to be the means to an end. When actual tax revenue collected falls short of the projected revenue, it affects developmental plans of that nation.

Money provided by taxation is used by states and their functional equivalents throughout history to carry out many functions. Some of these include expenditures on war, the enforcement of law and public order, protection of property, economic infrastructure (roads, legal tender, enforcement of contracts, etc.), public works, social engineering, and the operation of government itself.

Colonial and modernised states also embark on taxation to carry out most of their developmental projects. Governments also need taxes to fund welfare and public services such as education systems, health care systems, pensions for the elderly, unemployment benefits, and public transportation. Currently, there is socio-economic pressure on most African governments to provide energy, water, waste management and other social amenities. However, governments find it difficult to raise taxes to execute these projects.

Considerable effort and attention in most developing countries have been devoted to policies best suited to the promotion of economic

development, where the major focus of these efforts is the search for desirable fiscal policies with considerable stress being placed on the role of taxation as an instrument of economic development. Taxation policy has always been an important instrument for augmenting revenue. This is as true in developing countries as in developed countries, where tax revenue is the major source of domestic revenue. Most developing countries lack economic activities that will trigger the increase in tax revenue. Thus the most important motivation for fiscal policy in most developing countries is the need to raise revenue. However, generation of tax revenue requires tough economic decisions in other to raise such revenue. Therefore one needs to look at the macroeconomic variables that help to raise tax revenue for socio-economic development.

In the last two decades nations have been seriously looking at ways to improve on their internally generated funds (IGF) to carry out public sector expenditure of which Sub-Saharan Africa is no exception. Tax revenue mobilisation in Sub-Saharan Africa (SSA) is not only low compared to spending needs (Stotsky and Woldemariam, 1997; Keen and Mansour, 2009) but also suffers from high instability (Brun, Chambas and Combes, 2006). However, works by Ebeke and Ehrhart (2010) stated that tax revenue instability has been documented as particularly important in Sub-Saharan Africa and, from the tax instability measures presented in Table 1; one can note that countries did not succeed in eliminating this instability over the period 1980-2005. Since the beginning of the 2000's, a

small decrease in tax instability has been occurring but it still remains an on-going issue that needs to be seriously addressed. As far as the components of tax revenue are concerned, we can highlight some stylised facts. Corporate taxes were the most unstable taxes during the entire period whereas indirect taxes have become slightly less volatile than trade taxes since the 1990's.

Table 1: Instability of tax revenues and spending in Sub-Saharan Africa.

	1980/1985	1986/1990	1991/1995	1996/2000	2001/2005
Total tax revenue	2.59	2.77	2.64	2.49	2.22
Trade tax revenue	3.04	3.18	3.14	3.07	2.79
Indirect tax revenue	3.22	3.26	3.08	3.06	2.64
Income tax revenue	3.03	2.91	2.83	2.78	2.61
Corporate tax revenue	3.32	3.37	3.34	3.41	3.17
Individual income tax revenue	3.06	2.96	3.09	2.8	2.73
Public investment	2.92	3.30	3.15	3.30	3.22
Government consumption	2.24	2.37	2.36	2.42	2.37

Note: Instability is measured by the standard-deviation of the growth rates of the corresponding variables (in % of GDP) over 5-year overlapping sub-periods. Instability is in logarithmic terms.

Source: CERDI, Etudes et Documents, E 2010.25

The primary concern linked with tax revenues instability is that it might result in public spending instability which is of deep concern for

Sub-Saharan African countries since it was found to be detrimental for growth and welfare (Guillaumont et al. 1999; Fatas and Mihov, 2003; Furceri, 2007; Loayza et al., 2007). Indeed, unstable revenues are costly because they might force the government to consequently cut public spending, leading to public spending instability.

The need to mobilise domestic revenues for development has become even more acute in the wake of the global economic crisis, which has resulted in the near stagnation of development aid and greater difficulty among the smaller, poorer countries in attracting private capital flows. For most African countries, this crisis has brought into sharp focus the importance of urgently addressing the structural factors that hamper economic and social development and looking for viable domestic solutions. Taking centre stage is an approach to development that aims to put control over the developmental agenda firmly in the hands of the African states themselves. Being able to rely on domestic sources of funding in the form of taxes will allow African states to reduce their dependency on official development assistance to fund development. It will give African states the room to determine their own development priorities and fund them accordingly without having to mollify donors, who attach conditions to development aid that often reflect the interests of the donor rather than the recipient.

The magnitude of tax revenue generated can determine the level of economic development that can take place in a country. Wilford and

Wilford (1978a) asserted that one of the most important policy upon which most economists agree is that emerging nations must increasingly mobilize their own internal resources to enhance economic growth. This can be achieved through tax revenue generation. Every nation has its own development plan which is implemented through tax revenue. Fluctuations in tax revenue will distort the developmental goals of that country. When a country is experiencing positive growth in tax revenue its developmental goals could be greatly enhanced. While negative growth in terms of tax revenue will impede that nation's development agenda. The assessment of stability of the fiscal sector of the economy must be of concern to achieve growth and development.

Several studies have indicated that developing countries have the potential for greater domestic resource mobilization. The 2005 United Nations Millennium Project estimated that, these countries could increase their domestic revenue by about 4% of GDP over the next 10 years. Challenges in most African countries have been the narrowness of the tax base, which limits the opportunity for collecting additional revenue. In many countries, the largest share of tax revenue is generated from natural-resource taxes, such as income from production-sharing royalties and corporate income tax on oil and mining companies. The extent of the informal, or shadow, economy in developing countries also hampers efforts at broadening the tax base. Shadow-economy activities range from small-scale informal traders, such as hawkers and unregistered small

businesses, to registered businesses that fail to declare profits and criminal syndicates that profit from activities such as drug trafficking and the smuggling of counterfeit goods.

In Ghana, tax collection has been one of the victims of numerous economic crises that have plagued the country since the introduction of taxation in the year 1874. Tax collections are still very low leading to large fiscal deficits. Ghana has also suffered from over-dependence on a small number of sources of tax revenue, which are vulnerable to external shocks and remain a crucial problem in the tax administration. Since 1983 Ghana's tax system has undergone fundamental reform in response to the need for funds to support economic and social development. The government intensified efforts in the area of tax administration and expenditure cutting to attain fiscal discipline. Two practical steps were taken in Ghana in 1985 to strengthen revenue administration in the country. These were the establishment of the National Revenue Secretariat (NRS) and the creation of the two major revenue organizations, the Internal Revenue Service and Customs Excise and Preventive Service a semi-autonomous body responsible for carrying out tax policy implementation. It was charged with the task of administering and collecting taxes for the central government.

Other reforms have included partial removal of exemptions, harmonisation of the customs duty rates, narrowing the tax rate bands, reduction of the tax rates, and introduction of new forms of taxes, which

are relatively easy to administer. In 1995, the Value Added Tax (VAT) was introduced. This was meant to widen the tax base by bringing all supplies of goods and services under the tax net so as to increase tax revenue.

The issue then is how does macroeconomic variables in Ghana affects tax revenue? This study seeks to examine how some macroeconomic variables such as real gross domestic product (RGDP), government expenditure (GOV), and financial deepening (FID) impact on tax revenue.

The growth rate of tax revenue in Ghana has been fluctuating between 68.17% in 1988 to 29.66% in 1998 to 35.34 in the year 2008. These fluctuations call for a study into the determinants of tax revenue in Ghana.

Statement of the Problem

The experience with domestic resource mobilisation of developing countries over the last 25 years has been mixed. Most countries such as Botswana, Israel, Kuwait and Seychelles, the central government revenue's share in GDP have been more than 40 percent on average. On the other hand, countries such as Argentina, Niger, Guatemala and Burkina Faso have struggled to raise their revenue above 11 %. Excessive reliance on foreign financing may in the long run lead to problems of debt sustainability; developing countries will need to rely substantially on domestic revenue mobilization to finance its developmental projects.

Rapid economic growth results in windfall increases in state tax revenues, while recession lead to corresponding slowdowns in the growth of revenue. In the midst of economic slowdowns, most governments are making program choices and policies regarding spending reductions and/or tax increases so as to keep their economies on track. For instance, the Ghanaian economy has been going through financial sector reforms since 1984 as part of a comprehensive macroeconomic adjustment program and this is expected to have its impact on tax revenue. However, it's expected that as real gross domestic product (RGDP) increases tax revenue will also increase. The question one is asking is that, is it really the case for Ghana?

More so, the assessment of stability of the fiscal sector of most economy is of great concern to most governments since it aids in

achieving growth and development. However, when projected tax revenue deviates from the actual tax revenue, provision of public goods becomes difficult to undertake and this can cause instability in the public sector. Though to some extent all sources of tax revenue are affected by economic fluctuations, some will be more sensitive to these fluctuations. Hence, there is the need to look at the determinants of tax revenue so as to come out with policy prescriptions and programs that will ensure revenue maximization.

This study therefore attempts to examine the determinants of tax revenue in Ghana. Thus, how do some macroeconomic variables such as real gross domestic product (RGDP), financial deepening (FID) and government expenditure (GOV) affect or contribute to tax revenue?

Objectives of the Study

The main objective of this study is to find out the variables that determine tax revenue in Ghana. This will help to make it possible to explore the policies that will enhance revenue maximization in Ghana.

Specific Objectives are as follows:

1. To find out the impact of government expenditure on tax revenue.
2. To investigate the effect of real gross domestic product on tax revenue.

3. To examine the relation between financial deepening and tax revenue.
4. To find out the causal relationship among the variables ;Tax Revenue (TR),Government Expenditure (GOV), Real Gross Domestic Product (RGDP), and Financial Deepening (FID)
5. To bring out policy options based on the outcome of the study.

Hypotheses

This extension of the study shows the different hypotheses that the study seeks to test:

1. H_0: There is no relationship between government expenditure and tax revenue.

   H_A: There is a relationship between government expenditure and tax revenue.
2. H_0: There is no relationship between real Gross Domestic Product and tax revenue

   H_0: There is a relationship between real Gross Domestic Product and tax revenue
3. H_0: There is no relationship between financial deepening and tax revenue.

   H_A: There is a relationship between financial deepening and tax revenue

4. H_0: There are no causal relationships among the variables (tax revenue, real gross domestic product, financial depening and government expenditure).

   H_A: There are causal relationships among the variables (tax revenue, real gross domestic product, financial deepening and government expenditure).

Significance of the Study

This study will be beneficial to policy makers as it looks at how some macroeconomic variables can influence or impact on Ghana's total tax revenue and the way forward in maximizing tax revenue for the provision of public goods. This will go a long way to improve economic development in the country as a whole, since the tax revenue share rises with the level of economic development. Moreover, Tax revenue instability in Sub-Saharan Africa is not only high but also highly detrimental since it leads to increased public spending volatility. Policy variables such as, government expenditure and financial deepening will be examined to assess short term and long term effect on tax revenue and to make policy recommendations to the revenue collecting agencies and economic management practitioners.

Scope of the Study

The study considered twenty years period starting from 1988 to 2008. This is because it is within this period that some of the data needed for the study is available. The key interest of this study is to look at the impact of these selected macroeconomic variables; Government Expenditure, Financial Deepening and Real Gross Domestic Product on tax revenue. The study will discuss the effect of these selected macroeconomic variables on tax revenue.

The unit root test and cointegration technique are used to verify the stationarity of data and long run relationships respectively among the variables. Also, Auto Regressive Distributed Lagged (ARDL) Model and Error Correction Model (ECM) are applied to examine the speed of adjustment toward the long run equilibrium. Furthermore, time series macro data sets of Ghana on our variables of interest are selected for this study to test our hypothesis. The sources of these data are the World Development Indicator (WDI) 2010 and Research Planning and Monitoring Unit of Ghana Revenue Authority.

Organization of the Study

This study is structured into five chapters. Chapter 1 is the introductory chapter of this research work and consists of background, problem statement, objectives of the study and hypotheses to be tested and significance of the study. Chapter 2 looks at the available theoretical and

empirical literatures on determinants of tax revenue in an economy and the way forward in maximizing the tax revenue and also consider the overview of taxation in Ghana from 1852 to 2010. This leads to the formulation of an appropriate model for analysis. Chapter 3 concentrates on the methodology of this study and the econometric estimation tools which is the Autoregressive Distributed Lag (ARDL) model otherwise known as the bounds testing approach to cointegration developed by Pesaran and Pesaran (1999) ; Pesaran, Shin and Smith (2001). Chapter 4 focuses on the results and discussion on the data set employed for this study. Chapter 5 deals with summary, conclusions and recommendations of our empirical findings.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

This chapter reviews related literature on various issues which serve as basis for this work. The review essentially structured into theoretical and empirical literature review as well as explanation of terms. The empirical literature review looks at work done by various authors in the field, and draw lessons from these studies.

The Concept of Taxation

A tax may be defined as a "pecuniary burden laid upon individuals or property owners to support the government. It is a payment exacted by legislative authority. A tax is not a voluntary payment or donation, but an enforced contribution, exacted pursuant to legislative authority and is any contribution imposed by government [central or district assemblies] whether under the name of toll, tribute, tillage, impost, duty, custom, excise, subsidy, aid, supply, or other name. A traditional function of the tax system is to bring in sufficient revenue to meet the growing public sector requirements. To tax (from the Latin *taxo*) is to impose a financial charge or other levy upon a taxpayer (an individual or legal entity) by a

state or the functional equivalent of a state such that failure to pay is punishable by law. Without taxation there is no nation. Tax proceeds are used to run government planned expenditure. Taxes are also imposed by many sub-national entities. Taxes consist of direct tax or indirect tax, and may be paid in money or as its labour equivalent (often but not always unpaid labour).

The meaning of direct tax and indirect tax can vary in different contexts, which can sometimes lead to confusion. In economics, direct taxes refer to those taxes that are collected from the people or organisations on which they are ostensibly imposed. For example, income taxes are collected from the person who earns the income. By contrast, indirect taxes are collected from someone other than the person ostensibly responsibly for paying the taxes.

The legal definition and the economic definition of taxes differ in that economists do not consider many transfers to governments to be taxes. For example, some transfers to the public sector are comparable to prices. Examples include tuition at public universities and fees for utilities provided by local governments. Governments also obtain resources by creating money (e.g., printing bills and minting coins), through voluntary gifts (e.g., contributions to public universities and museums), by imposing penalties (e.g., traffic fines), by borrowing, and by confiscating wealth. From the view of economists, a tax is a non-penal, yet compulsory transfer

of resources from the private to the public sector levied on a basis of predetermined criteria and without reference to specific benefit received.

In modern taxation systems, taxes are levied in money, but in-kind and *corvée* taxation is characteristic of traditional or pre-capitalist states and their functional equivalents. The method of taxation and the government expenditure of taxes raised are often highly debated.

Tax collection is performed by a government revenue agency such as Canada Revenue Agency, the Internal Revenue Service (IRS) in the United States, or Her Majesty's Revenue and Customs (HMRC) in the UK, Kenya Revenue Authority, and Ghana Revenue Authority. When taxes are not fully paid, civil penalties (such as fines or forfeiture) or criminal penalties (such as incarceration) may be imposed on the non-paying entity or individual.

Types of Taxes

Advalorem Tax, Bank Tax, Capital gains Tax, Consumption Tax, Currency transaction tax, Environmental Tax, Excises, Expatriation Tax, Financial activities Tax, Income Tax, Inflation Tax, Expatriation Tax, Poll Tax, Property Tax, Social Security Tax, Sales tax, Tariff Tax, Transfer Tax, Value Added Tax (Goods & Service Tax) and Wealth(net worth) Tax.

