

**THE EFFECT OF TAX RATE ON TAX REVENUE AND MISINVOICING
IN SUB – SAHARAN AFRICA: A CASE STUDY OF IMPORT TARIFF ON
IMPORT REVENUE AND/OR ON IMPORT MISINVOICING**

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THE REQUIREMENT FOR THE AWARD OF THE MASTER OF
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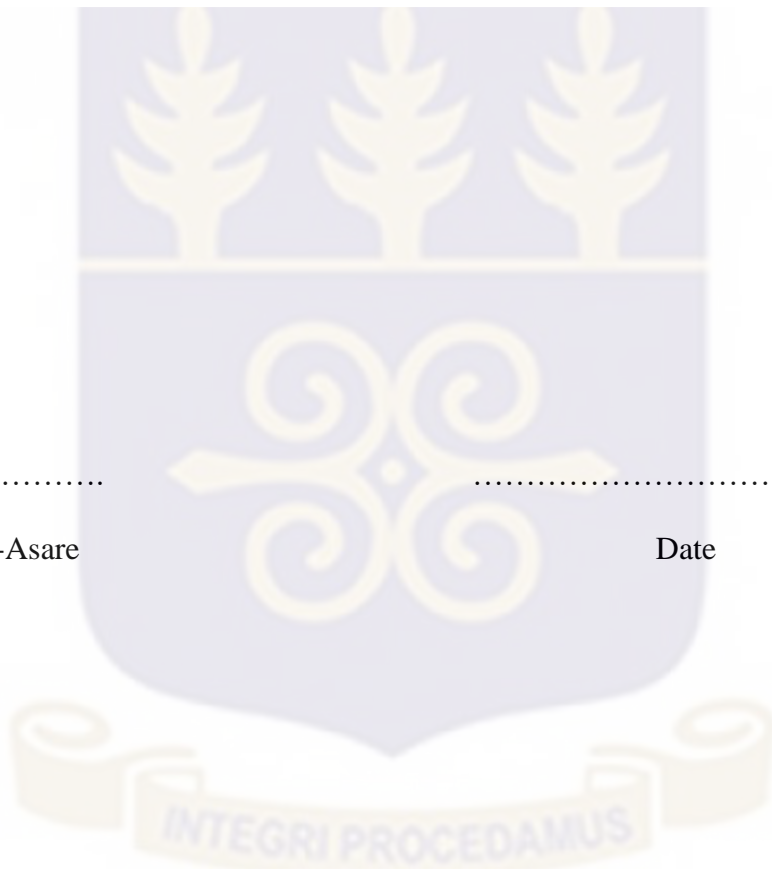
DECEMBER, 2017.

DECLARATION

I, Edna Obuo Ansa-Asare, an M-Phil (Economics) student of University of Ghana, do hereby declare that this thesis is the product of my own original research. I further declare that this piece of research or a part thereof has not been presented by anyone in this or any other University.

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CERTIFICATION

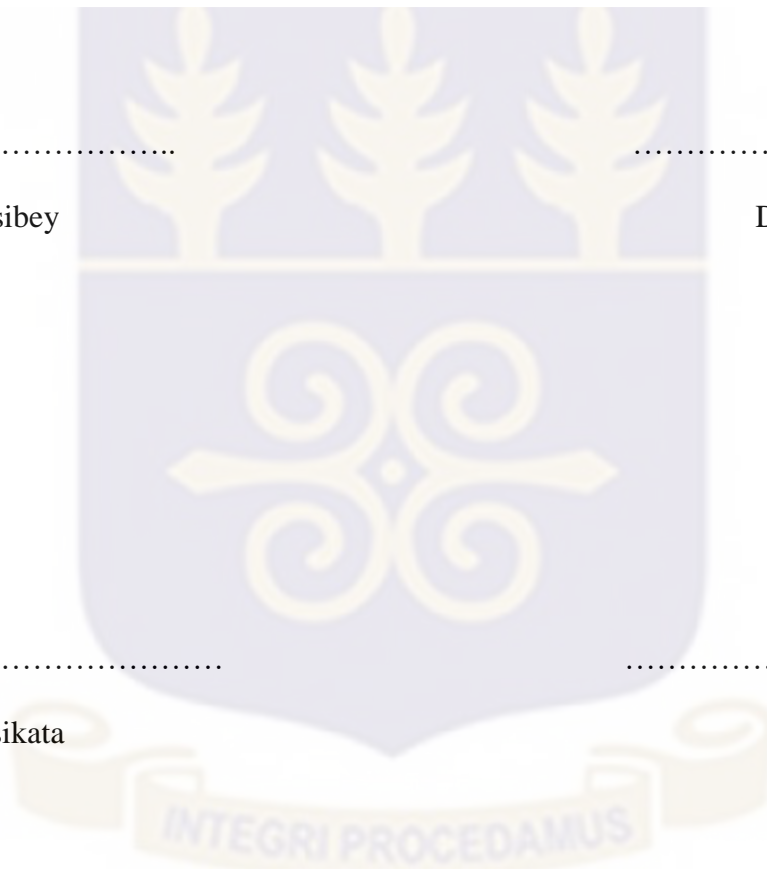
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ABSTRACT

Large fiscal deficits caused by rapid expansion in expenditure and low levels of revenue are major challenges facing Sub-Saharan African (SSA) countries for the past years. These, coupled with drawbacks in Official Development Assistance (ODA) flows makes it urgent for Governments of these countries to mobilise tax revenue both directly and indirectly. Because of high propensity of SSA citizens to comply, countries have tended to increase the import tariff in order to increase tax revenue, on the theory that, increased tax rate increases revenue. Worldwide debate indicates that, tax leakages such as import misinvoicing reduces trade tax revenue of the developing countries. This import misinvoicing is however, encouraged by higher import tariff.

This research uses the System GMM panel regression for twenty-four (24) selected SSA countries over the period 1995-2015, to investigate whether a higher import tariff increases import revenue, and/or for the period 2003-2013, to also find out the impact of higher import tariff on import misinvoicing. The data utilised was obtained from World Bank, World Economic Outlook and UN Commodity Trade Data Bases.

The result from the analysis shows that, import tariff significantly increases import revenue, however increasing the tariff beyond the normal range (doubling the import tariff) reduces the import revenue. The above notwithstanding, import revenue is negatively affected by exchange rate.

Further, import misinvoicing increases with higher import tariff but rather reduced with expansion in Government expenditure, favorable exchange rate and trade liberation.

In the light of the above, Governments in the region can caution themselves to regulate the tariff within the normal range and also to maintain a stable macroeconomic system in order to maximize import revenue and reduce import misinvoicing.



DEDICATION

I dedicate this work to my husband, Mr. Sampson Rosenberg Owusu Adokoh and my sons, Papa Yaw Ayeyi Owusu Adokoh, Naseda Kwabena Barimah Owusu Adokoh and Owurahene Kwabena Fosu Owusu Adokoh for their love, sacrifices and immense support.

I also dedicate it to my entire family for their concern, assistance and constant prayers during this period.



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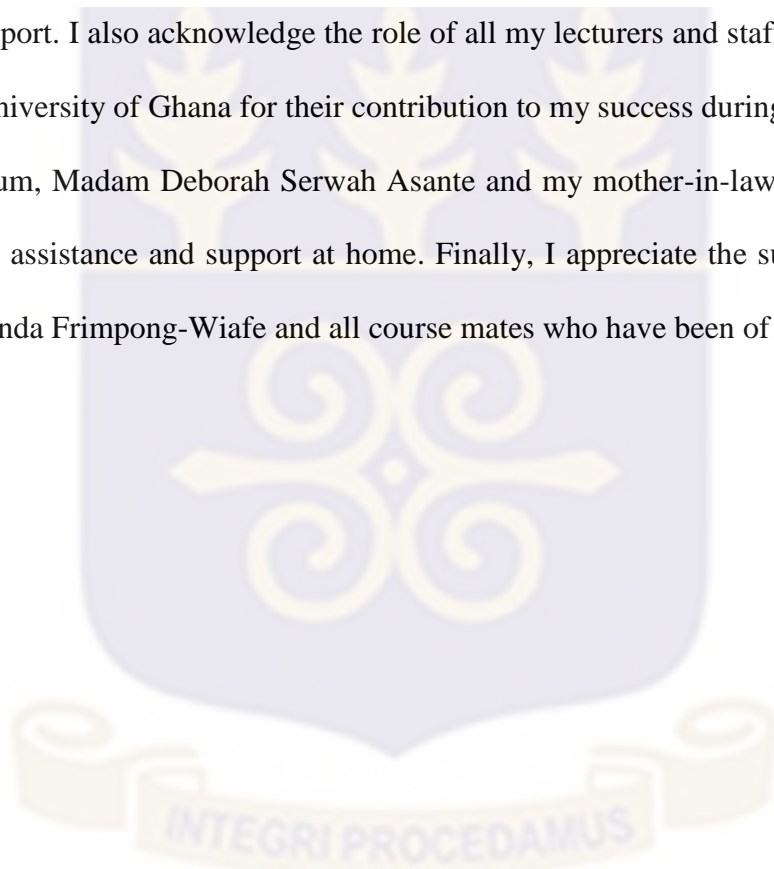


TABLE OF CONTENTS

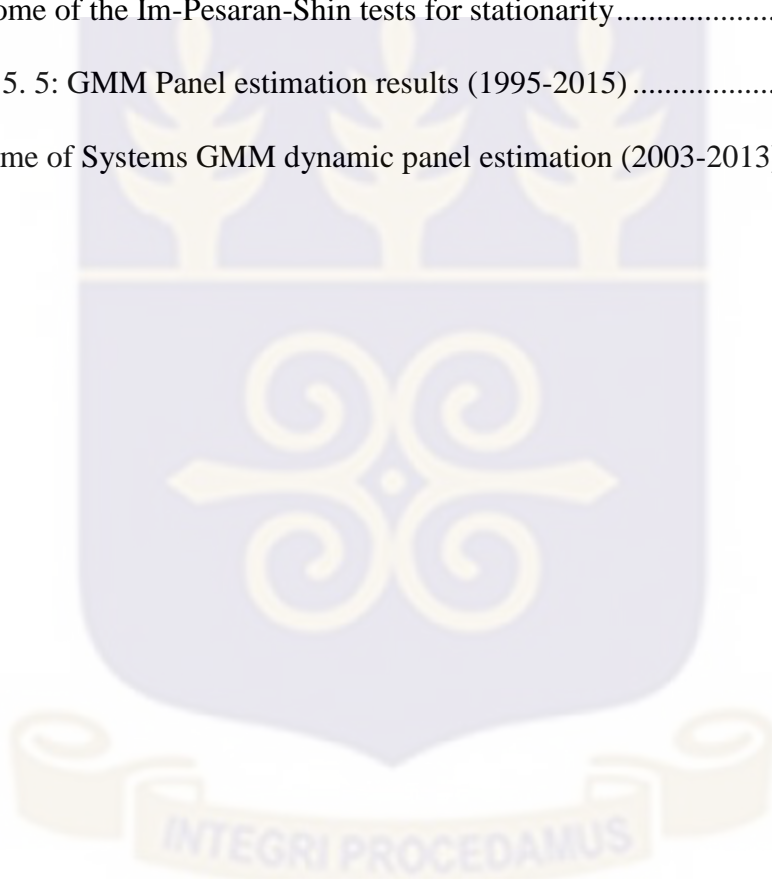
DECLARATION	ii
CERTIFICATION	iii
ABSTRACT	iv
DEDICATION	vi
ACKNOWLEDGEMENTS'	vii
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ABBREVIATIONS and ACRONYMS	xiii
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background of the study	1
1.2 Research Problem.....	4
1.3 Study Objectives	7
1.4 Research Questions	7
1.5 Significance of the Study	8
1.6 Organization of the Study	9
CHAPTER TWO	10
LITERATURE REVIEW	10
2.0 Introduction	10
2.1 Theoretical Framework	10
2.1.1 The Laffer curve	10
2.1.2 Tax Rate and Misinvoicing.....	11
2.2 Empirical Literature Review	13
2.2.1 Tax Rate and Revenue Generation Debate.....	13
2.2.2 Import Tariff and Misinvoicing Debate.....	16
2.3 Conclusion.....	18
CHAPTER THREE	19
OVERVIEW OF IMPORT TAX RATE, IMPORT TAX REVENUE AND IMPORT MISINVOICING	19
3.0 Introduction	19
3.1 Nature of the Sub-Saharan African Region.....	19
3.2 Trends in Per Capita Income Growth Rate in SSA.....	22

3.3 Trends in Inflation Rate in SSA	23
3.4 Trends in Real effective exchange Rate in SSA	24
3.5 Trends in Import Revenue in Sub- Saharan Africa	24
3.6 Trends in Import &Trade misinvoicing in Sub- Saharan Africa.....	25
3.7 Trends in Trade liberalization in Sub- Saharan Africa	27
3.8 Trends in Import Tariff in Sub- Saharan Africa.....	28
3.9 Conclusion.....	29
CHAPTER FOUR.....	30
METHODOLOGY	30
4.0 Introduction	30
4.1 Analytical Framework.....	30
4.1.1 Tax Rate and Revenue Generation	30
4.1.2 Utility Function.....	31
4.1.3 Tax rate and import misinvoicing.....	32
4.2 The Empirical Model	34
4.2.1 Diagnostic Tests	37
4.2.2 Testing for Unit Roots in Panel Data.....	37
4.2.3 Multicollinearity Test.....	37
4.2.4 Sargan Test.....	39
4.2.5 Autocorrelation Test.....	40
4.2.6 Hausman Specification Test	40
4.2.7 Breusch and Pagan Lagrange Multiplier Test for Random Effects (LM Test)	41
4.3 Definition of Variables and Expected Signs	42
4.3.1 Dependent Variable	42
4.3.2 Independent Variables	43
4.3.3 Control Variables.....	44
4.4 The Data Source and Sample Size	47
4.5 Conclusion.....	47
CHAPTER FIVE	49
DATA ANALYSIS AND DISCUSSION OF RESULTS	49
5.0 Introduction	49
5.1 Descriptive Statistics.....	49

5.2 Pre Estimation Sensitivity Analyses	51
5.2.1 Stationarity or Unit Root Test	51
5.2.2 Multicollinearity Test.....	51
5.3 Panel Data Estimation Results.....	52
5.3.1 Import Rate and Import Revenue.....	54
5.3.2 Misinvoicing and Import Tariff.....	57
5.4 Conclusion.....	61
CHAPTER SIX.....	63
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....	63
6.0 Introduction	63
6.1 Summary	63
6.2 Conclusions	64
6.3 Recommendations for Policy	66
6.4 Suggestions for Future Studies and Limitations	68
REFERENCES	70
APPENDICES	82
Appendix A: Import Revenue Analysis	82
Appendix 1A: Pooled regression for Import Revenue Analysis	82
Appendix 2A: Random effect regression for import revenue	83
Appendix 3A: Breusch-Pagan Lagrangian Multiplier test for Random Effect.....	84
Appendix 4A: Correlation Matrix	84
Appendix 5A: Fixed effect with import revenue	85
Appendix 6A: Multicollinearity Test	86
Appendix B: Import Misinvoicing Analysis	86
Appendix 1B: Pooled regression for Import misinvoicing Analysis.....	86
Appendix 2B: Random effect regression for import misinvoicing.....	87
Appendix 3B: Breusch-Pagan Lagrangian Multiplier test for Random Effect.....	88
Appendix 4B: Correlation Matrix	89
Appendix 5B: Fixed effect with import revenue.....	90
Appendix 6B: Multicollinearity Test	91