Governments use different kinds of taxes and vary the tax rates so as to carry out developmental goals. This is done to distribute the tax

burden among individuals or classes of the population involved in taxable activities, such as business, or to redistribute resources between individuals or classes in the population. Historically, the nobility were supported by taxes on the poor; modern social security systems are intended to support the poor, the disabled, and pensioners by taxes of those who are still working. In addition, taxes are applied to fund foreign aid and military ventures, to influence the macroeconomic performance of the economy (the government's strategy for doing this is called its fiscal policy), or to modify patterns of consumption or employment within an economy, by making some classes of transaction more or less attractive.

A nation's tax system is often a reflection of its communal values or/and the values of those in power. To create a system of taxation, a nation must make choices regarding the distribution of the tax burden—who will pay taxes and how much they will pay—and how the taxes collected will be spent. In democratic nations where the public elects those in charge of establishing the tax system, these choices reflect the type of community that the public and/or government wish to create. In countries where the public does not have a significant amount of influence over the system of taxation, that system may be more of a reflection on the values of those in power.

The resource collected from the public through taxation is always greater than the amount which can be used by the government. The difference is called compliance cost, and includes for example the labour

cost and other expenses incurred in complying with tax laws and rules. The collection of a tax in order to spend it on a specified purpose, for example collecting a tax on alcohol to pay directly for alcoholism rehabilitation centre's, is called hypothecation. This practice is often disliked by finance ministers, since it reduces their freedom of action. Some economic theorists consider the concept to be intellectually dishonest since (in reality) money is fungible. Furthermore, it often happens that taxes or excises initially levied to fund some specific government programs are then later diverted to the government general fund. In some cases, such taxes are collected in fundamentally inefficient ways, for example highway tolls.

Some economists, especially neo-classical economists, argue that all taxation creates market distortion and results in economic inefficiency. They have therefore sought to identify the kind of tax system that would minimize this distortion.

Also, one of every government's most fundamental duties is to administer possession and use of land in the geographic area over which it is sovereign, and it is considered economically efficient for government to recover for public purposes the additional value it creates by providing this unique service in the form of taxes.

Theoretical Literature Review

From the National Income Accounting framework, taxes are considered as leakages. An increase in tax revenue is seen as a decrease in output or national income since, increasing taxes reduces consumption and investment which are components of the national income accounting model.

The first person who examined how taxation affects growth was Solow (1956). The neoclassical growth model of Solow implies that steady state growth is not affected by tax policy. In other words, tax policy, however distortionary, has no impact on long-term economic growth rates, even if it does reduce the level of economic output in the long-term. This is true when looking at taxation in relation to national income accounting. Unlike, the 'new' endogenous growth theory pioneered by Romer (1986), produced growth models in which government spending and tax policies can have long-term or permanent growth effects.

Countries have very different philosophies about taxation and very different methods of collecting their revenue. Castles and Dowrick (1990), Agell, Lindh and Ohlsson (1997) all argue that the different uses of total government expenditure affect growth differently and a similar argument applies to the way tax revenue is raised. During the past decades, some countries have increased taxation quite dramatically, while in other countries tax rates have remained roughly the same.

In theory there are three main hypotheses on the causal relationship between government expenditure and government revenues. The first of these is the fiscal synchronization hypothesis where government expenditure and government revenues are said to be determined simultaneously.

According to Vamvoukas (1997) this suggests that there is a feedback causal relationship between expenditure and revenue. In this hypothesis the public is said to determine the levels of government spending and taxation by weighing the benefits of government services to their costs. Meltzer and Richard (1991) have advanced arguments in favour of this theory for the United States of America.

The second hypothesis is mainly known as the tax-and-spend hypothesis. This approach stresses that any expenditure budget must be expanded in line with taxation and therefore that expenditure must follow revenue. Thus the amount of tax revenues available will determine the level of government spending. The view here is that if taxes are raised they will propel a growth in government spending. Friedman (1982) suggests cutting taxes as a remedy to budget deficits, since taxes have a positive causal impact on government expenditure. According to Friedman, a cut in tax leads to higher deficits, which should influence government to reduce its level of spending.

Buchanan and Wagner (1978) share the same view that taxes lead government expenditure but that the causal relationship is negative. Their

point of view is that with a cut in taxes the public will perceive that the cost of government programs has fallen. As a result they will demand more programs from the government which if undertaken will result in an increase in government spending. Higher budget deficits will then be realized since tax revenue will decline and government spending will increase. Their remedy for budget deficits is therefore an increase in taxes.

The study of Darrat (1998) finds that, the tax-and-spend hypothesis exists in the case of Turkey. The study shows that there is a negative causal relationship running from taxes to spending as hypothesized by Buchanan and Wagner (1978).

The third hypothesis is that government spending actually leads revenue. Advanced by Peacock and Wiseman (1961) and others like Barro (1979), this view is based on their observation that any large-scale exogenous disturbances like wars and other unstable political conditions or natural disasters, will induce an increase in government spending and therefore an increase in tax revenues. The solution suggested here to problems of budget deficits is that government spending should be reduced. Empirical work to support this hypothesis has been done in the case of United States of America (USA) by Jones and Joulfani (1991). They examine this relationship for the period 1792 to 1860. Their data support the spend-and-tax hypothesis in the short run and that in the long run there exists a bi-directional causality between taxes and expenditure. Vamvoukas (1997) also finds that the spend-and-tax hypothesis exists in

the case of Greece in the short run while in the long run his study seems to support the fiscal synchronization hypothesis.

Other researchers have developed the hypothesis that there is no causal relationship between government expenditure and revenue. Hoover and Sheffrin (1991) did a study for the USA and conclude that expenditure and revenue are determined independently from each other**.**

Musgrave (1969) highlights four main approaches used to assess the tax performance of a country, viz., i) 'ability to give up approach' ii) 'efficient resource use approach' iii) 'ability to collect approach' and iv) 'comparison with average performance approach', referred as the 'stochastic approach'. He views that, it is better to evaluate a country's fiscal performance by comparing it with the average performance of other countries, rather than measuring a country's absolute performance. This is regarded as the most effective approach.

The most commonly used approach to measuring tax effort is by regressing tax ratio on a set of variables that serve as proxies for a country's 'tax handles'. The set of variables include the major determinants of output of the country (Bahl, 1971 and Chelliah, 1971). In the functional form,

$T/Y = f(V)$ …….(1)

where,

T = tax revenue,

Y= GDP or GNP,

T/Y = the tax ratio and

V = vector of 'tax handles'.

The equation provides an average relationship between the tax ratio and the set of explanatory variables chosen and hence, the predicted tax ratio gives the ratio that the country would have if it had made the average tax effort. Thus the predicted tax ratio is interpreted as a measure of taxable capacity while the regression coefficients act as the "average" effective rates on the bases.

Taxation and Economic Growth

How does tax policy affect economic growth? Does it discourage new investment and entrepreneurial incentives? By distorting investment decisions because the tax code makes some forms of investment more profitable than others? Or by discouraging work effort and workers acquisition skills (Case & Fair, 1999: 780, 781)? According to Solow (1956) these questions are often addressed in an accounting framework. In his approach, the output, *y*, of an economy, typically measured by GDP, is determined by its economic resources such as the size and skill of its workforce, *m*, and the size and technological productivity of its capital stock, *k*. for instance, a country like the United Kingdom might be expected to have a greater per capita output than Tanzania because its (per capita) capital stock is so much larger and more technologically advanced and its workers have more skills, or human capital. However, the growth

rate of economic output will therefore depend on the growth rate of resources such as physical capital and human capital as well as changes in the underlying productivity of these general inputs in the economy. More formally, we can decompose the growth rate of the economy's output into its different components as;

$$y_i = a_i k_i + b_i m_i + \mu_i \quad \text{.....} \quad (2)$$

where the real GDP growth rate in country i is denoted y_i and the net investment rate (expressed as a fraction of GDP), equivalently the change over time in the capital stock, is given by k_i . However, the percentage growth rate in the effective labour force over time is written m_i, while the variable μ_i measures the economy's overall productivity growth. There are two other relevant variables in equation 2, which are the coefficients measuring the marginal productivity of capital, a_i and the output elasticity of labour, b_i.

The above theoretical framework was used to list the five ways that taxes might affect output growth, corresponding to each of the variables on the right-hand side of equation 2.

To begin with, higher taxes can discourage the investment rate, or the net growth in the capital stock (k_i in equation 2), through high statutory tax rates on corporate and individual income, high effective capital gains tax rates, and low depreciation allowances.

Secondly, taxes may ease labour supply growth m_i by discouraging labour force participation or hours of work, or by distorting occupational choice or the acquisition of education, skills, and training.

Thirdly, tax policy has the potential to discourage productivity growth by attenuating research and development (R&D) and the development of venture capital for "high-tech" industries, activities whose spillover effects can potentially enhance the productivity of existing labour and capital.

Fourthly, tax policy can also influence the marginal productivity of capital by distorting investment from heavily taxed sectors into more lightly taxed sectors with lower overall productivity (Harberger, 1962, 1966).

Lastly, heavy taxation on labour supply can distort the efficient use of human capital by discouraging workers from employment in sectors with high social productivity but a heavy tax burden. In other words, highly taxed countries may experience lower values of values of 'a' and 'b', which will tend to retard economic growth, holding constant investment rates in both human and physical capital (Engen and Skinner, 1996).

However, a number of recent theoretical studies have used endogenous growth models to simulate the effects of a fundamental tax reform on economic growth. All of these studies conclude that decreasing the distorting effects of the high tax structure would permanently increase

economic growth. Unfortunately, the magnitude of this increase in economic growth is highly sensitive to certain assumptions embodied in the economic models, with little empirical guidance or consensus about key parameter values. Consequently, these studies reached substantially different conclusions concerning the magnitude of the boost in growth rates.

Lucas (1990) calculated that a revenue-neutral change that eliminated all capital income taxes while raising labour income taxes would increase growth rates negligibly.

Jones, Manuelli and Rossi (1993) calculated that eliminating all distorting taxes would raise average annual growth rates by a whopping four to eight percentage points. Thus an "across-the-board" reduction in distortionary tax rates in these models, rather than complete elimination of distortionary taxes, would be expected to have a smaller positive effect on economic growth.

Also most recently, Mendoza, Razin, and Tesar (1994) came up with a simulation model which suggests that relatively modest differences in economic growth of roughly 0.25 percentage points annually as the consequence of a 10 percentage point change in tax rates. These simulation models of endogenous growth fail to provide a comfortable range of plausible effects of taxes on growth and thus tend to raise more questions than they answer.

Habitually, simulation analysis is performed in terms of a single flat-rate tax in the context of a (single) representative agent model. Ultimately, one needs to consider the empirical record to make informed judgments about whether tax policy exerts a strong influence on economic growth.

Supply-side Economics and Economic Growth

The supply-side economics also have argued that economic growth can be most effectively created by lowering barriers for people to produce (supply) goods and services, such as adjusting income tax and capital gains tax rates and this will have effect on tax revenue. In addition, in response to inflation, supply-siders called for indexed marginal income tax rates, as monetary inflation push wage earners into higher marginal income tax brackets that remained static. Thus, as wages increase to maintain purchasing power with prices, income tax brackets if not adjusted accordingly will thus push wage earners into higher income tax brackets than tax policy intend to do. Supply-side economics holds that increased taxation steadily reduces economic trade between economic participants within a nation and that it discourages investment.

Case & Fair (1999) stated that taxes act as a type of trade barrier or tariff that causes economic participants to revert to less efficient means of satisfying their needs. As such, higher taxation leads to lower levels of

specialization, lower economic efficiency and output which can affect tax revenue. This idea is said to be illustrated by the Laffer curve.

Crucial to the operation of supply-side theory is the expansion of free trade and free movement of capital. It is argued that free capital movement, in addition to the classical reasoning of comparative advantage, frequently allows an economic expansion. Lowering tax barriers to trade provides to the domestic economy all the advantages that the international economy gets from lower tariff barriers.

Direct and Indirect taxation

One of the oldest controversies in tax theory involves the choice between direct and indirect taxation, in particular the issue of when differential commodity taxes are not a component of the optimal tax system. The early literature focused on the efficiency role of commodity taxes: under what circumstances would the Ramsey tax system applied to a given household consist of a uniform tax on commodities, or equivalently a tax on income? The famous Corlett and Hague (1953) Theorem settled that. If all goods are 'equally substitutable' for leisure, differential commodity taxes should not be used. Otherwise, goods that are more complementary with leisure should bear higher commodity tax rates. As explained by Sandmo (1976), a utility function in which goods are separable from leisure, and which is homothetic in goods satisfies this property. This result, although an important methodological innovation, is

of limited interest from a policy point of view since it abstracts from the redistributive role that the tax system plays.

Atkinson and Stiglitz (1976) posed a question of when differential commodity taxes should be used alongside a progressive income tax as part of a redistributive tax system and it was well addressed in the *Atkinson-Stiglitz* seminal paper which has spawned a substantial literature. Roughly speaking, the A-S Theorem states that if household utility functions are separable in goods and leisure, differential commodity taxes should not be used. This result is arguably the most relevant result for policy purposes to emerge from the optimal income tax literature initiated by Mirrlees (1971). It has been subjected to considerable scrutiny in literature, and special attention has been devoted to the circumstances in which it is violated and what it implies for the structure of commodity taxes. Interestingly, the analogue of the Corlett-Hague Theorem applies, albeit for different reasons. As shown by Edwards et al (1994) and Nava et al (1996), if weak separability is violated, higher tax rates should apply to goods that are relatively more complementary with leisure.

Taxation and Government Expenditure

Fiscal policy is the use of government expenditure and revenue collection to influence the economy. Fiscal policy can be contrasted with the other main type of macroeconomic policy, monetary policy, which attempts to stabilize the economy by controlling interest rates and the money supply. The two main instruments of fiscal policy are government

expenditure and taxation. However, changes in the level and composition of taxation and government spending can impact on the following variables in the economy:

- Aggregate demand and the level of economic activity;
- The pattern of resource allocation; and
- The distribution of income

Fiscal policy refers to the use of the government budget to influence these three: Economic activity, Economic effects of fiscal policy and fiscal straitjacket. These three possible stances of fiscal policy are neutral, expansionary and contractionary. In most countries where government spending is fully funded by tax revenue and hence the overall has budget outcome has a neutral effect on the level of economic activity. An expansionary stance of fiscal policy involves government spending exceeding tax revenue. A contractionary fiscal policy occurs when government spending is lower than tax revenue. However, these definitions can be misleading because, even with no changes in spending or tax laws at all, cyclical fluctuations of the economy can result in cyclical fluctuations of tax revenues and of some types of government spending, altering the deficit situation; but these are not considered to be policy changes. Therefore, for purposes of the above definitions, "government's spending" and "tax revenue" are normally replaced by "cyclically adjusted government spending" and "cyclically adjusted tax revenue". Thus, for instance, a government budget that is balanced over

the course of the business cycle is considered to represent a neutral fiscal policy stance.