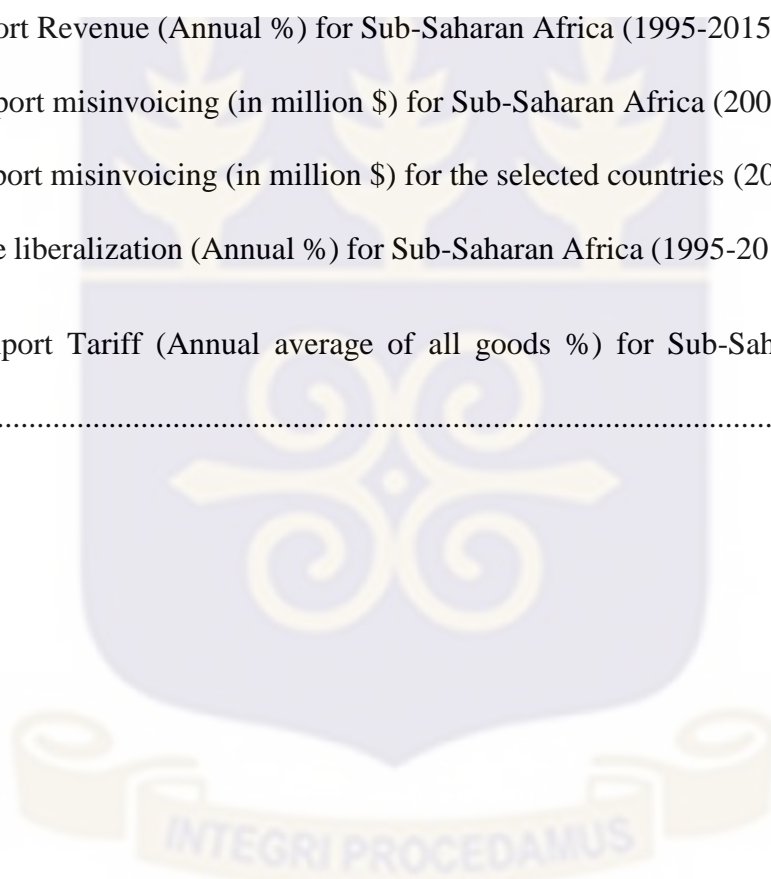
LIST OF TABLES

Table 4. 1: Hypothesized impact of the determinants on Imports Misinvoicing.....	333
Table 5. 1: Summary Statistics of Panel Data of Sub-Saharan Africa (1995-2015).....	50
Table 5. 2: Summary Statistics of the Misinvoicing Panel Data of Sub-Saharan Africa (2003-2013).....	50
Table 5. 3: Fisher Unit Root of Variables based on Augmented Dickey-Fuller.....	5252
Table 5. 4: Outcome of the Im-Pesaran-Shin tests for stationarity.....	533
Table 5. 5: Table 5. 5: GMM Panel estimation results (1995-2015).....	544
Table 5. 6: Outcome of Systems GMM dynamic panel estimation (2003-2013).....	577



LIST OF FIGURES

Figure 2. 2 The Laffer curve	11
Figure 3. 1: GDP Growth (Annual %) for sub-Saharan Africa (1995-2014).....	21
Figure 3. 2: GDP Per Capita Growth (Annual %) for sub-Saharan Africa (1995-2015).....	222
Figure 3. 3: Inflation (Annual %) for Sub-Saharan Africa (1995-2015)	233
Figure 3. 4: Real effective exchange (Annual %) for Sub-Saharan Africa (1995-2015)	244
Figure 3. 5: Import Revenue (Annual %) for Sub-Saharan Africa (1995-2015).....	255
Figure 3. 6A: Import misinvoicing (in million \$) for Sub-Saharan Africa (2003-2013).....	266
Figure 3. 6B: Import misinvoicing (in million \$) for the selected countries (2003-2013)	277
Figure 3. 7: Trade liberalization (Annual %) for Sub-Saharan Africa (1995-2015)	28
Figure 3. 8: Import Tariff (Annual average of all goods %) for Sub-Saharan Africa (1995-2015).....	29



LIST OF ABBREVIATIONS and ACRONYMS

ADF	Augmented Dickey-Fuller
AEC	African Economic Community
AEO	Africa Economic Outlook
AR	Autoregressive
AU	African Union
ECOWAS	Economic Community of West African States
GDP	Gross Domestic Product
GEP	Global Economic Prospects
GLS	Generalized Least Squares
GMM	Generalized Methods of Moment
GNI	Gross National Income
IDA	International Development Association
IMF	International Monetary Fund
IPS	Im-Pesaran- Shin
LDCs	Low Development Countries
LICs	Low Income Countries
LM	Lagrangian Multiplier
MICs	Middle Income Countries
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
REC	Regional Economic Communities
REO	Regional Economic Outlook
SSA	Sub-Saharan Africa
UN	United Nations
UNDP	United Nations Development Program
VAR	Vector Autoregressive
VAT	Value Added Tax

VIF	Variance Inflation Factor
WDI	World Development Indicators
WEO	World Economic Outlook
WGI	World Governance Indicators
WLS	Weighted Least Squares



CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Most Governments in developing countries make it their major aim to promote economic and social development (Leftwich, 1994). Governments are motivated to work towards achieving the expected goals directed at development. According to Kaldor (1964), a Government is responsible to raise enough income to undertake economic development. Irrespective of the prevalent ideology or political situation of any country, it is the responsibility of the Government in question, to provide basic needs from accrued revenue. For most Sub Saharan African countries with several needs but limited revenue thus resources, this provision becomes a major challenge (Tanzi, 1996). This challenge is partially clarified by high public demands for social facilities' in these low-income countries, a reflection of developing countries weaknesses in structure, in raising needed revenue for necessary public services provision and social amenities especially through taxation.

Wildford and Wilford (1978), pointed out that, it will be beneficial for developing countries to amass internal resources through revenue to support the provision of their economic needs. This notion is said to be an important economic policy supported by Economists.

With the drawback of Official Development Assistance (ODA) flows to most of the sub-Saharan African countries, there is an urgent need to mobilize revenue either directly or indirectly. Because of the high propensity of citizens to comply, countries are much more motivated to resort to taxation in order to increase tax revenue. An efficient tax policy execution is an effective way of gathering resources (revenues). Governments in most developing countries are not able to get the

maximum revenue from tax mobilization and this is premised on certain reasons, of these is the adoption of the apropos tax revenue system. In the developed world, the ratio of tax revenue to GDP is proximately 35%, 15% in developing nations, whereas, in the low-income countries, tax revenue is as low as 12% of GDP (Ndikumana, 2010). Three distinct trends in tax ratios are determined, by basing African countries on their level of income. Countries with income per capita between US\$ 3,856 and US\$ 11,905 are termed as “upper middle income”, “lower middle-income level” is given to countries whose per capita income falls between US\$ 976 and US 3,855 and “Low-income countries” are countries with income per capita around US\$ 975.

Two main types of taxation are known worldwide, the direct and indirect taxation (Cremer and Gahvari, 1995). A direct tax denotes those levies imposed on properties, wealth and earnings of persons and companies in a country by its Government. It is exclusive to the party that pays it, and cannot be transferred to another party (Fox and Wallich, 1997). Such taxes include profit tax, social security contributions, corporation tax, and income tax. Customs duties (tariff) levied on imports, and excise duties on production are indirect taxes (Cnossen, 2012).

Import duty is a tax imposed on foreign goods or services when entering into a country, it is paid by the importer of goods or services (Pfister, 2005). In recent years, countries are being encouraged to promote trade liberalization. This is the process of removing trade obstacles (i.e. charges) between different nations, which increases free trade in the long run. Trade liberalization encourages the movement of goods which in the long run turn to increase revenue. Averagely, developing countries that reduced their tariffs with precision in the 1980s grew more quickly in the 1990s as compared to those that did not.

There have been several arguments about the effect of tax rate on tax income, after Professor Laffer expanded Adam Smiths’ theory (Tijerina-Guajardo & Pagan, 2000), on the correlation between

tax rate and tax revenue (Bartlett and Roth, 1983). There exist both positive and negative relationship, the positive relationship exists only on the “Laffer curve” (refer to figure 3.1) known as the normal range. Beyond this, the slope of the curve drops, indicating a negative relationship and it’s referred to as the prohibitive range. (Ballard et al, 1985). The positive relationship implies growth in tax raises revenue (Bartlett and Roth, 1983), all other things being equal, with the negative relationship reducing the tax revenue following a tax rate increase. In practice, no Government will consciously charge a higher tax (beyond the normal range) (Fullerton, 1982). This conflicting debate has steered round politics and journalism over a vast diversity of both supported and unsupported claims and suggestions.

This research considers the effect of higher import tax rate on import revenue considering the introduction of trade liberalization and its impact on import tax rate and the volume of trade. The study differs from previous literature in that it adopts the panel data analysis in assessing this relationship.

Furthermore, in recent years, the worldwide debate (academically and politically) on development aid and development finance, indicated that tax inefficiency and leakages may negatively affect the ability to develop countries in raising enough revenue to finance their public sectors (Lal, 1995). They are therefore forced to consider other options like borrowing and grants.

One of such tax inefficiencies and leakages is trade misinvoicing, this is a major challenge in the importation and exportation of goods.

Trade misinvoicing is a term which refers to a process of moving money illegally across borders thus the deliberate misreporting of the cross-border commercial transaction value on the document sent to customs. Trade misinvoicing is said to be a major aspect of illegal financial outflows as

measured by Global Financial Integrity. Governments of sub-Saharan African countries lose an average of about US\$ 43 billion annually (Baker, 2014) through misinvoicing. In trying to restrict imports into domestic economies, many developing countries impose high import tariffs and barriers; this is in line with protecting their domestic industries as well as their precious foreign exchange reserves. This system influences importers in developing countries to misreport the value of their imports, thus evading these huge tariffs imposed by the importing country and also provides them with the opportunity of smuggling money out of the country (Biswas & Sengupta, 2011).

Systemic identification of faked invoicing was first done by Morgenstern (1963). He did this by juxtaposing the domestic trade statistics with the partner country statistics (Biswas and Sengupta, 2011). Initially, he proved the existence of corrupt activities (misinvoicing) within the international trade and further quarried the extent of misreporting using the data from partner countries (Biswas and Marjit, 2005).

This research further finds the effect of the import tariff on import misinvoicing, since much research has not been conducted on the relationship between higher import tariff and misinvoicing considering the changes in import tax rate.

1.2 Research Problem

Large fiscal deficits have been a major challenge confronting a number of SSA nations for several years. Rapid expansion in expenditure and low revenue levels have been assigned as the primary cause of such fiscal imbalances. In recent years, however, endogenous growth models argue that growth can be achieved by either decreasing expenditure levels or increasing revenue in order to

reduce the fiscal imbalances (Tanzi and Zee, 1997). As a result, many countries in the African sub-region including Ghana, Uganda, Nigeria, Kenya and many others have raised their tax rates through reforming their tax systems. Thus raising tax revenue to achieve fiscal sustainability has become the most feasible alternative. Most sub-Saharan African countries import goods and services into their countries to support the insufficient resources available for the people. Taxes are being imposed on such import for two main reasons; to raise revenue for the government and also protect local manufacturers of such goods (Donovan, 1996). According to Sindzingre (2007), revenue losses can be reduced by firming up local tax, encouraging exemption reduction and rate differentiation such as trade liberalization. The introduction of trade liberalization has decreased the tariffs drastically rather than increase it, but this trade liberalization has however eliminated most of the issues associated with the importation of goods (Shaw et al, 2001), it is therefore in the best interest of these nations to adopt this system. Again, countries like India, Vietnam, and Uganda, have experienced relatively rapid growth and swift poverty reduction with trade liberalization on the average, than other developing countries that did not open up their trade.

The introduction of ECOWAS trade systems has affected tax levels. Ghana, for instance, started charging this rate from February 2016 and this system is expected to raise import tariffs by about 0.308 per cent (according to a document published by Gesellschaft fur Internationale Zusammenarbeit (GIZ)). These systems are said to increase import revenue rather than reduces it.

The question, therefore is, “Is it the change in the import tariff that is responsible for the improvement in import tax revenue or there may be other factors?”

However, there have been wide variations in import tax revenue performance SSA nations since 1995. Some nations had ratios below 10 percent while others had ratios above 20 percent. The majority of countries had average import tax revenue-GDP ratios below 15 percent over the period

1995-2015. On average, the total import tax revenue-GDP ratio declined from 18.4 % in 1995 to 5 % in 2015. The largest decline was experienced by countries like—South Africa, Mauritius, Tanzania and Kenya.

Holding the elements of the tax base constant, this research investigates whether import tariff and economic policies can cause variation in import tax performance in SSA nations. Additionally, few empirical studies analyzing the relationship among tax rate and tax revenue in the globalization context in Sub-Saharan Africa has been undertaken. The current study proposes to empirically examine the effect of import tax rate (import tariff) on import tax revenue in Sub-Saharan Africa (SSA).

Furthermore, emerging nations face difficulties in tax mobilization revenues, creating gaps between actual monies collected and projected revenue (Dudley, 1963; Cheibud, 1998)

Importers of these countries with the aim of making huge profits try to avoid import tariff by underestimating the value of their goods. Others, with the aim of laundering money into the country, overestimate the actual value of their import. And this is termed as trade misinvoicing. Trade misinvoicing is said to be causing a lot of revenue loss to the Governments of these countries. It is reported that developing countries lose an amount averaging about \$542 billion dollars every year through illegal outflows (GFI, 2013). Trade misinvoicing is the cause of majority (thus 80%) of these illegal money outflows and does monstrous deterioration to the state of a country's economy and development (Mashiri & Sebele-Mpofu, 2015). With the introduction of trade liberalization, tariff rates have been reduced and assuming the normal firms' behavior, import tax revenue is expected to increase with a reduction in misinvoicing, but this has not been achieved. Misinvoicing still records high figures even with trade improvements and the presence of monitoring processes. This continues to affect revenue and GDP in the long run.

This research again seeks to find the effect of the import tariff on import misinvoicing. This will serve as an impetus to the already existing studies on this objective and it adds to the literature by using the panel regression techniques over some selected countries of SSA for which data was available.