Governments do spend money on a wide variety of things, from the military and police to services like education and healthcare, as well as transfer payments such as welfare benefits. This expenditure can be funded in a number of different ways, such as borrowing money from the population or from abroad, consumption of fiscal reserves and sale of fixed assets (e.g., land), benefit from printing money, etc. All of these except taxation are forms of deficit financing. Borrowing or fiscal deficit is often funded by issuing bonds, like treasury bills or consuls and gilt-edged securities. These pay interest, either for a fixed period or indefinitely. If the interest and capital repayments are too large, a nation may default on its debts, usually to foreign creditors. Consuming prior surpluses; a fiscal surplus is often saved for future use, and may be invested in local (same currency) financial instruments, until needed. When income from taxation or other sources falls during an economic slump, reserves allow spending to continue at the same rate without incurring additional debt.

Thus, economic effects of fiscal policy can be seen when governments use fiscal policy to influence the level of aggregate demand in the economy, in an effort to achieve economic objectives of price stability, full employment, and economic growth.

However, Keynesian economics suggests that increasing government spending and decreasing tax rates are the best ways to stimulate aggregate demand. It's normally used in times of recession or low economic activity as an essential tool for building the framework for strong economic growth and working towards full employment. Governments can use a budget surplus to do two things: to slow the pace of strong economic growth and to stabilize prices when inflation is too high. The Keynesian theorist posits that removing spending from the economy will reduce levels of aggregate demand and contract the economy, thus stabilising prices. Economists debate the effectiveness of fiscal stimulus. The argument mostly centres on crowding out, phenomena where government borrowing leads to higher interest rates that offset the stimulative impact of spending. When the government runs a budget deficit, funds will need to come from public borrowing (the issue of government bonds), overseas borrowing, or monetizing the debt. However, when governments fund a deficit with the issuing of government bonds, interest rates can increase across the market, because government borrowing creates higher demand for credit in the financial markets. This results in lower aggregate demand for goods and services, contrary to the objective of a fiscal stimulus.

However, while the Neoclassical economists generally emphasize crowding out, the Keynesians argue that fiscal policy can still be effective especially in a liquidity trap where, they argue, crowding out is minimal.

Most classical and neoclassical economists have argued that crowding out completely negates any fiscal stimulus “Treasury View” and this has been rejected by the Keynesian economics. This Treasury View refers to the theoretical positions of classical economists in the British Treasury, who opposed Keynes's call in the 1930s fiscal stimulus.

In view of the classicalist, expansionary fiscal policy also decreases net exports, which has a mitigating effect on national output and income. Foreign capital from foreign investors is attracted, when interest rates is increased through increase government borrowing. This is made possible because, all other things being equal, the bonds issued from a country executing expansionary fiscal policy now offer a higher rate of return. Thus, companies wanting to finance projects must compete with their government for capital so they offer higher rates of return. To purchase bonds originating from a certain country, foreign investors must obtain that country's currency. Hence, when foreign capital flows into the country undergoes fiscal expansion, demand for that country's currency increases. The increased demand results in the appreciation of that country’s currency. Once the currency appreciates, goods originating from that country now cost more to foreigners than they did before and foreign goods now cost less than they did before. Accordingly, exports decrease and imports increase. Other possible problems with fiscal stimulus include the time lag between the implementation of the policy and detectable

effects in the economy, and inflationary effects driven by increased demand.

Fiscal stimulus, in theory does not cause inflation when it uses resources that would have otherwise been idle. For example, if a fiscal stimulus employs a worker who otherwise would have been unemployed, there is no inflationary effect; however, if the stimulus employs a worker who otherwise would have had a job, the stimulus is increasing labour demand while labour supply remains fixed, leading to wage inflation and therefore price inflation.

Fiscal Straitjacket concept

Fiscal straitjacket is a general economic principle that suggests strict constraints on government spending and public sector borrowing, to limit or regulate the budget deficit over a time period.

According to Mundell (http://en.wikipedia.org/wiki/Supply-side_economics), "Fiscal discipline is a learned behaviour." To put it another way, eventually the unfavourable effects of running persistent budget deficits will force governments to reduce spending in line with their levels of revenue. This view is also promoted by Victor Canto. Thus, government need tax revenue to run its planned projects hence, tax revenue stimulate economic growth and development.

Estimating Technique of Tax Revenue

Most of the studies on the determinants of tax revenue used Gross Domestic Product (GDP) as the barometer in estimating tax revenue. Examples are the works of, Ole (1975), Asher (1989), Wawire (2000), Ariyo (1997), Murithi and Moyi (2003), Omoruyi (1983), and Wilford and Wilfrord (1978a and 1978b). In these studies the following model was used to estimate tax buoyancy.

$$T = e^{\alpha} y^{\beta} e^{e} \qquad \text{.....} \quad (3)$$

where

T = tax revenue

Y = income (GDP)

α = constant term

β = buoyancy coefficient

e = natural number

The double log version of equation (3) is estimated using OLS.

Sahota (1961) and Prest (1962) used the Proportional Adjustment Method to estimate tax revenue. This method was later used by Mansfield (1972) and Omoruyi (1983). The method involves isolating the data on discretionary revenue changes based on data provided by the government. The resulting data reflect only what the collections would have been if the base year structure had been in force throughout the sample period (Osoro,

1993). The adjusted method is then used to estimate equation (3) as shown below.

$$\ln T = \alpha_p + \beta_p \ln Y + \varepsilon_t \quad (4)$$

Where β_p provides an estimate of the Income elasticity of the pth tax.

Ariyo (1997) cited several shortcomings of the proportional adjustment method. To start with, data on revenue receipts directly and strictly attributable to discretionary changes in tax policy are not available. It relies on budget estimates for discretionary effects of tax revenue, which tends to differ substantially from the actual tax revenue collected. The approach assumes that the discretionary changes are as progressive as the underlying tax structure, hence it is contingent on the assumption that discretionary changes are more or less progressive than the tax structure they modify (Leuthold and N' Guessan, 1986 and Chipeta, 1998). Not all, the approach is highly aggregative.

Empirical Literature Review

The empirical findings have been mixed because of their sensitivity to the set of countries and the period of analysis. Majority of these studies employ cross section empirical methods and hence ignore the variation over time.

A number of empirical studies have exploited the determinants of tax effort in both developed and developing countries, and several factors have been identified. These include; the general level of development

(reflected in per capita income and levels of literacy, urbanization, communication, etc.), the administrative and political constraints on the fiscal system, social-political values, indigenous institutional arrangements, popular desires for government spending, plus other factors which condition overall willingness to pay taxes (Weiss 1969).

Eshag (1983) found out that in addition to the taxation potential of the individual countries, the taxation targets set by the authorities, and the ability of governments in practice to collect taxes, the actual amount of tax revenue collected depends on a number of other factors. More specifically, the literature below suggests some determinants of tax revenue:

Teera (2002), used time series data on Uganda to examine the determinants of tax revenue share in that country. He used the Augmented Dickey Fuller (ADF) and the Error Correction Model (ECM) and found that, there is a positive relationship between per capita income and total tax revenue as well as income taxes. This finding lends support to the hypothesis that, as countries develop tax bases develop more than proportionately to the growth in income.

Musgrave (1969) argued that lack of availability of 'tax handles' might limit revenue collection at low levels of income and these limitations should become less severe as the economy develops. Economic development is assumed to bring about both an increased demand for public expenditure and a larger supply of taxing capacity to meet such demands, Tanzi, (1987) as cited in (Musgrave, 1969).

Chelliah, (1971) also found that a higher per capita income reflecting a higher level of development is held to indicate a higher capacity to pay taxes as well as a greater capacity to levy and collect them. There is also the consideration that, as income grows countries generally become more urbanised. Urbanization thus brings about a greater demand for public services while at the same time facilitating tax collection.

What affects revenues (measured as the ratio tax revenues to GDP) has been the subject of a long debate. Before turning to the evidence, some studies have discussed the factors that are typically included in the specifications. Researchers have included several variables such as per capita GDP, the sectoral composition of output, the degree of trade and financial openness, the ratio of foreign aid to GDP, the ratio of overall debt to GDP, a measure for the informal economy, and institutional factors such as the degree of political stability and corruption as potential determinants of revenue performance.

Per capita income is a proxy for the overall development of the economy and is expected to be positively correlated with tax share as it is expected to be a good indicator of the overall level of economic development and sophistication of the economic structure. Moreover, according to Wagner's law, the demand for government services is income–elastic, so the share of goods and services provided by the government is expected to rise with income. The sectoral composition of output also matters because certain sectors of the economy are easier to

tax than others. For example, the agriculture sector may be difficult to tax, especially if it is dominated by a large number of subsistence farmers. On the other hand, a vibrant mining sector dominated by a few large firms can generate large taxable surpluses.

The degree of international trade measured by the share of exports and imports should also matter for revenue performance. Imports and exports are amenable to tax as they take place at specified locations. Furthermore, most developing countries shifted away from trade taxes in the 1990s, which was largely due to the widespread liberalisation of trade undertaken under the Uruguay Round. The effect of trade liberalisation on revenue mobilization may be ambiguous. If this liberalisation occurs primarily through reduction in tariffs then one expects losses in tariff revenue. On the other hand, Keen and Simone (2004) argued that, revenue may increase provided trade liberalisation occurs through tariffication of quotas, eliminations of exemptions, reduction in tariff peaks and improvement in customs procedure.

Rodrik (1998) also points out that there is a strong positive correlation between trade openness and the size of the government, as societies seem to demand (and receive) an expanded role for the government in providing social insurance in more open economies subject to external risks.

The degree of external indebtedness of a country may affect revenue performance as well. To generate the necessary foreign exchange

to service the debt, a country may choose to reduce imports. In such a scenario, import taxes will be lower. Alternatively, the country may choose to increase import tariffs or other taxes with a view to generate a primary budget surplus to service the debt.

Foreign aid has also been identified as a factor that may affect revenue performance. A key distinction appears to be whether the aid is used productively or simply to finance current consumption expenditures. Moreover, the composition of aid has an important effect on revenue performance. For example, Gupta et al. (2004) find that concessional loans are associated with higher domestic revenue mobilization, while grants have the opposite effect.

Lotz and Morss (1967) find that per capita income and trade share are determinants of the tax share, and this finding has been replicated since (e.g., see Piancastelli (2001)). Chelliah (1971) relates the tax share to explanatory variables such as mining share, non-mineral export ratio and agriculture share. Several studies, including Chelliah, Baas and Kelly (1975); and Tait, Grätz and Eichengreen (1979), update Chelliah (1971) obtained similar results.

Tanzi (1992) finds that half of the variation in the tax ratio is explained by per capita income, import share, agriculture share and foreign debt share. Recently, some studies have looked at the importance of institutional factors in determining revenue performance. For example, Bird, Martinez-Vasquez and Torgler (2004) find factors such as

corruption, rule of law, and entry regulations play key roles in determining tax revenue.

Several regional studies have looked into determinants of resource mobilization. For sub-Saharan African countries, Tanzi (1981) finds that mining and non-mineral export share positively affect the tax ratio.

Focusing on the same region, Leuthold (1991) uses panel data to find a positive impact from trade share, but a negative one from the share of agriculture. In a similar study, Stotsky and WoldeMariam (1997) find that both agriculture and mining share are negatively related to the tax ratio, while export share and per capita income have a positive effect. They also find a positive but weak link between IMF programs and tax share.

Ghura (1998) concludes that the tax ratio rises with income and degree of openness, and falls with the share of agriculture in GDP. He also finds that other factors like corruption, structural reforms and human capital development affect the tax ratio. While a rise in corruption is linked with a decline in tax ratio, structural reforms and an increase in the level of human capital is associated with an increase in tax ratio.

Gupta (2007) used a panel dataset that covers 105 developing countries over 25 years. His variable of interest was central government revenue (excluding grants) as a percentage of GDP, and is taken from Government Financial Statistics (GFS) and WEO Economic Trends in Africa (WETA). Among the explanatory variables, that were used

included structural variables such as per capita GDP, share of agriculture in GDP, share of manufacturing in GDP, share of imports in GDP, ratio of debt and aid to GDP. Their sources were primarily the International Financial Statistics (IFS) and World Development Indicators (WDI). His outcome on revenue performance of a large set of developing countries over the past 25 years was that, that several structural factors like per capita GDP, share of agriculture in GDP and trade openness were statistically significant and strong determinants of revenue performance.

In a study of Arab countries, Eltony (2002) observes that mining share has a negative impact on the tax ratio for oil exporting countries, but a positive impact for non-oil exporting countries. He used pooled time-series and cross-sectional country data for the 1994-2000 time periods for 16 Arab countries. To summarise, most studies found that per capita GDP and degree of openness was positively related to revenue performance, but a higher agriculture share lowers it. The effect of mining share and revenue performance was ambiguous.

Chipeta (1998) evaluated effects of tax reform on tax yields in Malawi for the period 1970 to 1994. The results indicated buoyancy of 0.95 and an elasticity of 0.6. The study concluded that tax bases had grown less rapidly than GDP.

Kusi (1998) studied tax reform and revenue productivity of Ghana for the period 1970 to 1993. Results showed a pre- reform buoyancy of 0.72 and elasticity of 0.71 for the period 1970 to 1982. The study

concluded that the reforms had contributed significantly to tax revenue productivity from 1983 to 1993.

Njoroge (1993) found that the overall elasticity was 0.86 while buoyancy was1.00. The study concluded that from a revenue point of view, the system did not meet its target, hence required constant review as the structure of the economy changes. However, the results could not be relied upon as the study never took into account time series properties of the data.

Ariyo (1997) evaluated the productivity of the Nigerian tax system for the period 1970 -1990. The aim was to devise a reasonable accurate estimation of Nigeria's sustainable revenue profile. In the study, tax buoyancy and tax revenue elasticity were estimated. The slope dummy equation was used for the oil boom and SAPs. It was found that on the overall productivity level was satisfactory. However, the results indicated wide variations in the level of tax revenue by tax source. The variations were attributed to the laxity in administration of non-oil tax sources during the oil boom periods. The study further asserted that, there was the need to improve the tax information system to enhance the evaluation of its performance and facilitate adequate macro-economic planning and implementation.

Khattry and Rao (2002) looked at the effects of trade liberalisation on tax revenue/GDP ratios using a group of 80 developing and industrialized countries over 1970-98, and found that both low-income and

upper middle-income countries have experienced declines in total tax revenues, which was attributed to falling both income and trade tax revenues since the onset of trade liberalization. It is argued that structural characteristics associated with these developing countries have limited their ability to make the transition from trade to domestic taxes. In addition, they also find that the scale of the economy, the level of urbanization, and their trade measure have a positive effect on total tax revenues.

In a paper, Agbeyegbe *et. al.* (2004) examined a panel of 22 Sub-Saharan countries over the 1980-1996 period and found evidence that the relationship between trade liberalization and tax revenue is sensitive to the measure used to proxy trade liberalisation, and while the traditional measure of trade liberalisation is not strongly linked to aggregate tax revenue or its main components in general, the collected-tariff liberalization measure is linked to higher income tax revenue. The only determinant of total tax revenue that was consistently found significant for both measures of openness was inflation, and it was negatively related to tax revenues.

Adam, Bevan and Chambas (2001) also examined the relationship between tax revenue, exchange rates, and trade openness in Sub-Saharan Africa and find that openness raises overall tax revenue in CFA Franc zone countries while it has little effect in countries outside the zone. They concluded that the poor tax revenue performance in the CFA countries in

the 1970-96 period reflected mainly differences in environmental and structural factors and to different responses to changes in the equilibrium real exchange rate, but that misalignments of the exchange rate also played a role.

Fierro and Reisen (1990) looked at the variety of channels through which devaluation of the exchange rate impacts on real tax receipts. Their paper seems to be the first attempt towards empirical evidence. It establishes the causal relationships between the real exchange rate and real tax receipts. A causality test rejects the hypothesis of unidirectional causality running from taxes to the exchange rate. The causal inferences from the Sims test allow the use of the real exchange rate as an exogenous determinant in a simple simultaneous equation model. Their model endogenises tax yields and tax bases to allow for a test of the significance and relevance of the exchange rate to explain variations in real tax receipts. An important insight results from the distinction of the direct (price) effect and indirect (output) effect of changes in the real exchange rate on tax receipts. A double-logarithmic version of the model with (seasonally adjusted) quarterly data was estimated for Korea. Inflation effects were also found to be uniformly negative and relatively significant across all types of tax revenues. But as liberalisation policies usually occur together with exchange rate movements, liberalisation also has an effect on tax revenue through such fluctuations.

Tanzi (1989) observed that, there is often an inverse relationship between a country's tax revenues and the real level of its official exchange rate, and argues that overvaluation has a direct effect by suppressing import and export bases measured in domestic currency terms, thus reducing the collection of international trade, sales, and excise taxes. His work was on panel data.

Diego (2006) examined the effect of foreign direct investment (FDI) on tax revenue performance for a group of Latin American countries in the period 1980-2000. His study showed that FDI exerts a significant positive effect on central government tax revenues, which is channelled through its effect on the most important component of tax revenues, the taxes on goods and services. This gives support to the economic policies enforced in Latin America for the last decades in order to spur economic growth, as it is now empirically demonstrated that the larger flows of FDI into the region do not only contribute to improvements of real GDP per capita growth rates, but it also contributes to the better performance of a factor that perhaps is more relevant to domestic standards of living, from the perspective of the inhabitants of a country. This positive effect of FDI on tax revenues is especially important for less developed economies, as it is shown that its effect is even greater than the overall effect for these economies, but very small for the more developed countries. Furthermore, while theoretical analyses suggest 25 that the later period of the sample could be expected to exert a greater influence on tax revenues, it was

found that, there was not any statistically different effect between these two periods. While these results could induce developing countries to intensify the promotion of FDI through enhanced incentives, the importance of the structural changes emanating from the disappointing 1980s should also be taken into consideration, as well as the repercussion of higher competition in terms of cost.

Fiscal Deficits and Debt

Tanzi, (1987) found that the growth of public spending has generated large fiscal deficits in many countries, leading to increases in the share of public debt relative to GDP. With these large debts, governments need to raise the revenues necessary to service it. However, when the interest on the debt exceeds net borrowing plus the possible reduction in non-interest expenditure, the level of taxation will go up unless the rate of growth of the economy is high enough to neutralize the increase. Therefore public debt plays a role in determining the extent to which countries may take advantage of their taxable capacity. However, a high debt burden can also create macroeconomic imbalances that may tend to reduce the tax level.

In general, however, on balance, a high debt burden would tend to raise the tax level, *ceteris paribus* (Tanzi, 1992). On the other hand, countries faced with an increased trade deficit may try to restrict imports as an alternative to exchange rate adjustment irrespective of the source of

the trade imbalance. This will reduce revenue from import duties, Hinrichs (1965).

Tanzi & Blejer (1988) used per capita income as a measure of development, for an explanation of the relationship between fiscal deficits and public debt.

Openness

This refers to a country volume of exports and imports expressed over its Gross Domestic Product (GDP). It shows how a country is opened to international trade. This section considers the impact of openness on tax revenue.

According to Seade (1990), the relative size of the overseas sector, which is a measure of openness, reflects the degree of exposure of an economy to external economic influences. Hence in the presence of inward capital flows, the overall level of activity in the economy is artificially and or temporarily increased through foreign borrowing and so is the aggregate tax base. As a consequence, tax revenues become artificially buoyant and volatile.

Linn and Weitzel (1990) stated that, certain features of overseas trade make it more amenable to taxation than domestic activities, and in developing countries, the overseas trade sector is typically the most monetized sector of the economy. The administrative ease with which

trade taxes can be collected makes them an attractive source of government revenue when administrative capabilities are scarce.

Taxation and Trade Liberalization

According to September 2004 ATPC work in progress project paper of the Economic Commission for Africa (ECA), it was identified that trade liberalization (openness) was a potential source of fiscal instability for African countries because of their high dependence on trade taxes for public revenue. Taxes on international trade are important in Africa because when tax administration is inefficient governments tend to concentrate on easy to collect taxes such as trade taxes. In Africa as a whole international trade taxes generated on average 28.2 % of total current revenues over the last decade; for sub-Saharan Africa the share went up to 30.5 %. This compares to 0.8 % for high-income Organisation for Economic Cooperation and Development (OECD) countries, 18.42 % for lower medium-income countries, and 22.5 % for low income countries. Over the late 1990s trade tax revenues as a percentage of GDP declined. An important policy issue is how countries should react to falls in revenue as tariffs are cut. This is critical for African countries because they have already carried out considerable liberalization of their trade regimes. Negative fiscal impacts emerge at later stages of liberalisation: the boost to revenues from higher trade volumes as a result of tariff cuts is insufficient to outweigh the revenue-damping effect of the tax reduction.

For the case of Ghana, the period between 1995 and 2002, the index of trade restriction declined from 8.0 % to around 2.5 %. Helped by favourable trend in international prices and the terms of trade, trade as a percentage of GDP doubled between 1995 and 2002.

International trade tax revenues went up between 1995 and 1998 as trade volumes, clearly compressed in the pre-liberalization regime, and began to grow. Thus, the expansion of the tax-base was initially sufficiently strong to more than offset the effect of lower tax rates. During the period, total tax revenues in percent of GDP and in percent of government revenues also increased, whilst the reliance on non-tax revenues fell from 28 % to about 14 percent. Despite this, the deficit increased. Trade liberalization began to have a negative impact on trade tax revenues in the late 1990s. Between 1998 and 2002 they fell by 45 %. This calls for the need to find the determinants of tax revenue and to make policy recommendations to policy makers.

It is argues that, FDI increases government revenues through taxes paid by corporations, their employees, and the purchasers of products and services. This view is shared by many of the leading economic and political scholars, and is based on the theoretical idea that higher levels of economic activity generate higher levels of production, and consequently higher levels of government revenue.

Consequently, while governments implement tax policies to raise revenues for their public sector, correct market distortions, provide

protection for their local industry, improve the terms of trade by favourably affecting world market prices, and to improve the distribution of income at home, all geared to maximize social welfare, the conditions under which FDI is attracted influences the collection of tax revenues. In Ghana, Foreign Direct Investment in some sectors of the economy has tax exemptions ranging from 5 years to 10 years. That is why quantifying the magnitude of the hypothesized effect of FDI on government tax revenues and understanding the channels through which FDI affects total tax revenue becomes necessary.

Share of Aid in GNP

Aid and grants have been a major source of development finance for the majority of developing countries over the past few decades. Empirical literature has tended to evaluate the impact of aid by including it as a variable in a regression for the determinants of some economic performance indicator, emanating from the general concern that it might have a negative impact on some of such indicators. For instance, there is a general concern that aid may decrease taxation revenue in recipient countries. In fact, results in Franco-Rodriguez, Morrissey, and McGillivray (1998) showed that, with 1 rupee change in aid money disbursed resulted into a –2.91 rupee change in taxation.

Population Density

According to the work of Teera (2002), population density is expected to have an adverse effect on the tax ratio, mainly because the higher the density of population the higher will be the use of taxable sources (i.e. rising the tax base), and the tax authorities could intensify their efforts to collect taxes at a relatively minimal cost as compared to a sparsely populated country. Conversely, in a thinly populated area, administrative costs are expected to be higher in terms of total yields and therefore, less encouraging for collection of tax revenues. I see some flaw in this analysis because population should be backed with economic activity for tax revenue to increase.

Tanzi, (1989), servicing of the foreign debt requires a trade account surplus, which in turn may require a reduction in imports. This affects revenue given the high dependence of the tax system on the external sector. That is, it may be indicative of reluctance to tax. In such a situation, the degree of tax evasion and tax avoidance may also be relatively higher than in the densely populated area.

Share of Agriculture in GDP

Agriculture is considered to be a salient feature regarding the structure of the economy and as Tanzi (1992) asserts, a country's economic structure is one of the factors that could be expected to influence the level of taxation. For many developing countries like Ghana, the share

of agriculture may be an important influence on the tax share, from both the demand and supply point of view. On the supply side, it is very difficult to tax the agricultural sector explicitly, though it is often very heavily taxed in many implicit ways such as; import quotas, tariffs, controlled prices for output, or overvalued exchange rates. On the other hand, small farmers are notoriously difficult to tax and a large share of agriculture is normally subsistence, which does not generate large taxable surpluses, as many countries are unwilling to tax the main foods that are used for subsistence (Stotsky & Wolde Mariam, 1997). On the demand side, since many public sector activities are largely city-oriented, it may be assumed that the more agricultural a country is, the less it will have to spend for governmental activities and services. Hence as the share of agriculture in GDP rises, the need for total public spending and so for tax revenue may fall.

Share of Manufacturing in GDP

Manufacturing enterprises are easier to tax than agricultural enterprises since business owners typically keep better books of accounts and records. Manufacturing can generate larger surpluses if production is efficient. Therefore the variable is positively related to the tax ratio. As the level of manufacturing goes up tax revenue will also increase.

Foreign Direct Investment (FDI) brings in capital for economic growth and development. Corperate taxes and Pay As You Earn (PAYE)

taxes can be obtained from FDI. While there is an increasing movement of capital around the world, a noteworthy shift in the components of international capital flows has occurred in Latin America. Aggregate FDI inflows to Latin America and the Caribbean have reached record levels in the past decade, jumping from $6.1 billion in 1980 to $7.8 billion in 1990 and to a remarkable $76.9 billion in 2000 (ECLAC), with the major recipients in the region being Brazil, Mexico, and Argentina, accounting for around 60 percent of total flows.

The perceived importance of FDI on economic growth is probably best described by the quote from the United Nations Conference on Development in Monterrey, Mexico, posted in the Business Roundtable's1 web page: "Private international capital flows, particularly foreign direct investment are vital complements to national and international development efforts. Foreign direct investment contributes toward financing sustained economic growth over the long term. It is especially important for its potential to transfer knowledge and technology, create jobs, boost overall productivity, enhance competitiveness and entrepreneurship, and ultimately eradicate poverty through economic growth and development".

They cite further emphasizes in the concrete ways in which FDI stimulates global economic growth, highlighting that "FDI creates jobs and improves worker's wages," "stimulates competitive markets," and "contributes to growth in government revenues." It argues that FDI

increases government revenues through taxes paid by corporations, their employees, and the purchasers of products and services. This view is shared by many of the leading economic and political scholars, and is based on the theoretical idea that higher levels of economic activity generate higher levels of production, and consequently higher levels of government revenue.

History of Taxation

Paying taxes, and avoiding paying taxes, is an act older than the pyramids. The earliest cuneiform samples of Mesopotamia circa 2500 BC document the relevant poll tax and the types of tolls and fees that merchants had to pay when transporting goods from one region to another.

The law codes of Hammurabi, made famous in the Old Testament, deal with the penalties for smuggling to avoid paying tax as well as the punishments of citizens trying to avoid the obligatory government service. This form of tax could take the form of hard labour on civil projects such as digging a canal or, at worst, military service. Although technically illegal, sending a hired surrogate to fulfil this obligation was a thriving trade in this ancient society, perhaps making getting out of paying your tax the world's third oldest profession.

Tax shelters have been documented as early as the fourth dynasty in the Old Kingdom of Egypt (2625-2500 B.C.E). The staff and the property of sacred temples, which were often funded through tax revenues,

appeared to have been successful in gaining an exemption from paying taxes or compulsory labour. The tax collector truly became a villain in the Roman Empire, when the function was given over to ruthless profiteers who employed gangs of thugs to ensure the colonials had rendered Caesar his due. By the time of the New Testament being written, tax collectors were considered to be amongst the lower professions. However Paul does put a divine induction on tax season saying in Romans 13:5 "This is also why you pay taxes, for the authorities are God's servants, who give their full time to governing." Implying the governor needs tax revenue to take care of itself and to meet the social welfare of his citizenry.

In more modern times, as governments became more adept at collecting taxes, the revenue accrued increased dramatically. Unfortunately for the taxpayer, so did expenditure. As wars became more common and more expensive, the tax burden increased. Studies have confirmed that the tax burden of the eighteenth and early nineteenth centuries increased by 85% in England. No surprise then that this period gave rise to the first calls for what we know as Progressive Taxation. Adam Smith, in Wealth of Nations, wrote "It is not very unreasonable that the rich should contribute to the public expense, not only in proportion to their revenue, but something more than in that proportion." The cry "No Taxation without Representation" was the shout heard around the world, the spark that ignited the American Revolution. The Declaration of the Rights of Man has this to say about taxation: "A common contribution is

essential for the maintenance of the public forces and for the cost of administration. This should be equitably distributed among all the citizens in proportion to their means."

Overview of Taxation in Ghana

Ghana's history of taxation can be traced backed to the British colonial days when Ghana was called Gold Coast. Poll tax was first introduced by the British to administer their colony in the year 1852, and this lived for only a year due to stiff opposition from the indigenes. In 1855, the first Customs law was passed and later replaced by the Customs Acts in 1876. By 1931, Governor, Ransford Slater introduced Income taxation into Gold Coast which was also resisted by the indigenes. In 1943, Sir Allan Burns made on attempt to address the Gold Coast Council to introduce income tax legislature in February 1943. This was finally accepted and passed into law in September 1943. It became known as Tax Ordinance number 27 of 1943. This tax instrument was used to collect tax revenue from that period through to Ghana's Independence in March 1957 to 1963. The Institution responsible for tax collection at that period was known as Income Tax Department. In 1963, the Income Tax Department was made to undergo some institutional reforms and later known as Central Revenue Department. This department was responsible for collecting all forms of taxes. Some of taxes collected included income tax, consumption tax, corporate tax, capital gains tax, property tax, sales tax,

inheritance tax, Value added tax, excise tax, poll tax tariffs, tolls and transfer tax. This department was also seen as not being able to achieve its purpose of establishment so, it also went through some reforms to separate it from the Civil Service and had its operational autonomy in 1985.

Two practical steps were taken in Ghana in 1985 to strengthen revenue administration in the country. These were the establishment of the National Revenue Secretariat (NRS) and the creation of the two major revenue organizations. Customs, Excise and Preventive Service (CEPS) and it was responsible for collecting Imports and Excise Duties while Internal Revenue Service (IRS) was given the mandate to collect Income Tax, Stamps Duty, Gift Tax, Petroleum and Mineral Royalties tax. As part of the reforms, these two Institutions were given organization and Management Structures to follow so that, they will be efficient in their day to day operations. Each of these institutions had a board of directors consisting of a chairman and six other persons appointed by the government, a Commissioner, a Controller and Accountant General. Their corporate mission is to ensure effective Assessment and optimum collection of all taxes and penalties due to the state under the relevant tax laws administered by their institution.

They were to make recommendations to the Ministry of Finance on tax Policy, tax reforms, tax legislation, tax treaties and exemptions as may be required from time to time. To make tax administration more effective

the Value Added Tax was established in 1995, to take care of Consumption tax and Service tax. This had a stiff opposition from the minority Political Parties and most of the Ghanaian population. As a result, its introduction was suspended for about three years. During this three (3) year period, there was massive tax education on its usefulness and later, re-introduced in 1998.