This will provide more robust findings which can be used for policymaking and implementation on the effect of tax rate on tax revenue and misinvoicing. The research will also find out whether the variation in the import revenue is caused by increased in misinvoicing.

1.3 Study Objectives

The primary aim of this current study is to examine the effect of import tariff on import revenue and/or import misinvoicing in SSA over the period 1995 -2015 and from 2003 to 2013 respectively. Specifically, the study sought to:

- i. Investigate the relationship between Import Tariff Rate and Import Revenue generation in sub-Saharan Africa over the period under study
- ii. Explore the relationship between Import Tariff Rate and Import Misinvoicing in sub-Saharan Africa over the period under study

1.4 Research Questions

Following from the research objectives outlined, this study provides answers to the following questions:

- What is the relationship between Import Tariff Rate and Import Revenue generation in Sub-Saharan Africa over the period under study?

- What is the relationship between Import Tariff Rate and Import Misinvoicing in sub-Saharan Africa over the period under study?

1.5 Significance of the Study

Review of literature show little evidence of an empirical study on the effect of import tariff on import revenue and misinvoicing in Sub-Saharan Africa. The study therefore adds to several related works and also creates a platform which arouses some interest for further studies in this regards, serving as a source of reference for future studies in the area.

The study is also equally relevant to policy makers and Tax collection agencies in SSA. Findings from the study will help policy makers and Tax collection agencies in SSA gain a better and practical understanding in identifying best tariff rate and causes of misinvoicing, thereby implying measures to adapt to improve the level of proceeds within the trade tax system and also serve as a guideline to them, with regards to appropriate tax policy measures required for increasing revenue generation.

The study will also provide information to policy makers and stakeholders on the tax rate and its relation to trade misinvoicing which reduces Government revenue drastically and outline some models for policymakers to follow in their attempt of reducing misinvoicing and other forms of revenue leakages.

1.6 Organization of the Study

The research is as follows: Chapter one gives an introduction to the study. Chapter two reviews related and relevant literature on this subject area; Chapter three gives the overview of tax rate, import revenue, misinvoicing and some key related variables in this study in the Sub-Saharan African region; Chapter four discusses the methodology used in analyzing the panel data set; Chapter five reports the results of the data analysis and discussion; Chapter six summarizes and concludes the study findings and recommendations for policymakers.



CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents on the theory and empirical evidence on the effect of tax rate on tax revenue and misinvoicing in general in Sub-Saharan Africa (SSA). This section discusses the Laffer curve as a theoretical framework and argument of tax rates and tax revenue as well as empirical literature on tax rate and revenue. The theory of the measurement of a good tax system is also established.

2.1 Theoretical Framework

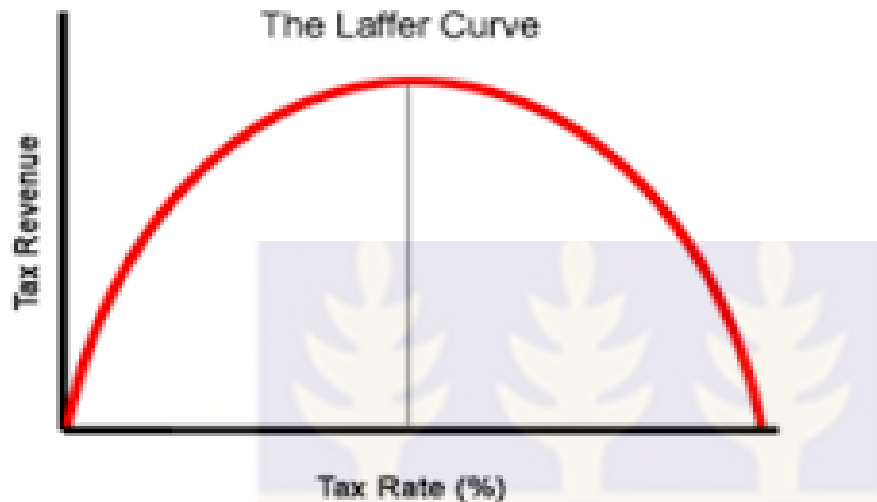
Professor Arthur Laffer (1974) theory on taxation, popularly known as the “Laffer Curve” highlights the theoretical basis for the relation between tax rates and tax revenue. This theory was initially propounded by Adams Smith (The Wealth of Nations). As such, we shall consider the Laffer curve as our theoretical framework. This is presented below:

2.1.1 The Laffer curve

The “Laffer Curve”, is a theoretical representation of the relationship between government revenue raised by taxation and all possible rates of taxation. This theory is demonstrated with a curve (i.e Laffer curve (Figure 2.1) which is constructed by an experiment), and is considered the amount of tax revenue raised at the extreme rates of 0% and 100%. The theory concludes that a 100% tax rate raises no revenue in the same way that a 0% tax rate raises no revenue. This is because, at 100% rate, there is no longer incentive for a rational taxpayer to earn any income or engage in trade. Laffer recognised Khaldun and Keynes, who advocate for tax cuts in order to reduce

government revenue thereby, reduce government spending and gain budget surpluses (Mouhammed, 2004).

Figure 2. 1: The Laffer curve



Source: (Laffer, 1974)

One potential result of this theory is that increasing tax rate beyond a certain point will become counterproductive, for raising further tax revenue because of diminishing returns (Laffer, 1974).

2.1.2 Tax Rate and Misinvoicing

The theoretical model for tax rate and misinvoicing is a direct presentation of a personal choice under uncertainty. This model of individual choice under uncertainty has been used to study tax evasion, where the individual is challenged to evade given the probability of being caught. In their study, income tax evasion; a theoretical view, Allingham and Sandmo (1972) showed that, for a risk-neutral individual, maximization of expected utility implies that evasion will tend to increase with marginal tax rates. Their objective was based on analyzing the individual taxpayers' decision

on whether to evade and to what extent to avoid taxes by deliberate underreporting. The study was related to the analysis of optimal portfolio and insurance policy in the economics of uncertainty.

In the case of risk aversion by Allingham and Sandmo (1972), they stated that "no clear-cut hypothesis emerges as to the connection between the regular tax rate and reported income." They, however, concluded this analysis by giving an economic meaning to the model, the model had two terms, a substitution effect favoring evasion and an income effect which does not favor tax evasion, the net effect, however, is uncertain. This is because, the substitution effect is negative where an increase in the tax rate makes it more profitable to evade taxes on the margin, the income effect, on the other hand, can be positive, zero and negative depending on the behavior of absolute risk aversion, if it is decreasing, constant or increasing. Since the decreasing risk aversion is the most appropriate assumption, a taxpayer is less wealthy with an increase in tax rate and this tends to reduce tax evasion, making the net effects uncertain. Yitzhaki (1987) concluded this model and said since most of the present concern is focused on marginal tax rates, holding constant total tax revenues (Giles and Caragata, 2001), the relevant theoretical question applies to the substitution effect of taxation, which encourages tax evasion.

Adopting this theory in import rate and misinvoicing, with an individual who is risk-neutral, the first-order condition is that the expected marginal cost of misinvoicing is equal to the tax rate on import. If the probability of the penalty rate rises with the amount of misinvoicing, then higher import tax rates will be associated with more import misinvoicing. A risk-averse person position will be uncertain as stated by Allingham- Sandmo (1972) but according to Yitzhaki (1987), the importer will be the invoice with a higher import rate.

2.2 Empirical Literature Review

This section discusses research related to this area of study.

2.2.1 Tax Rate and Revenue Generation Debate

The reflection of poor revenue performance in emerging nations stems from the fact that tax elasticity and buoyancy is low and thus the main idea behind the adoption of methods such as lower tax rate to improve the tax revenue. Nonetheless, others experts hold a contrary view. These tax experts hold the opinion that high taxation will lead to much revenue (as seen in the United Kingdom proposed to accrue of thirteen billion pounds if the tax hikes are raised to 20% (Nartey, 2011).

The bulkiest share of revenues for the majority of Sub-Saharan African countries is taxation, except countries that relatively, depend massively on natural resource blossoming, where revenue from nontax activities may be preeminent (Agbeyegbe et al, 2004). In most cases, the reforms were successful in increasing revenues, but much attention is further needed to solve a number of challenges in these countries' tax policies (Taylor, 2010). In analyzing the status for prosperous modification of the tax policies indicated that massive developments are needed to ensure the appropriate application of the tax policies, present the best technical assistance and promote the administration of reforms with larger affability in organizing their assets.

Tax systems enclose a vast range of taxes, and these can be grouped into three main classes: taxes on goods and services, income & profits taxes and taxes on international trade. The prime parts of the income and profits taxes are the personal income taxes and corporate taxes, even though there can be a capital gains tax set apart in some cases (Ballard, 2009).

International Trade Taxes constitute a valid determinant of proceeds in most SSA states. It is the tax paid on commodities moving in and out of a country. Revenue from import tax, however, composes a vast percentage of the trade tax revenues (Khattry and Rao, 2002).

Ghura (1998) used an unbalanced panel data set for 39 SSA countries from 1985-1996 in determining the effect of corruption and government policies on tax revenue. He found out that tax revenue- GDP ratio rises with an economy that practices an open market system, increase in income, GDP for agriculture dropped and the present of oil and non-oil mining sectors.

Globalization has had a significant impact on revenue generation in SSA; such includes the introduction of trade liberalization. According to Keen and Mansour (2010), trade liberalization decreased trade tax returns.

Adam et al (2000) employed panel regression analysis of twenty-two SSA nations to study the effect of reduction in inflation on revenue generation from 1980 to 1996. This study followed the devalued CFA Franc in 1994, which slightly improved their revenue generation in 1996. The devaluation of the CFA Franc was conducted following a continuous slump in the tax ratio to GDP, from almost 15 percent of GDP. It was realized, from using a simple theoretical model and an econometrical one that, the reduction in inflation also cajoled distortions in exchange rates' leading to discouraging revenue performance. Most of the countries failed to eliminate the distortions in the exchange rate due to structural and environmental factors. It was then concluded the poorly performed income in CFA nations under study was mostly due to structural, environmental and behavioural responses and not necessarily due to the changes in exchange rate. The study did not consider other determinants of revenue mobilization such as the GDP growth rate and per capita income.

Trade liberalization was however positive on tax revenues however without largely connected to overall tax revenues; they then concluded that the application of appropriate supportive monetary policies can boost the tax yield.

In analyzing the tax revenue in SSA, using Kenya as a case study, Cheeseman and Griffiths (2005) concluded that reduction in import tariffs due to trade liberalization has been prosperous. This is because, the increased in imports has compensated for the markdown in import revenue, proceeding increased in trade income. There will be pressures on the government of the country in its provision for social amenities, should trade liberalization be continued, this is because, the Kenyan government, for instance, did not receive enough revenue from trade.

In analyzing the tax system in Nigeria for the period 1970-1990, Ariyo (1997) renowned that tax productivity rest on effectiveness show a tax is administered and collected, ease of legislative instrument guiding taxation, apathy by the general public.

Bonga et al (2014) in measuring the tax performance of Zimbabwe estimated the elasticity and buoyancy of the taxation system for the period 2000-2013. They explored the tax regime in their country using traditional tax ratio trends and dynamic measures of tax buoyancy and tax elasticity. The two approaches produced a tax buoyancy statistic of 1.013 (more than unitary) suggesting the tax regime responded to the growth in countrywide revenue. Using the Dummy Variable Approach, findings showed no significant changes in tax regimes with “Zimbabwean Dollar” Era and the “Dollarization” Era. The study concludes that most of the revenue needed in Zimbabwe is collected by the authority rather than other parastatals or government institutions.

2.2.2 Import Tariff and Misinvoicing Debate

Clotfelter (1983) in his research provided econometric evidence showing tax avoidance is sensitive to minimal tax rates. The estimating elasticity of underreported revenue but it was however clear that the model used was too simple to describe tax evasion adequately. This is because, forms of tax evasion, for instance, might differ from one person to the other based on the circumstances. Dependence on these results, therefore, depends on the magnitude and other objectives.

Two methods were used by Patnaik and Vasudevan (2000) in determining the capital flight in India; “residual or broad measure” and the “Morgan Guaranty Trust Company”. Morgan Guaranty Trust Company concluded that maintaining policies like low inflation rate reduces capital flight through misinvoicing because it boosts the confidence of investors in the country.

Buehn and Eichler (2011) concluded that a higher black market price (BMP) induces over-invoicing of imports but decreases the incentive to under-invoice imports. Tax fraud was not found to be an incentive to is invoice imports but rather higher import tariffs increase imports under-invoicing and vice versa. The costs of deterrents were not significant to import over-invoicing it rather had a negative effect on import under-invoicing, where an increase in the fine rate reduces under-invoicing.

Biswas and Sengupta (2011) found out that, the rate of import under-invoicing rise with an increasing import duty rate. The tariff also caused increases in the production of the local firm's whiles a decline in import charge paid the importers is measured with a rise in the tariff. Another thing they realized was that raising the tariff without an adjustment in the monitoring efforts or penalties induces a rise in under invoice by importers, on the other hand adjusting the monitoring process without a change in the tariff rate reduces under-invoicing. Furthermore, the output of neither the local businesses nor the magnitude imports is influenced by altering the process or the

penalty imposed. In that way profits of domestic producer increases with increased charge rate and vice versa. Remarkably an increase in the tariff lowers imports but increases under-invoicing concurrently; this automatically increases the domestic price of the good, which in effect benefits the importer. It was realized that welfare increases with the increase in the penalty- this is because government collect higher penalties- but the increase in the monitoring processor tariff increases welfare to a point then diminishing returns set in, it is, therefore, necessary to set an optimal point for the rate.