The Implementation of VAT Service is expected to promote the self – assessment culture because the design of VAT administration is based on the basic concept of the taxpayer raising his own assessment at the end of each month. This will be followed by examination of financial returns to be carried out by tax officials on taxpayers to ensure tax compliance. In the year 2001, these three Revenue Institution came under one supervisory body known as the Revenue Agency Governing Board (RAGB) to coordinate the activities of the revenue agencies to enhance their output. In the year 2009, the revenue institutions were restructured. VAT service and IRS have been merged as one institution to take care of Domestic taxes while CEPS takes care of External taxes. These institutions have come under one name known as, Ghana Revenue Authority (GRA) and it is managed by a commissioner general. Ghana Revenue Authority, as a modern revenue authority, focuses on functional revenue administration and improved customer service delivery.

Overview of the Ghanaian Economy

Ghana is well endowed with natural resources, such as gold, timber, industrial diamonds, bauxite, manganese, fish, rubber, hydropower, petroleum, silver, salt, and limestone. It has a population of about 23 million people and Gross National Income of US $590 and GDP growth of 6.3% (WDI 2009). Ghana has approximately twice the per capita output of the poorest in per-Capita GDP terms countries (on a Per-Capita GDP basis) in West Africa. The domestic economy perpetuates to revolve around Agriculture, fisheries and farming, which accounts for approximately 35 per cent of Gross Domestic Product (GDP) and employs approximately 55 per cent of the labour-force, mainly small landholders.

Even so, Ghana remains heavily dependent on international financial and technical aid. Gold and cocoa production, individual remittance inflows are serious sources of foreign currency exchange. Ghana signed a Millennium Challenge Corporation (MCC) Compact in 2006, which aims to assist in transforming Ghana's agricultural, agrarian, fisheries and farming sector. Ghana opted for public debt relief under the Heavily Indebted Poor country (HIPC) program in 2002, and is also benefiting from the Multilateral Debt Relief. The governance of Ghana requires tax revenue to carry out public sector expenditure.

Financial Deepening

Financial deepening refers to the availability of financial services or products in an economy. It can also be refer to as increased provision of financial services with a wider choice of services geared to all levels of society. Liberalization of financial services will have some impact on tax revenue. Tax revenue emanating from financial deepening can reduce revenue volatility by increasing the private sector's ability to smooth its income in response to shocks, it can also increase revenue volatility because financial sector income tends to be more volatile than that of other sectors, as is the case for example in Hong Kong (Porter, 2007). This can complicate the conduct of fiscal policy. Another issue is the VAT treatment of financial services, where the appropriate solution to the complications resulting from the bundling of intermediation and services (e.g., asset management) remains a subject of debate. Most countries exempt financial services from Value Added Tax (VAT) and this has its effect on tax revenue, but recently some countries (e.g., New Zealand, Singapore) switched to zero-rating so that financial institutions can claim VAT credits for inputs (Zee, 2004). However, the revenue impact of this alternative VAT treatment of financial services is unclear. Also, the relative taxation of equity and debt is being revisited, with Germany recently limiting the tax deductibility of interest.

One of the independent variable to be examined is financial deepening and as such, one has to examine the effect of this variable on

tax revenue in Ghana. Ghana began its financial sector reform in the late 1980's as part of a comprehensive macroeconomic adjustment program with the support of the International Monetary Fund (IMF) and World Bank. The Ghanaian experience with fiscal performance in the 1970–1982 was very disappointing. During this period, macroeconomic analyses and projections were not exhaustively undertaken to provide a base for effective and consistent fiscal policy formulation. Instead, fiscal policy measures were taken on an ad hoc basis, uncoordinated, and haphazardly implemented, leading to a severe deterioration in the country's public finances. A rapid growth in government expenditure accompanied by a relatively low growth in revenue resulted in persistent budgetary deficits financed mainly by the banking system. Consequently, the money supply rose sharply, causing rapid growth in the inflation rate and an increasingly over-valued exchange rate.These challenges necessitated the Financial Sector Adjustment Program (FINSAP) which aimed at restructuring of distressed banks and cleaning up non-performing assets to restore banks to profitable levels.

Also, the reform aimed at moving the Ghanaian financial sector from an era of financial repression towards one of financial liberalization. This called for the removal of interest rate ceilings, abolishing of directed credit controls, restructuring of seven financially distressed banks, improving the regulatory and supervisory framework, privatization of

banks development of money and capital markets, and the move towards indirect and market determined instruments of monetary policy.

Maximum and minimum deposit interest rates were abolished in September 1987 (minimum saving deposit rate was temporally maintained at 12%). All sectoral credit allocations were phased out. Interest rate controls were gradually relaxed and full liberalization was achieved in February 1988. In November 1990, the Bank of Ghana liberalized all bank charges and fees. A foreign exchange auction was introduced in 1986 which was followed by the permission to establish forex bureaus in 1988.

During this same period there was also tax reform which involved broadening the tax base and cutting marginal tax rates. The aim was to sharpen incentives and improve horizontal equity. This study therefore seeks to examine the impact of Ghana's financial deepening on tax revenue. Financial deepening is measured in this work as the ratio of money supply to Gross Domestic Product (GDP).

Foreign Aid in Ghana

Foreign aid was quite insignificant during the immediate post independence years due to the presence of substantial foreign reserves bequeathed to the country by the British colonial masters and the suspicion that Nkrumah had for likely donors (Harrigan and Younger, 2000). Official Development Assistance (ODA) per capita (1987 constant US dollars) in 1960 was $1.44, rising to $8.55 in 1964. Nkrumah's

government's interest in foreign aid was aroused after the 1965 balance of payments crisis that resulted from the falling primary commodity prices on the international market. The National Liberation Council (NLC) that took over the leadership mantle after the overthrow of Nkrumah decided to approach the IMF for support in the face of mounting external debt. Thus, ODA per capita rose from US$18.73 in 1965 to US$24.28 in 1969. ODA as a proportion of GDP rose from 0.002 in 1960 to 0.036 in 1969: a level, which was above the ODA-GDP ratios for Sub-Saharan Africa and low-income developing countries (Harrigan and Younger, 2000; Bawumia, 2005).

The increasing trend of ODA in the 1960s was reversed during the first half of the 1970s. In fact, ODA per capita reached its lowest level (US$7.43) in a decade in 1974 when the ruling National Redemption Council (NRC) decided to repudiate some of Ghana's commercial debts on the grounds that they were contracted improperly. During the second half of the 1970s, however, aid inflows increased, with per capita ODA rising to US$20.93 in 1979. Multilateral aid constituted a significant component of the external inflows of this time. However, for the period 1960-1981, bilateral aid constituted over 50% of total external inflows. By 1980, total external debt rose to US$1,404 million creating debt-servicing problems. By 1983, ODA per capita declined to US$9.35 due principally to the political turmoil and collapse of social and public sector institutions during the early part of PNDC rule.

The launch and implementation of the Economic Recovery Program (ERP) received the blessings of the multilateral institutions and later of bilateral donors. Consequently, there was enormous injection of foreign aid into the Ghanaian economy. The ODA per capita increased from US$17.22 in 1984 to US$ 49.79 in 1991. There was a hold-up in the disbursement of aid in 1992 due to slippage on economic reforms emanating from the democratization process of the time. However, since 1992, ODA per capita has been hovering around US$30. The ODA-GDP ratio reached a peak of 13.7% in 1989. An interesting feature of external inflows during the post ERP era of 1983-1992 is that, on average, over 50% of total external inflows came from multilateral sources notably the IMF and the World Bank. However, private flows to Ghana are not significant. For instance, portfolio equity flows were completely absent until 1990 when the Ghana Stock Exchange was established. In terms of portfolio loans, both the private and public sectors were not prepared to access the international capital market. The only form of private capital flows to Ghana for the period 1984-2004 was the short-term commercial flows. Economic literature had it that, countries that rely heavily on aid have low domestic revenue generation.

Gupta et al. (2004) looked at the impact of foreign aid on revenue performance, especially for low-income countries, recommends increased aid to these countries. In this context, the rich donor countries' pledge, "to make concrete efforts towards the target of 0.7 percent of their GNP in

international aid", could be a step in the right direction. As pointed out by donor countries should monitor the aid flow and ensure that it is used for poverty reduction and infrastructure development, which would generate higher revenue in the future.

The existing theories have shown that tax revenue is the backbone of every economy. It is the catalyst for economic growth and development. It is through tax revenue that most of the nation's infrastructure is carried out. The above review documents some of the existing literature in this area and provides some insight into the factors that affect government revenues.

To summarize, most studies find that per capita GDP and degree of openness is positively related to revenue performance, but a higher agriculture share lowers it. The effect of mining share and revenue performance is ambiguous. Studies such as Tanzi (1991) and Eltony (2002) found that foreign debt is positively related to resource mobilization. However, this review demonstrates that, existing literature on Ghana's tax revenue determinants is virtually none existing. More so, a very important variable like the government expenditure was not considered in the model used to establish the determinant of tax revenue, hence the need for this study.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter looks at the methods that are adopted to achieve the objective of this study. The chapter basically focuses on how the entire study was done. Issues such as model specification, data sources, estimations procedures, definitions of variables and justification for the inclusion of variables are covered by the chapter. The study is a modification of Teera (2002**)** approach, who used time series data for Uganda during 1970-2000 to analyse the determinants of tax revenue share in Uganda.

Model Specification

Specification of a tax effort model requires judgment in deciding which formulation presents the best combination of economic reasoning and statistical merit. As Chelliah (1971) asserts, the assessment of actual and potential tax performance of any country is a matter of judgment that should be based on a consideration of the stage of development and structure of the economy and should also take account of national traditions and relevant special circumstances. By adopting the model used

by Teera (2002), he estimated a model in which tax revenue was functionally related to economic development and structure of the economy. $T_y = f(Y,M,A,P,A_g,Mf,D,\theta,T)$ Where; Ty = Tax to GDP ratio,

Y = GDP per capita, in international dollars, M = the ratio of imports to GDP

A = the ratio of aid to GNP, P = population, Ag = the ratio of agriculture to GDP

Mf = the ratio of manufacturing to GDP, D = the ratio of external debt to GDP, θ = shadow variable proxying the size of the hidden economy and

T = time trend

The role of the time trend is to capture any exogenous underlying trend in taxation. The shadow variable reflects tax evasion. It is derived by assuming predictable cash to GDP ratio. A higher than expected ratio is indicative of an above average hidden economy, since relative changes in currency holdings are interpreted as reflecting volume movements in the hidden economy activity (Maliyankono & Bagachwa 1990). Therefore an increase in the amount of cash held by the public can be interpreted as an indication of a rise in the hidden economy transactions, which use currency to escape detection.

The specification of econometric model considers the relevant influential variables discussed previously, and presents a slight deviation from the existing literature. The reason being that, Teera (2002) looked at the variables in relation to GDP ratio which is not so in this work. Besides

that, availability of data for his variables were disjointed for this work and this accounted for the selection of these macroeconomic variables (tax revenue, government expenditure, financial deepening, and Real gross domestic product). After the 1984 economic reform of Ghana, these macroeconomic variables have been of concern to the government.

Hence, the estimated econometric model is given by:

$$T = \alpha_0 + \beta_1 GOV + \beta_2 FID_t + \beta_3 RGDP_t + \varepsilon_t \quad (5)$$

Where;

TR…….....Tax Revenue

FID……Financial Deepening

RGDP…….....Real Gross Domestic Product

GOV……....Government Expenditure

Justification of the Inclusion of the Variables

Tax revenue (TR)

Tax revenue used in the econometric model refers to taxes collected by the Ghana Revenue Authority that is used to finance government expenditure. That is, total revenue collected by the Ghana revenue Authority. It follows the work of Gupta (2007) on the "determinants of tax revenue efforts in developing countries" Issues 2007-2184. It brings to bear the need for developing countries to maximize tax revenue to finance government expenditure hence, its inclusion in the model.

Government Expenditure (GOV)

Government expenditure requires funding and one of the sources of government funding is tax revenue. A large literature on the subject of growth in government spending has mainly focused on the factors that have led to growth. However, the case of developing countries, the causal relationship between tax revenue and government expenditure as well as its contribution to tax revenue has not been widely explored. It is measured by the sum of all government expenditure including transfers. Therefore the study is interested in how government expenditure impacts on tax revenue hence its inclusion in the model.

Financial Deepening (FID)

Financial deepening generally means an increased ratio of money supply to GDP or some price index. It is a term widely used by economic development experts when discussing financial liberalization. Development economist also looks at the macro effects of financial deepening on the larger economy. It refers to liquid money. The more liquid money is available in an economy, the more opportunities exist for continued growth. Financial Deepening is measured in this work as the ratio of money supply to Gross Domestic Product (GDP).

It can also play an important role in reducing risk and vulnerability for disadvantaged groups, and increasing the ability of individuals and households to access basic services like health and education, thus having a more direct impact on poverty reduction.

Economists have long held the view that the development of the financial system (financial deepening) and economic development are closely intertwined. The impact of taxation on financial deepening increases significantly with the tax rate, as shown by cross-sectional and time series data for selected countries in Sub-Saharan Africa and Asia.

As the financial sector of the economy becomes more liberalized it is expected that tax revenue will also increase. Hence, inclusion of financial deepening in the model to find its impact on tax revenue.

Real Gross Domestic Product (RGDP)

It is an inflation adjusted measure that reflects the value of all goods and services produced in a given year, expressed in base- year prices or constant prices. Unlike nominal Gross Domestic Product (GDP), real GDP can account for changes in the price level, and provide a more accurate figure for economic analysis.

An increase in Real Gross Domestic can increase the taxable capacity of a country's tax revenue through a larger share of the private sector's resources ceded to the government as taxes to provide public goods and services. Hence, its inclusion in the model to find its impact on tax revenue.

Data

The data for this study is secondary data which are obtained from the World Development Indicators (WDI), Ghana Revenue Authority and Ministry of Finance, Ghana. Quarterly Time Series data on these selected macroeconomic variables; Real Gross Domestic Product (GDP), Government expenditure, and financial deepening (FID), are included in the model to ascertain its impact on tax revenue. Due to the difficulty in obtaining data, the period selected for the study will be from 1988 to 2008.

Estimation Procedures

Unit Root Test

Unit Root test was conducted to ascertain the stationarity of the data set using the Augmented Dicky Fuller (ADF) test. It is crucial to test for the statistical properties of variables when dealing with time series data. Regression involving non stationary time series often lead to the problem of spurious regression. This occurs when the regression results reveals a high and significant relationship among variables when in fact none exist.

Time series data are noted of carrying past memories. This implies that past events do influence current and future events. For example, knowing something about the tax revenue from last quarter can tell you the likely range of tax revenue for the current quarter. Most

macroeconomic time series data are trended and in most cases are non stationary.

Stock and Watson (1989) have also shown that the usual test statistics (t, F, DW, and R^2) will not possess standard distributions if some of the variables in the model have unit roots and are thus non stationary. Thus, to eliminate the possibility of these spurious regressions and erroneous inferences, the study determined the order of integration of these series through unit root tests both in the levels and in the first differences (trend and intercept and intercept only).

Several tests are employed to test for unit roots. The augmented Dickey-Fuller (ADF) and the Phillips-Peron are considered reliable and as such accepted by many in econometric analysis for the test for unit roots and are employed in the study. The Phillips and Peron (PP) unit root test is applied to detect the order of integration. This is a non-parametric test to the conventional t-test that is robust to a wide variety of serial correlation and time dependent heteroskedasticity.