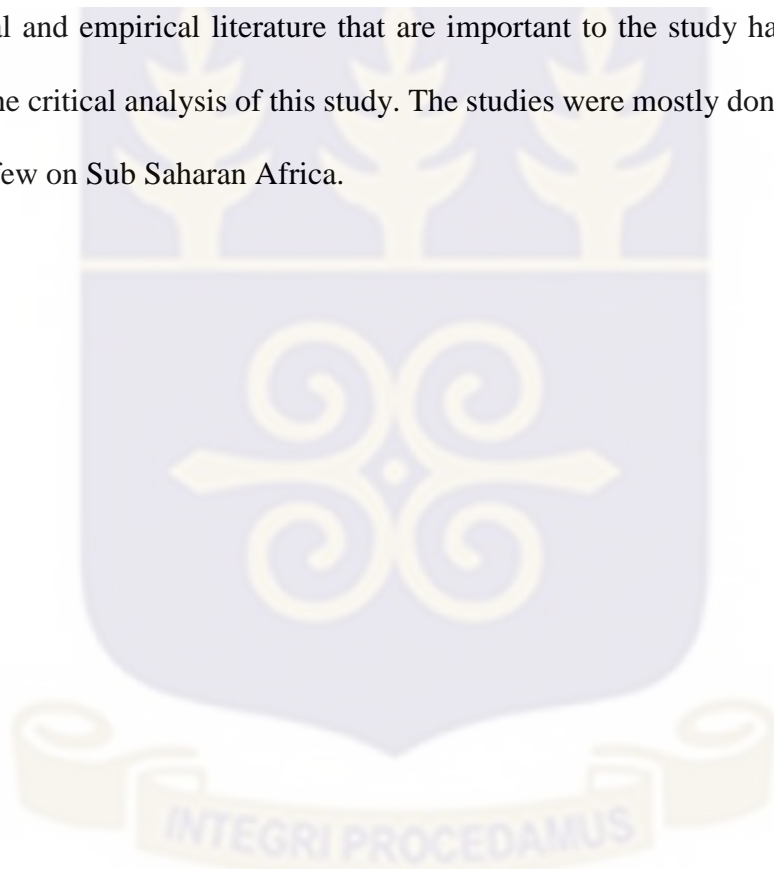
Biswas (2012) analyses the consequences of a tight and restricted foreign trade regime that can soon be a fact following worldwide economic meltdown. It relates corrupt misinvoicing phenomena in trade statistics with restrictive trade regime. He made a simple cartel framework to show that so long as restrictive tariff barriers are erected, both export and import under-invoicing are possible. The result shows that high tariff barrier gives incentives not only to the importers but also to the exporters to gain by underreporting the trade statistics. Interestingly, this paper shows that even if foreign exchange is fully floated, underground foreign exchange market can be created and traders may rationally underreport without any gain through black market premium – a departure from conventional theory.

Farzanegan (2009) investigates the main causes and consequences of import and export smuggling and estimates the relative index of smuggling in Iran from 1970 to 2002. The Multiple Indicators - Multiple Causes (MIMIC) econometric modelling was used for a comprehensive analysis of the latent variable of smuggling. The main results of the paper indicate that the rate of fine for smuggling and the general level of education reduce smuggling, while the tariff burden increases the incentives for illegal trade. Moreover, trade openness accompanies more illegal trade for the case of Iran. On average, the relative size of smuggling was about 13% of the total trade in Iran.

The absolute amount of smuggling per year was about \$3 billion. Major institutional effects as well as exogenous shocks like oil prices, war, revolution and unification of exchange rates over the period of study were controlled for.

2.3 Conclusion

This chapter looked at the previous literature of other studies that have been done in this area of study. Theoretical and empirical literature that are important to the study has been reviewed in order to help in the critical analysis of this study. The studies were mostly done on the developing countries with a few on Sub Saharan Africa.



CHAPTER THREE

OVERVIEW OF IMPORT TAX RATE, IMPORT TAX REVENUE AND IMPORT MISINVOICING

3.0 Introduction

This chapter presents an overview of taxation as a source of revenue to Governments. It presents a historical overview as well as some current trends within the import sector with the aim of setting the study within a context. It outlines the various level of import tax and the level of revenue generated at that level. Furthermore, the chapter describes some trend and recent developments of selected macroeconomic variables that are relevant to this study.

3.1 Nature of the Sub-Saharan African Region

Sub-Saharan Africa is very diverse in nature, in respect of the angle one looks at it, whether on the population, income levels, or output of the economy. There are forty-eight (48) countries in SSA as well as the IMF has decomposed these countries into four key sub-group, comprising, the oil exporters, middle-income countries, fragile countries and non-fragile low-income countries (IMF, 2012).

The Oil exporter's countries are Angola, Cameroon, Chad, Equatorial Guinea, Gabon, Nigeria and the Republic of Congo. These countries earn about 70-80% of their national revenues through export of oil. The oil production comprises of about 35-60% of the country's GDP and this plays a significant role in managing the country's economic developments.

These countries can further be categorized into two; the first economies refer to countries that have long attained the middle-income level, with South Africa leading in this category. The rest of the countries are Botswana, Cape Verde, Lesotho, Mauritius, Namibia, Seychelles and Swaziland.

The category refers to economies that recently attained the minimum per capita income position, and they are Ghana, Senegal and Zambia.

According to the World Bank's IDA Resource Allocation Index of institutional quality, fragile countries are countries that have low ratings, and these countries are Burundi, Central African Republic, Comoros, Democratic Republic of Congo, Cote d'Ivoire, Guinea, Guinea-Bissau, Liberia, Sao Tome and Principe, Togo and Zimbabwe. Countries in this sub-group are referred to as such because their economic developments to a larger extent can be influenced by non-economic events such as civil conflicts and other political upheavals.

Non-fragile low-income countries, on the other hand, are economies whose economic developments are normally accredited to more typical economic factors. The countries found in this group are Benin, Burkina Faso, Ethiopia, the Gambia, Kenya and Madagascar. Malawi, Mali, Mozambique, Niger, Rwanda, Sierra Leone, Tanzania and Uganda are all in this category.

The oil exporters reported at US\$ 1,500 per capita (IMF, 2012). The low-income countries and the fragile countries recorded a relatively low level of GNI per capita levels at about US\$ 400 and US\$ 500, respectively.

Frey and Volz (2013) however, observed that the Sub-Saharan African region can further be grouped into 14 Regional Economic Communities (RECs) on the basis of countries which coordinate their economic activities as part of the African Economic Community (AEC) as promulgated by the Abuja Treaty in 1991 and subsequently in 1994.

Currently, SSA countries have recorded a persistent growth, especially for the low-income economies. Even with that, Gross Domestic Product (GDP) growth rate has to be different among the various countries under the mentioned grouping, especially, with income levels. The GDP

growth rate for most of the various income levels fell in the year 2009 greatly due to the global financial crises, the middle-income countries, however, experienced a drastically fall from a rate of 5.6 percent in 2007 to 0.16 percent. GDP growth for fragile countries, however, increased to 6.9 percent in 2012 with that of the oil exporting countries falling to 3.5 percent which then picked up again with a rate of 5.7 percent in 2013 and 5.9 in 2014. Fragile countries GDP is growing at the same rate, with a GDP growth rate (IMF, 2015).

Figure 3. 1: GDP Growth (Annual %) for sub-Saharan Africa (1995-2014)



Source: World Development Indicators, (World Bank, 2016).

The rest of the chapter looks at discussions on the recent developments and trends in GDP per capita growth and other macroeconomic variables, considering the period under study.

3.2 Trends in Per Capita Income Growth Rate in SSA

Growth in per capita income of the SSA region has been steadily low especially when compared with other developing areas like Latin America and Pacific's and even more, very low when the per capita incomes of developed regions such as OECD are taken into account. This low capita growth is greatly associated with the poor nature of growth.

Per capita income in SSA has experienced a remarkable increase from 1995 to date; it stood at an average of 1.49% around 1980 and increased in two subsequent decades. This can be associated with stable political systems and also Government fiscal discipline. The per capita income average growth rate stood around 2.07% between 1991- 2000 and again stood at 5.26% between 2001 and 2010.