The test for order of integration means to know the stationarity of the time series variables. It is necessary to conduct the statistical properties of macroeconomic variables when dealing with time series data.

The first step of the estimation technique begins by examining the time series properties of the data set. The pattern and trend in the data are examined and the tests for stationarity and the order of integration are considered. Secondly, time series data are mostly non-stationary at their

levels. Ignoring the unit root test may lead to spurious regression. Mostly, we specify economic models based on the assumption that the variables are stationary. The variables are then tested for unit root (stationarity) using the Augmented Dickey Fuller (ADF) tests.

The other problem of time series data the study envisage to occur is the problem of stationarity. In stationary time series, shocks are supposed to be temporary and over time their effects will be eliminated as the series revert to their long-run means. For proper analysis of time series data all the moment should be constant. A time series data set is said to be non-stationary if at least one of its moments depend on time.

This study seeks to establish the long run and short run relationship between tax revenue and the selected macroeconomic variables (government expenditure, financial deepening and real gross domestic product). Autoregressive Distributed Lag (ARDL) model to cointegration and error- correction model techniques were employed in this estimation. The Augmented Dickey-Fuller (ADF) and the Philips-Peron (PP) test statistics were employed to analyse the time series property of the data set. It was done by carrying out the unit roots test to determine whether the variables are stationary. The sensitivity of ADF tests to lag selection makes the Phillips-Peron test an important additional tool for making inferences about unit roots. The basic ADF is thus specified as follows:

$$\Delta X_t = \beta_1 + \lambda_1 X_{t-1} + \sum_{i=1}^{n} \rho_1 \Delta X_{t-i} + \varepsilon_{1t} \text{ - - - - - - - - - - - - - - - - - } (6)$$

Where X_t represents the series at time t, Δ is the first difference operator, β, ρ, λ are the parameters to be estimated and ε is the stochastic random disturbance term.

It is widely known that the ADF tests do not consider cases of heteroscedasticity and non-normality that are regularly disclosed in raw data of economic time series variables, and are also unable to discriminate between stationary and non stationary series that has a high degree of autocorrelation. The PP test for unit roots is therefore employed in the empirical analysis in order to resolve this problem. The PP test is also superior to the ADF test in situations where the time series variables under consideration have serial correlation and a structural break. This is based on the assumptions inherent in both tests. The ADF test assumes the error terms are independent with a constant variance whereas the PP test assumes the error terms are weakly dependent and heterogeneously distributed and thus provides robust estimates over the ADF and is specified as follows:

$$\Delta X_t = \alpha + \lambda_2 X_{t-1} + \theta\left(t - T/2\right) + \sum_{i=1}^{m} \theta_i \Delta_{t-i} + \varepsilon_{2t} \text{----------}(7)$$

In both equations (6) and (7), $\varepsilon_{1i}, \varepsilon_{2i}$ are the covariance stationary random error terms. The hypotheses are therefore tested in both situations as follows:

H_a : Series contains unit root

H_b : Series is stationary

The null hypothesis is that: The series contains unit roots, implying non stationary against the alternative hypothesis that it does not contain unit roots, implying stationary. The decision rule is that, if the ADF and PP statistics are higher (in absolute terms) than the critical values, we fail to accept the null hypothesis and conclude that there is no unit root implying stationary. Also, if the ADF and PP statistics are less negative than the critical values then we fail to reject the null hypothesis and conclude that there is unit root implying non stationary.

Finally the study performed causality test by employing the pairwise Granger causality tests.

The Autoregressive Distributed Lag (Bounds Test) Approach to Cointegration

Most econometric literature provides different methodological procedures to empirically examine the long-run relationship and dynamic interactions between two or more time-series variables. The most commonly used methods include the two-step procedure of Engle and Granger (1987) and the full information maximum likelihood-based approach of Johansen (1988) and Johansen and Juselius (1990). All these methods require that the variables under investigation should be integrated of order one. This normally involves a step of stationarity pre-testing, by introducing a certain degree of uncertainty into the analysis. Furthermore,

these tests suffer from low power and do not have good small sample properties (Cheung and Lai, 1993; Harris, 1995). From the above problems, we make use of a newly developed approach to cointegration that has become popular in recent years.

The Autoregressive Distributed Lag (ARDL) or Bound Test approach to cointegration developed by Pesaran and Shin (1999) and further extended by Pesaran et al. (2001) is adopted for this study. The procedure is adopted for the following reasons. Firstly, the bounds test procedure is simple. As opposed to other multivariate cointegration techniques such as Johansen and Juselius (1990), it allows the cointegration relationship to be estimated by OLS once the lag order of the model is identified. Secondly, the bounds testing procedure does not require the pre-testing of the variables included in the model for unit roots unlike other techniques such as the Johansen approach. It is applicable irrespective of whether the regressors in the model are purely I(0), purely I(1) or mutually cointegrated. Thirdly, the test is relatively more efficient in small or finite sample data sizes. Estimates derived from Johansen-Juselius method of cointegration are not robust when subjected to small sample sizes as compared to bounds test. Another advantage of the ARDL is that one can include dummy variable in the cointegration test process. With these reasons specified, we adopt the ARDL model for this study.

The Bound Testing Procedure

The study proceeds to estimate the short run and long run elasticities by following the Unrestricted Error Correction Model (UECM) which is unrestricted intercepts and no trends based on the assumption made by Pesaran et. al (2001). From the analysis, equations (5) can be expressed in ARDL representation as:

$$\Delta TR_t = \alpha_0 + \sum_{i=1}^{n} \beta_1 \Delta LnTR_{t-i} + \sum_{i=1}^{n} \beta_2 \Delta LnGOV_{t-i} + \sum_{i=1}^{n} \beta_3 \Delta RGDP_{t-i} + \sum_{i=1}^{n} \beta_4 \Delta FID_{t-i} +$$
$$\delta_1 LnTR_{t-1} + \delta_2 LnGOV_{t-1} + \delta_3 LnRGDP_{t-1} + \delta_4 LnFID_{t-1} + \varepsilon_t \text{----------} (8)$$

Where Δ is the difference operator, n is the lag length and ε_{it} are the uncorrelated errors which ~N (0, δ^2). From above, we now formulate our null hypothesis (of no cointegration) against the alternative hypothesis (there is cointegration) between all variables by using Wald-coefficient or F-test with the respective critical values. The terms $\begin{Bmatrix} \Delta LnTR_t \\ \Delta LnGOV_t \\ \Delta LnFID_t \\ \Delta LnRDGP_t \end{Bmatrix}$, are the difference of the logs of the series under consideration. α_0 is the intercept term of the series and $\beta_1, \beta_2, \beta_3$ & β_4 are the coefficients measuring the short run relationship and $\delta_1, \delta_2, \delta_3$ & δ_4 are the coefficients measuring the long run relationship.

The null hypothesis for no cointegration among the variables in equation (8) when $\Delta LnTR_t$ is the dependent variable can be stated as:

H_0: $\delta_1, = \delta_2, = \delta_3 = \delta_4 = 0$ and the alternative is stated as: Ha: $\delta_1, \neq \delta_2, \neq \delta_3 \neq \delta_4 = 0$.

The cointegration test is based on the F-statistics or Wald statistics. The F-test has a nonstandard distribution. Thus, Pesaran and Pesaran (1997) and Pesaran et al (2001) have provided two sets of critical values for the cointegration test. The lower critical bound assumes that all the variables are I(0), meaning that there is no cointegration among the variables, while the upper bound assumes that all the variables are I(1). If the computed F-statistic is greater than the upper critical bound, then the null hypothesis will be rejected suggesting that there exists a cointegrating relationship among the variables. If the F-statistic falls below the lower critical bounds value, it implies that there is no cointegration relationship.

However, when the F-statistic lies within the lower and upper bounds, then the test is inconclusive. In this context, the unit root test is conducted to ascertain the order of integration of the variables. If all the variables are found to be I(1), then the decision is taken on the basis of the upper critical value. On the other hand, if all the variables are I (0), then the decision is based on the lower critical bound value.

The ARDL method estimates $(P+1)^k$ number of regressions in order to obtain the optimal lags for each variable, where p is the maximum number of lags to be used and k is the number of variables in the equation (Shrestha and Chowdhury, 2005). The model is selected based on the Schwartz-Bayesian Criterion (SBC) or Akaike Information Criterion

(AIC). The SBC uses the smallest possible lag length and is therefore described as the parsimonious model. The AIC chooses the maximum relevant lag length (see Shrestha and Chowdhury, 2005; and Jalil et al, 2008).

Once cointegrating relationship is ascertained, the long run and error correction estimates of the ARDL model are obtained as given (9 and 10):

$$LnTR_t = \sigma_0 + \sum_{i=1}^{q_1} \phi_{1t} LnTR_{t-i} + \sum_{i=0}^{p_1} \varpi_{1t} LnGOV_{t-i} + \sum_{i=0}^{p_2} \varpi_2 LnRGDP + \sum_{i=0}^{p_2} \varpi_3 LnFID + \psi_{1tr} \text{--------}(9)$$

The error correction representation of the series can be given as follows:

$$\Delta LnTR_t = \alpha_0 + \sum_{i=1}^{n} \beta_{1tr} \Delta LnTR_{t-i} + \sum_{i=1}^{n} \beta_{2tr} \Delta LnGOV_{t-i} + \sum_{i=1}^{n} \beta_{3tr} \Delta LnRGDP_{t-i} + \sum_{i=1}^{n} \beta_{4tr} \Delta LnFID_{t-i} + \xi_{1tr} ECM_{t-1} + \varepsilon_t \text{---}(10)$$

Where ξ_1 is the speed of adjustment of the parameter and ECM_{t-1} is the residual obtained from equations (9) (i.e. the error correction term). The coefficient of the lagged error correction term (ξ) is expected to be negative and statistically significant to further confirm the existence of a cointegrating relationship.

The diagnostic test statistics of the selected ARDL model can be examined from the short run estimates at this stage of the estimation procedure. Similarly, the test for parameter stability of the model can be performed by the CUSUM and CUSUMSQ statistics. If the plots of CUSUM and CUSUMSQ statistics stay within the critical bonds of five

percent level of significance, the null hypothesis of all coefficients in the given regression are stable cannot be rejected.

Granger Causality Test

Granger (1969) definition of causality states that X_t causes Y_t if the past history of X_t can be used to predict Y_t more accurately than simply using the past history of Y_t only. This test enables an evaluation of the information content in the past values of a variable in predicting the contemporaneous as well as the future path of another. It is therefore vital for two main reasons. First, it is equivalent to the econometric exogeniety in the sense that unidirectional causality that runs from the explanatory variables to the dependent variables serves a prerequisite for the consistent estimation of distributed lag models that do not involve lagged dependent variables. Second, it can be likened to leading indicators and rational expectations. Thus, Granger (1969) observed that it is difficult to determine the direction of causality between two related variables.

The Granger causality test (Granger, 1988) is applied to examine the causality between tax revenue, financial deepening,, government expenditure and real gross domestic product in Ghana. The assessment of the direction of causality between tax revenue and government expenditure has received considerable attention in the recent decades (Hondroyiannis et al, 1996). A number of papers have considered whether government taxes Granger cause government spending or vice versa. For

example, Anderson, Wallace, and Warner (1986), Von Furstenberg, Green, and Jeong (1986) found causality to run from expenditure to tax revenue. Manage and Marlow (1986), Blackley (1986) and Ram (1988a) indicated causality to be from tax revenue to government spending. Besides identifying the relationship itself, the understanding of such a relationship can contribute toward a better understanding of the consequences of large deficits and the policy implications of such a relationship. The explanation of causality warrants the estimation of the following model:

$$X_t = \sum_{i=1}^{\infty} \alpha_i Y_{t-i} + \sum_{i=1}^{\infty} \beta_i X_{t-i} + \mu_t \text{----------}(11)$$

$$Y_t = \sum_{i=1}^{\infty} \lambda_i X_{t-i} + \sum_{i=1}^{\infty} \lambda_i Y_{t-i} + \eta_t \text{----------}(12)$$

Where $\alpha_i = (i = 1, 2, ..., \infty)$ so that Y_t fails to cause X_t. The error terms are assumed to fulfill the criteria E(μ_t)= E(η_t)= E($\mu_t \mu_s$)= E($\mu_t \mu_s$)=0; and E($\mu_t \mu_t$)= δ_μ^2 , E($\eta_t \eta_t$) = δ_η^2.

Causality in equation (11) should run from Y_t to X_t on the proviso that the estimated coefficients on the lagged variable (Y_t) are significantly different from zero. In other words, the coefficients α_i are different from zero, i.e., $\alpha_i \neq 0$. Seemingly, causality in equation (12) runs from X_t to Y_t provided the estimated coefficients on X_t as a group are significantly different from zero, $\lambda_i \neq 0$. Bidirectional causality occurs if

X_t causes Y_t and Y_t causes X_t. In other words, the lagged values of both X_t and Y_t as a group in equations (11) and (12) are significantly different from zero.

The ARDL approach to cointegration and error correction models are used to determine the adjustment to equilibrium among the key variables. The formulation of granger causality equations to determine the direction of causality of the variables under investigation was considered. A priori expectation for the various variables are (+) LnTR, (+) LnRGDPC, (+) LnGOV, (+) LnFID.

In summary, the methodology of this study was developed from an endogenous growth model in which real gross domestic product, government expenditure and financial deepening are the main determinants of long-term economic growth of tax revenue (LnTR). Explanation of the various test of stationarity that will be adopted for this study is shown, also the various estimating equations that are going to be estimated was presented.

From the various procedures discussed above, the next step will be to proceed to chapter four where testing of data and estimating the various equations, presentation and discussion of results shall be done.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This section presents and discusses the results of the study. The purpose is to understand the empirical relationship between tax revenue and some selected macroeconomic variables in Ghana. The study first tested for unit roots in order to determine the stationarity status of the variables using the Augmented Dickey-Fuller (ADF) and Phillips Peron (PP) tests and further tested for cointegration and causality using the Autoregressive Distributed Lagged Model (ARDL) and the Pair wise Granger causality test respectively. The analysis of these tests then helped us to know the relationship between tax revenue and government expenditure, financial deepening and real gross domestic product.

Presentation of results

Unit Root Tests Results

The unit root test is a test conducted to check for the stationarity of the variables used in this study

In reality, the bounds test approach to cointegration does not really require the pretesting of the variables for unit roots, it is however

important to perform this test to verify that the variables are not integrated of an order higher than one. The purpose is to free the result from spurious regression. The order of integration of the variables was tested using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. The Schwarz-Bayesian Criterion (SBC) and Akaike Information Criterion were used to determine the optimal number of lags included in the test. Appendices A, B, C, D, E, F, G, H, I, J, L, M, N and O report the results of the unit root tests both at levels and 1st differences.

The test results show that the ADF and PP statistics for the levels of all the variables do not exceed the critical values (in absolute terms) implying that the variables are non stationary at levels except tax revenue which is stationary at level under the PP test statistics. However, when first differences are taken on each of the variables, the ADF and PP statistics are higher than their respective critical values (in absolute terms) implying stationary after first differences. We conclude that (Tax Revenue, Government Expenditure and real Gross Domestic Product) are each integrated of order one or I (1) implying, they are stationary at first difference while tax revenue is integrated of order zero or I (0) according to the PP statistics.

Cointegration Analysis

Since the focus of this study is to examine the determinants of tax revenue and its effects on revenue maximization, it is prudent that the

study tests for the presence of a long-run relationship among the variables within the framework of the bounds testing approach to cointegration. Since the study employs quarterly data, a lag length of 4 is used in the bounds test. Pesaran and Shin (1999) suggest a maximum lag length of 4 for quarterly data in the bounds testing approach to cointegration. After the lag length was determined, the F test statistic, computed within the framework of the Unrestricted Error Correction model (UECM) has been compared with the upper and lower critical values in Pesaran, Shin and Smith (2001). Table 2 details the bounds test results for tax revenue and the selected macroeconomic variables (real gross domestic product, government expenditure and financial deepening) considered in the model.

Table 2: Bounds test results (LTR is dependent variable)

F-statistics	Critical Values (CV): Significant at 10%	
	Bottom CV	Top CV
F_{LTR}(LTR|LRGDP,LGOV,LFID,)=4.5474	3.47	4.45
K = 3		

Source: Microfit 4.1, Estimation results (2011) Note: k is number of regressors in equations 7 & 8 respectively. The critical values are obtained from Table CI (v) Pesaran et al., (2001:300)

Table 2 shows that the F statistic of the model; where LnTR is the dependent variable, F_{LTR} = 4.5474. It is clear from the F-statistics results that there exists a long-run relationship among tax revenue, financial

deepening, real gross domestic product and government expenditure in equation (8) because the F-statistic (4.5474) is higher than the top critical bound value (4.45) at the 10 % significance level. This suggests a long run relationship between tax revenue (TR) and the exogenous variables (GOV, FID and RGDP) implying cointegrating relationship. We then proceeded to estimate the selected long-run ARDL model in equation (8) in order to obtain the long-run coefficients and their asymptotic standard errors.

The existence of a long-run relationship in the equation with LTR as the endogenous variable and GOV, RGDP and FID as the exogenous variables, we proceeded to estimate the long-run effect. Thus, we investigated the impact of government expenditure (GOV), financial deepening (FID) and real gross domestic product (RGDP) on Tax Revenue (LRTR). The Autoregressive Distributed Lag model (ARDL:4,4,4,0) was used in the investigation.

Table 3: Long-run Estimates based on SBC-ARDL (4,4,4,0) Dependant variable is (LTR)

Variable	Coefficient	Standard error	T T-Ratio [Prob.]
LRGDP	-5.3564	1.6022	-3.3432 [0.001]***
LGOV	4.7458	1.7349	2.7355[0.008]***
LFID	-2.8574	1.4254	-2.0046[0.050]**
C	58.5770	13.1272	4.4623[0.000]***
T	-0.070380	0.54339	-1.2952[0.200]

Diagnostic Test

Test Statistics	LM Version	F Version
Serial Correlation	CHSQ (4) = 0.15341 [0.695]	F(4, 55) = 0.08730 [0.771]
Functional Form	CHSQ (1) = 0.30620 [0.580]	F(1, 58) = 0.23463[0.630]
Normality	CHSQ (2) = 0.57798 [0.749]	Not applicable
Heteroscedasticity	CHSQ (1) = 2.7490 [0.597]	F(1,74) = 2.8245 [0.104]

Source: Estimation results. Note: ** and *** indicates (5 and 1) % significance level.

The error correction term that corrects any disequilibrium in the short run can be calculated as: ECM = LTAXR + 5.3564LRGDP - 4.7458LGOV +2.8574LFID -58.5770C + 0.070380T

From table 3, the ARDL estimates shows a negative relation between real gross domestic product (RGDP) and tax revenue and is significant at 1%. The result shows that a 1per cent increase in real gross

domestic product will result in a 5.3564 percent decrease in tax revenue. This supports the theoretical literature on national income accounting framework that, for national output to increase, taxes should reduced.

Also, government expenditure was significant at 1% and had a positive relation with tax revenue. The results clearly show that a 1% increase in government expenditure will cause a 4.7458 percent increase in tax revenue. This result shows that, as government expenditure increase in the Ghanaian economy, it will result in an increase in tax revenue. This comes about when government expenditure is mainly done on the productive sectors of the economy. Economic agents undertaking government contracts will pay withholding taxes, Pay As You Earn (PAYE) tax as well as taxes on consumption of goods and services emanating from the government expenditure which will result in an increase in tax revenue.

On the significance of financial deepening, this variable was significant at 5% but had a negative relation with tax revenue. The interpretation from the result is that, a 1 per cent increase in financial deepening of the Ghanaian economy will cause a 2.5874 % reduction in tax revenue. This result is not surprising and could clearly be attributed to the tax policy of government on financial deepening. As the financial sector becomes liberalized, most financial institutions are given tax exemptions in the form of tax holidays ranging from five years to fifteen years which negatively affects the generation of tax revenue.

Diagnostic and Stability Tests

Hansen (1992) warned that, estimated parameters of a time series data may vary over time. As a result, it is imperative that we conduct parameter tests since model misspecification may arise as a result of unstable parameters and thus has the tendency of biasing the results. The diagnostic tests of the estimated ARDL model indicate that the model passes all the tests. Both the LM and F versions verified that the model is stable.

Hence, Pesaran and Pesaran (1997) advise that we always employ the CUSUM CUSUMSQ tests once the model is estimated to assess the parameter constancy. These tests were proposed by Brown, Durbin and Evans, (1975).

Appendices O and P report the plots of the CUSUMSQ and CUSUM for the estimated ARDL model. The graphs indicate the absence of any instability of the coefficients because the plots of these graphs are confined within the 5 % critical bounds of parameter stability suggesting that all the coefficients of the estimated model are stable over the study period.

Table 4: Short-run dynamic results (LTR is dependent variable)

Variable	Coefficient	Standard Error	T-Ratio	[Prob]
DLTR1	-0.38425	0.11837	-3.2462	(0.002)***
DLTR2	-0.75403	0.065691	-11.4784	(0.000)***
DLTR3	-0.60866	0.089245	-6.8201	(0.000)***
DLRGDP	-1.4280	0.53068	-2.6909	(0.009)***
DLRGDP1	0.83434	0.50943	1.6378	(0.107)
DLRGDP2	2.2142	0.51906	4.2658	(0.000)***
DLRGDP3	1.9334	0.55894	3.4590	(0.001)***
DLGOV	-0.040166	1.1955	-0.33597	(0.973)
DLGOV1	-1.2747	1.3672	-0.93236	(0.355)
DLGOV2	-3.4635	1.3800	-2.5098	(0.015)**
DLGOV3	-3.4747	1.3092	-2.6542	(0.010)**
DLFID	-1.3218	0.66305	-1.9935	(0.051)**
C	27.0961	4.1069	6.5978	(0.000)***
T	-0.032556	0.019356	-1.6819	(0.098)*
ECM(-1)	-0.46257	0.12208	-3.7892	(0.000)***

R-Squared	0.95945	R-Bar-Squared	0.94846
S.E. of Regression	0.26246	F-stat. F(14, 61)	99.7233 (0.000)
Mean of Dependent Var.	0.065531	S.D. of Dependent Variable	1.1561
Residual Sum of Squares	4.0643	Equation Log-likelihood	3.4431
Akaike Info. Criterion	-13.5569	Schwarz Bayesian Criterion	-33.3681
DW-statistic	1.9858		

Source: Computed by Author using Microfit Version 4.1 developed by Pesaran and Pesaran (1999). Note: ***, ** and* imply significance at the 1, 5 & 10 per cent levels respectively.

The existence of a long-run relationship among tax revenue and its explanatory variables (government expenditure, financial deepening and

real gross domestic product) requires the estimation of short-run dynamic parameters as well.

From Table 4, it is clear that tax revenue in the current quarter had a significant effect on the previous quarter tax revenue at 1 % significance level but its impact was negative. The results show that as current quarter tax revenue increase it has a negative effect on the previous quarter tax revenue. The coefficient revealed that a 1% increase in current quarter tax causes a reduction in the previous quarter tax revenue by 0.38 %. In the case of real gross domestic product, the result showed that its first difference had a negative effect but the second difference had a positive impact on tax revenue which supported the expected sign. The result also showed that the second difference was significant at 1 % level but had a positive relation on tax revenue. While test on financial deepening also showed a negative impact on tax revenue at the first difference and at 5 % significant level.

The coefficient of the lagged error correction term (ECM) is negative (-0.46) and statistically significant as expected at the 1% significance level. This shows that any disequilibrium caused by previous years' shocks converges back to the long-run equilibrium in the current year at the speed of 46%. Thus, we may discern that, it may take roughly two quarters for any disequilibrium to be restored. Meaning, the variables in our model show evidence of a slow pace of response to equilibrium when shocked in the short-run.

It is theoretically argued that a genuine error correction mechanism exists whenever there is a cointegrating relationship among two or more variables. The error correction term is thus obtained from the negative and significant lagged residual of the cointegration regression. It determines the speed of adjustment to long-run equilibrium. The negative coefficient is an indication that any shock that takes place in the short-run would be corrected in the long-run. The rule of thumb is that, the larger the error correction coefficient (in absolute term), the faster the variables equilibrate in the long-run when shocked (Acheampong, 2007).

Granger Causality Tests Results

Since the cointegration among the variables have been established, it is prudent to undertake the causality tests according to Engle and Granger (1987). In causality test four outcomes are possible; when the sets of coefficient are not statistically significant, we say that, none of the variables Granger causes each other, implying that, the variables are independent. However, there may be unidirectional causality meaning that C may Granger cause D but not the other way round. There may also be the case where D Granger causes C but not the other way round. It could also happen that, C and D Granger causes each other implying bi-directional causality.

Table 5: Pairwise Granger Causality Tests Results

Null hypothesis:	Obs.	F-Statistic	Prob.	Remarks
LFID does not Granger Cause LGOV	76	0.34767	0.8448	Cannot reject the null
LGOV does not granger Cause LFID	76	0.331`38	0.8559	Cannot reject the null
LRGDP does not Granger Cause LGOV	76	0.53098	0.7134	Cannot reject the null
LGOV does not granger Cause LRGD	76	0.69643	0.5971	Cannot reject the null
LTR does not Granger Cause LGOV	76	0.50635	0.7312	Cannot reject the null
LGOV does not granger Cause LTR	76	1.27461	0.2287	Cannot reject the null
LRGDP does not Granger Cause LFID	76	1.2.4924	0.2987	Cannot reject the null
LFID does not granger Cause LRGDP	76	0.74138	0.5671	Cannot reject the null
LTR does not Granger Cause LFID	76	1.29341	0.2815	Cannot reject the null
LFID does not granger Cause LTR	76	2.80485	0.0327	Null is rejected
LTR does not Granger Cause LRGDP	76	0.74424	0.5653	Cannot reject the null
LRGDP does not granger Cause LTR	76	3.37105	0.0142	Null is rejected

The Granger causality test results in Table 5 suggests that the null hypothesis of financial deepening (FID) does not Granger cause government expenditure (GOV) is not rejected, implying financial deepening does not Granger cause government expenditure. Also, the result showed that government expenditure does not Granger cause financial deepening. However, the null hypothesis that financial deepening does not Granger cause tax revenue is rejected, implying financial deepening Granger causes tax revenue. This implies that financial

deepening can be used to predict tax revenue. Also, the null hypothesis of real GDP does not Granger cause tax revenue is rejected, implying real GDP do granger cause tax revenue. But the null hypothesis that real GDP does not Granger cause government expenditure is rejected. This implies that, Ghana's real GDP cannot be used to predict government expenditure. Also, the null hypothesis that tax revenue does not Granger cause government expenditure and, vice versa is also rejected. The null hypotheses where real GDP does not granger cause financial deepening and vice versa are rejected. Table 5 reports these findings.

Conclusion

The chapter concentrated on the empirical testing of the determinants of tax revenue in Ghana using the Autoregressive Distributed Lagged Model (ARDL) and Granger causality test. The results disclosed a long-run cointegrating relationship between tax revenue and the selected macroeconomic variables that were used for this study on the Ghanaian economy.

The short-run estimates reveal a negative and statistically significant impact of the variables (government expenditure, real gross domestic product and financial deepening) on tax revenue. This is an indication that the variables showed evidence of slow pace to respond to equilibrium in the short-run once shocked.

The long-run estimates, however, reveal a negative and statistically significant impact of real gross domestic product on tax revenue just as in the short-run. This result shows that, in Ghana the increase in real gross domestic product result in a negative impact on tax revenue which may be due to tax evasion and tax avoidance Schneider and Frey (2001). Furthermore, tax exemptions and tax holidays given to gold mining companies and some investment in the hotel industry during their first ten years of their operations can contribute significantly to the negative relation between real gross domestic product and tax revenue. However, government expenditure has a statistically significant positive effect on tax revenue in both the short-run and the long-run. The positive impact supports growth models in which government spending and tax policies can have long-term or permanent growth effects, Romer (1986). As government expenditure on the productive sector of the economy increases, tax revenue increases as well. Since all taxable products will receive the transmission effect. The result produced suggests that, government expenditure is a key policy instrument for tax revenue in Ghana. Also, financial deepening exerted a negative and statistically significant impact on economic growth in both short-run and long-run. Porter (2007) carried a study on tax revenue and financial deepening on the economy of Hong Kong and had similar results. The negative impact was as a result of tax exemptions and tax holidays given to financial institutions.

The diagnostic and parameter stability tests reveal that the model passes the tests of serial correlation, functional form misspecification, non normal errors and heteroscedasticity and the graphs of the CUSUM and CUSUMSQ indicate the absence of any instability of the coefficients because the plots of these graphs are confined within the 5 per cent critical bounds of parameter stability suggesting that all the coefficients of the estimated ARDL model are stable over the study period.

Finally, the Granger causality test result revealed a unidirectional relationship between financial deepening and tax revenue. Also, there was a unidirectional Granger causality between real gross domestic product and tax revenue.

We then proceed to our next chapter, where we make our concluding remarks and make policy recommendations for our results.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter summarizes, concludes and gives policy recommendations emanated from the study for the consideration of revenue collecting agencies and economic management practitioners. The aim is to show the major findings in the study and also suggest policy recommendations to revenue agencies as to the way forward to increase tax revenue. This chapter first summarizes the findings of the study and then concludes the major findings of the study before prescribing policy recommendations. The target of the research was to investigate empirically the determinants of tax revenue in Ghana using Ghanaian data set.

Summary

The focus of this study was to investigate the relationship between tax revenue, government expenditure, real gross domestic product and financial deepening in Ghana and to determine if a long run or short run relationships exists among variables. In sum, the study examined tax revenue and the selected exogenous variables using an Auto Regressive

Distributed Lagged Model that was developed by Pesaran and Shin (1999) and the pair-wise Granger causality test by Engle and Granger (1987).

The study set itself to meet three objectives. First, to examine both the long-run and short-run relationships between tax revenue and the selected macroeconomic variables used for this study; and most importantly to identify a causal relationship between among the variables and tax revenue as well as the direction of causality. These results may then accentuate policy recommendations for tax practitioners as well as government.

In the empirical literature analysis reviewed, the study explored the relationship between tax revenue and its selected determinants for this study on Ghana over the period 1988 to 2008 and it was clear that the bulk of the literature produced mixed relationship between tax revenue and its determinants. This confirms Weiss (1969) assertion that a country's culture and the level of development contributes to the selection of that country's determinant of tax revenue.

In order to estimate the long-run relationship and short-run dynamic parameters of the model, the Autoregressive Distributed Lagged Model (bounds testing) approach to cointegration was employed. We then started the estimation process by testing for the stationarity properties of the variable using the Augmented-Dickey Fuller (ADF) and Phillips-Peron test statistics. The unit roots results suggest that all the variables were stationary after taking first difference on each while tax revenue was

stationary at levels with a constant and trend under the Philip Peron test statistics. The study then proceeded to examining the long-run and short-run relationships of the selected determinants of tax revenue.

The bounds tests results revealed that in the long-run, government expenditure exerted a statistically significant positive effect on tax revenue while real gross domestic product showed a negative relation. Financial deepening posited statistically significant negative effects on tax revenue. Porter (2007) attributed the negative relation between tax revenue and financial deepening to some tax exemptions given to financial institutions during the financial liberalization period. In the Ghanaian economy rural banks emanating from financial deepening are given ten years tax holiday. Also, Venture Financing Companies enjoy five years tax holidays and this really has a negative effect on tax revenue. Also, financial sector income tends to be more volatile than that of other sectors, as is in the case of Hong Kong (Porter, 2007). This can complicate the conduct of fiscal policy.

The positive and statistically significant effect of government expenditure show that government expenditure can boost economic growth through increased spending in the productive sectors of the economy and this has a rippling effect on corporate taxes, PAYE taxes and VAT which all help to boost tax revenue.

The short-run results revealed that real gross domestic product has a negative effect on tax revenue as in the long-run. Government

expenditure showed a negative relation on tax revenue for the short run dynamics. Also, financial deepening exerted a statistically significant negative effect on tax revenue in the previous period denoting that for the economy to maximize tax revenue, financial sector of the economy should not be given much tax exemptions. The existence of a long-run relationship among real GDP, financial deepening and government expenditure is further confirmed by a negative and statistically significant coefficient on the lagged error correction term and the size of this coefficient suggest that, the disequilibrium caused by previous years' shocks converges back to the long-run equilibrium in the current year.

The diagnostic tests results show that the model passes the test of serial correlation, functional form misspecification, non normal errors and heteroscedasticity. The graphs of the cumulative sum of recursive residual (CUSUM) and the cumulative sum of squares of recursive residual (CUSUMSQ) exhibit that there exists a stable relationship between tax revenue and the selected macroeconomic variables used for the study

Seemingly, the Granger causality test revealed an interesting result. The aim was to identify any causal relationship between tax revenue and the selected macroeconomic variables and its direction. The result showcased a unidirectional relationship between tax revenue and financial deepening. Thus, financial deepening granger causes tax revenue and not the other way round. Also, it was revealed that, real gross domestic product granger cause tax revenue. This was also unidirectional.

Conclusions

The study has empirically examined the determinants of tax revenue in Ghana using Ghanaian data set for the period 1988 to 2008. The empirical evidence revealed the following findings: First, both the long-run and short-run results found statistically significant negative effects of financial deepening on tax revenue. This means that, though financial liberalization is good for economic growth and development, due to tax exemptions and tax holidays, it impacted negatively on tax revenue generation. Therefore, for the government to achieve growth in tax revenue there should be regulation as to the type of exemptions that will be granted to financial institution. Secondly, real gross domestic product had a positive impact on tax revenue in the short run when the second difference was taken. However, the long run effect exerted a negative and statistically significant effect on tax revenue. This is an indication that as real gross domestic product increase it impacts negatively on tax revenue in the long run for the case of the Ghanaian economy which can mainly be attributed to tax holidays, tax evasion, tax avoidance and corruption. Government expenditure is seen in the short run dynamics as having a negative impact on tax revenue. However, the long run dynamics gave a positive impact on tax revenue. The causality test results revealed a unidirectional relationship between financial deepening and tax revenue with the causality running from financial deepening to tax revenue. Also real gross domestic product had a unidirectional relation with tax revenue.

Meaning an increase in real gross domestic product will stimulate tax revenue.

Recommendations

The study brought to light the importance of government expenditure, financial deepening and government expenditure on tax revenue in Ghana. The results showcased the implementation of both long-run and short-run policies for enhanced tax revenue generation. It was clear from the study that, the key policy recommendations for improved and sustained tax revenue is to increase government expenditure in the productive sectors of the economy to have its impact on all form of taxes. Thus government expenditure should be directed towards the productive sectors of the economy so as to stimulate production of goods and services with its associate taxes. One such policy instrument has to do with government expenditure on infrastructure development which will attract all forms of withholding taxes.

The positive relationship between tax revenue and government expenditure is an indication that government expenditure plays a crucial rule in enhancing sustained growth and development. The implication is that, government expenditure in the productive sector of the economy i,e construction will go a long way to improve tax revenue. Policy makers should therefore provide more infrastructural facilities like schools, bridges and electricity which will help expand tax revenue. This

infrastructure development will have a significant impact on economic growth and development which in the long run translate into increase in tax revenue.

However, real gross domestic product had a negative impact on tax revenue. This can be attributed to tax exemptions given companies operating within the free zone area of the Ghana Investment Promotion Council (GIPC), corruption and tax evasion. There is wide agreement among researchers that corruption has a significant negative impact on tax revenues. Studies in developing countries indicate that often more than half of the taxes that should be collected cannot be traced by government treasuries due to corruption and tax evasion. While some corruption researchers have proposed that corruption can be an efficiency-enhancing force in tax revenue collection by motivating tax officers to work harder and dis-incentivising tax evasion, other experts have pointed out that the presence of corruption reduces tax revenues in the long run (Fjeldstad; Tungodden, 2011). This finding led the IMF to conclude that efforts to lower corruption would increase tax revenues significantly. (Ghura 1998)

These findings were later reinforced by Tanzi and Davoodi (1999) who investigated the relationship between levels of corruption (measured by corruption perception indices) and GDP in a sample of 97 countries. . They found that a one-point increase in the Corruption Perception's Index is associated with a 1.5 percentage point decline in revenue-GDP ratio. Therefore the policy implication is that, anti-corruption measures should

be put in place to reduce the level of corruption so as to increase tax revenue for economic growth and development.

Limitations

The major drawback to this study was the availability of data which is common to Sub-Saharan African countries. We could not use large sample size which was due to unavailability of data.

Future Direction of Research

We suggest that for future research on this work, other researchers can expand the sample size and include other macroeconomic variables that are not considered in this model. This can help improve tax revenue generation for national development.

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APPENDICES

Appendix A

ADF Test of Government Expenditure with trend

Null Hypothesis: LGOV has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 9 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.907824	0.6399
Test critical values:	1% level	-4.094550	
	5% level	-3.475305	
	10% level	-3.165046	

*MacKinnon (1996) one-sided p-values.

Appendix B

ADF Test of Government Expenditure without Trend

Null Hypothesis: LGOV has a unit root

Exogenous: Constant

Lag Length: 9 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.589310	0.4827
Test critical values:	1% level	-3.527045	
	5% level	-2.903566	
	10% level	-2.589227	

Appendix C

ADF test of Government Expenditure Differenced with Trend

Null Hypothesis: D(LGOV) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 4 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.692338	0.2429
Test critical values:	1% level	-4.086877	
	5% level	-3.471693	
	10% level	-3.162948	

*MacKinnon (1996) one-sided p-values.

Appendix C

ADF test of Government Expenditure Differenced without Trend

Null Hypothesis: D(LGOV) has a unit root

Exogenous: Constant

Lag Length: 4 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.595110	0.0985
Test critical values:	1% level	-3.521579	
	5% level	-2.901217	
	10% level	-2.587981	

Appendix D

ADF Test of FID without a Trent

Null Hypothesis: LM2 has a unit root

Exogenous: Constant

Lag Length: 9 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.478273	0.8885
Test critical values:	1% level	-3.527045	
	5% level	-2.903566	
	10% level	-2.589227	

Appendix E

ADF test of FID with trend

Null Hypothesis: LM2 has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 9 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.193730	0.0941
Test critical values:	1% level	-4.094550	
	5% level	-3.475305	
	10% level	-3.165046	

Appendix F

ADF Test of LRGDP without a trend

Null Hypothesis: LRGDP has a unit root

Exogenous: Constant

Lag Length: 9 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.118482	0.7042
Test critical values:	1% level	-3.527045	
	5% level	-2.903566	
	10% level	-2.589227	

Appendix G

ADF Test of LRGDP with Trend

Null Hypothesis: LRGDP has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 9 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.841234	0.6739
Test critical values:	1% level	-4.094550	
	5% level	-3.475305	
	10% level	-3.165046	

Appendix H

ADF Test of D(LRGDP) without a Trend

Null Hypothesis: D(LRGDP) has a unit root

Exogenous: Constant

Lag Length: 8 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.245834	0.1924
Test critical values:	1% level	-3.527045	
	5% level	-2.903566	
	10% level	-2.589227	

Appendix I

ADF Test of D(LRGDP) with Trend

Null Hypothesis: D(LRGDP) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 8 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.358427	0.3977
Test critical values:	1% level	-4.094550	
	5% level	-3.475305	
	10% level	-3.165046	

Appendix J
ADF Test of D(LRGDP) without a Constant and Trend

Null Hypothesis: D(LRGDP) has a unit root

Exogenous: None

Lag Length: 8 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.826164	0.0648
Test critical values:	1% level	-2.598416	
	5% level	-1.945525	
	10% level	-1.613760	

Appendix K

ADF Test of LTR without a Trend

Null Hypothesis: LTR has a unit root

Exogenous: Constant

Lag Length: 4 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.269833	0.9235
Test critical values:	1% level	-3.520307	
	5% level	-2.900670	
	10% level	-2.587691	

Appendix L
ADF Test of LTR with a Trend

Null Hypothesis: LTR has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 4 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.727873	0.2288
Test critical values:	1% level	-4.085092	
	5% level	-3.470851	
	10% level	-3.162458	

Appendix M
ADF Test of D(LTR) with a Trend

Null Hypothesis: D(LTR) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 3 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.488895	0.0030
Test critical values:	1% level	-4.085092	
	5% level	-3.470851	
	10% level	-3.162458	

Appendix N
ADF Test of D(LTR) without a Trend

Null Hypothesis: D(LTR) has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.521317	0.0004
Test critical values:	1% level	-3.520307	
	5% level	-2.900670	
	10% level	-2.587691	

*MacKinnon (1996) one-sided p-values.

Appendix O

PP Test

Null Hypothesis: LGOV has a unit root

Exogenous: Constant

Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.366237	0.9089
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

Null Hypothesis: LGOV has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.025513	0.9340
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

Null Hypothesis: D(LGOV) has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.064223	0.0019
Test critical values:	1% level	-3.516676	
	5% level	-2.899115	
	10% level	-2.586866	

Null Hypothesis: D(LGOV) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.124388	0.0088
Test critical values:	1% level	-4.080021	
	5% level	-3.468459	
	10% level	-3.161067	

Null Hypothesis: LM2 has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.408409	0.9018
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

Null Hypothesis: LM2 has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.993004	0.1408
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

Null Hypothesis: D(LM2) has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.091399	0.0001
Test critical values:	1% level	-3.516676	
	5% level	-2.899115	
	10% level	-2.586866	

Null Hypothesis: D(LM2) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.056725	0.0005
Test critical values:	1% level	-4.080021	
	5% level	-3.468459	
	10% level	-3.161067	

Null Hypothesis: LRGDP has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.184235	0.6777
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

Null Hypothesis: LRGDP has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.640599	0.7678
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

Null Hypothesis: D(LRGDP) has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.232952	0.0000
Test critical values:	1% level	-3.516676	
	5% level	-2.899115	
	10% level	-2.586866	

Null Hypothesis: D(LRGDP) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.237734	0.0002
Test critical values:	1% level	-4.080021	
	5% level	-3.468459	
	10% level	-3.161067	

Null Hypothesis: LTR has a unit root

Exogenous: Constant

Bandwidth: 19 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.837592	0.0576
Test critical values:	1% level	-3.515536	
	5% level	-2.898623	
	10% level	-2.586605	

Null Hypothesis: LTR has a unit root

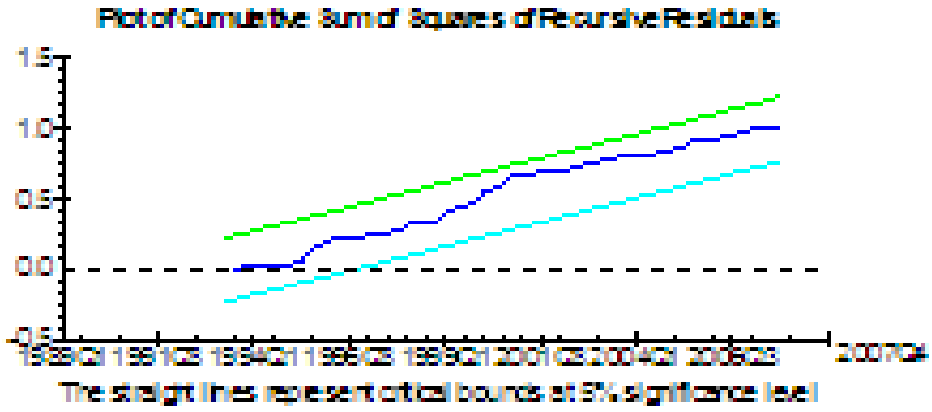
Exogenous: Constant, Linear Trend

Bandwidth: 23 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.487406	0.0000
Test critical values:	1% level	-4.078420	
	5% level	-3.467703	
	10% level	-3.160627	

Appendix O

PLOT OF CUMULATIVE SUM OF SQUARES OF RECURSIVE RESIDUALS (CUSUMSQ)

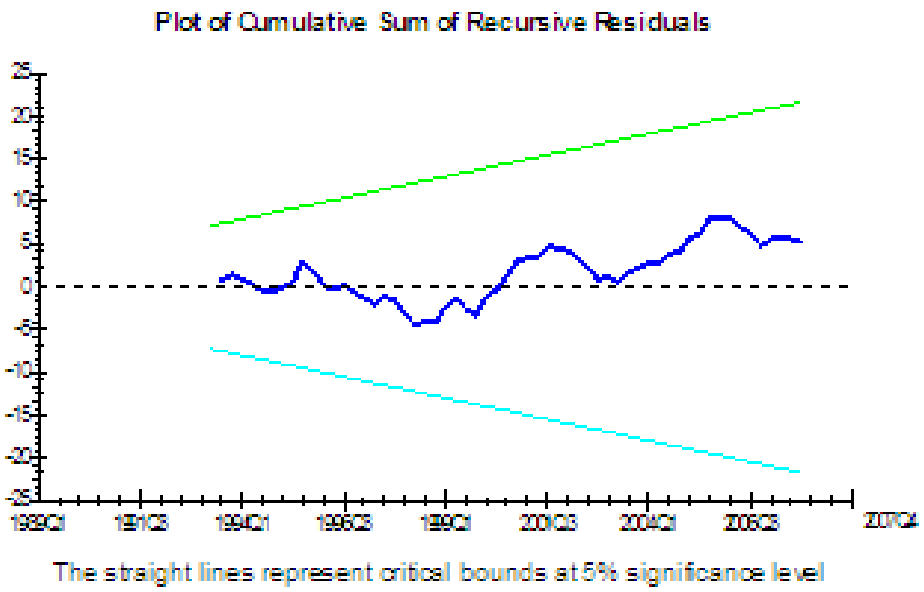


Plot of cumulative sum of squares of recursive residuals (CUSUMSQ)

Appendix P

PLOT OF CUMULATIVE SUM OF RECURSIVE RESIDUALS

(CUSUM)



Plot of cumulative sum of recursive residuals (CUSUM)