The per capita GDP growth performance is considered remarkably (Bruckner and Lederman 2012), this is because, for over four decades starting from 1960, the growth rate had been desolate, averaging around 0.5% per annum. The trend is shown in the figure below:

Figure 3. 2: GDP Per Capita Growth (Annual %) for sub-Saharan Africa (1995-2015)

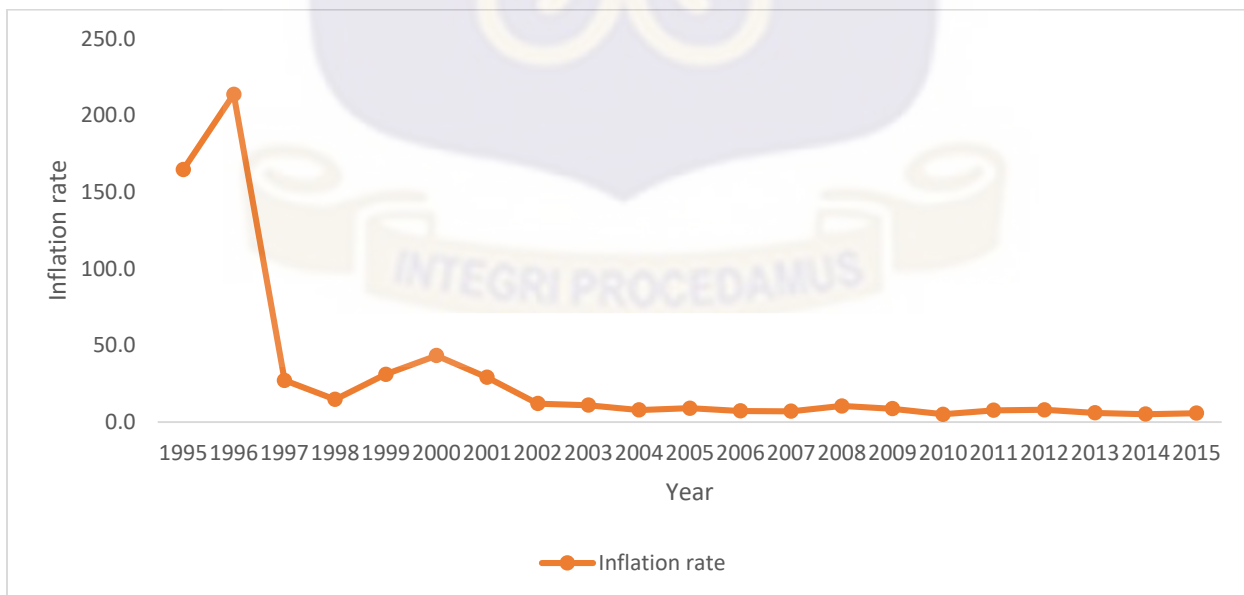


Source: World Development Indicators, (World Bank, 2016)

3.3 Trends in Inflation Rate in SSA

There has been a general fall in inflation from the 1993 period and onwards. The SSA region had an average inflation of 9.67% around 1990, and it increased to 27.44 percent in 1994. The inflation rate, however, remained low, it reached about 4.21% in 2004 over a decade. It then increased to 10.55 percent per annum in 2008. This moderate increase in inflation can be associated to a number of reasons such as; the sharply increased in domestic food prices countries such as Guinea, Kenya, Madagascar and Sierra Leone. Unfavorable weather conditions which lead to poor harvests in countries like Benin (Floods) and Kenya (drought). Major factors such as political crisis and foreign exchange shortages also accounted for the fall in inflation in Cote d'Ivoire and Guinea respectively (IMF, 2011), and importing countries such as Guinea, Sierra Leone and Madagascar were also affected by the high international prices. Overall, the average inflation in SSA declines by 4.0% over the period (WDI, 2012). The figure below depicts the trend of the inflation over the period.

Figure 3. 3: Inflation (Annual %) for Sub-Saharan Africa (1995-2015)

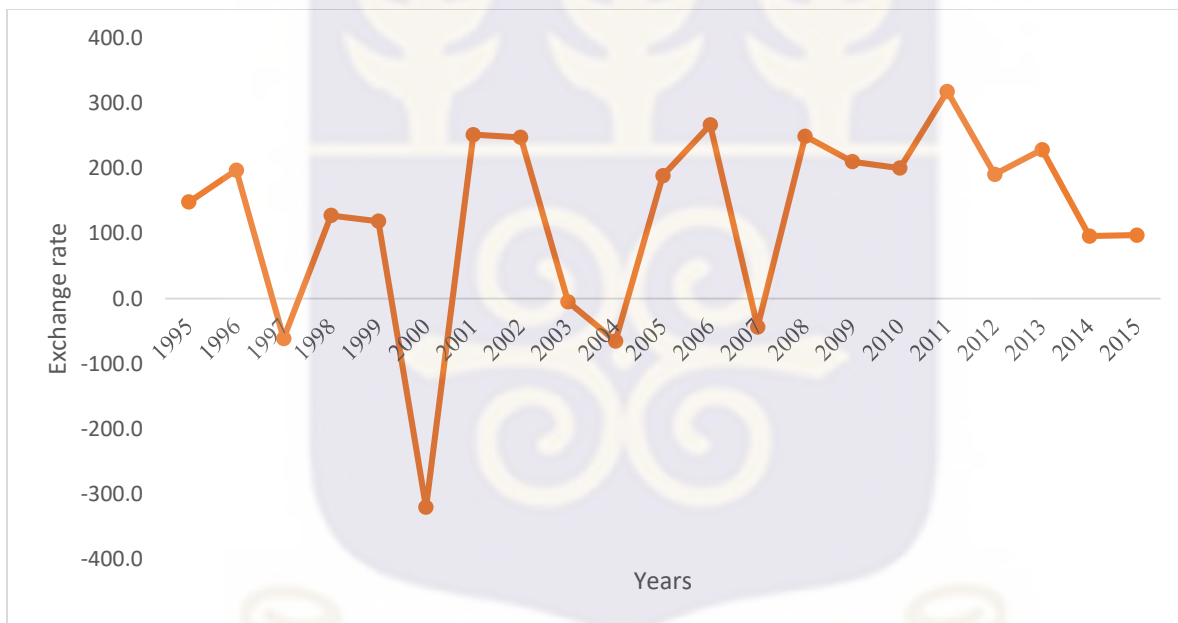


Source: World Development Indicators, (World Bank, 2016)

3.4 Trends in Real effective exchange Rate in SSA

This is used to measure the comparative movements in aggregate price indices across countries. This research adopted the standard real effective exchange rate and this and it is expressed in a common currency and again weighted by gross bilateral trade share. This makes exports a bit costly, but imports are however made cheaper than the locally made goods, resulting in a fall in the import revenue. The REER over the period recorded a sustained depreciation from 1995-2002, but it, however, recorded a strong appreciation afterwards. The trend is shown in the figure below.

Figure 3. 4: Real effective exchange (Annual %) for Sub-Saharan Africa (1995-2015)



Source: World Development Indicators, (World Bank, 2016)

3.5 Trends in Import Revenue in Sub- Saharan Africa

Import revenue includes revenue for protection purposes. The level of the income depends on the rate of the import duties imposed by each country and it can either be based on specific or ad valorem. The import revenue was relatively high in 1990 (Seychelles, for instance, had very high

import revenue), but however fall in 2000 with the introduction of trade liberalization, other trade unions and also due to import misinvoicing. Ghana, for instance, loses an average of US\$386 million per year due to trade misinvoicing. The income level is expected to further fall with more trade liberalization systems in place but increase the overall income levels in the countries. The figure below depicts the trend.

Figure 3. 5: Import Revenue (Annual %) for Sub-Saharan Africa (1995-2015)



Source: World Development Indicators, (World Bank, 2016)

3.6 Trends in Import & Trade misinvoicing in Sub-Saharan Africa

Trade misinvoicing forms up to 80 percent (Baker et al, 2014) of illegal fiscal losses from emerging nations which is on the annual average of about \$542 billion. The main process of determining the misinvoicing data is through the enquiry on differences among trade data developed nations account to the financial agencies as well as the UN. Import misinvoicing keeps increasing over the period. It however declined around 2008 to 2010 but experienced a sharp increase afterwards.

Figure 3.6a depicts the trend and figure 3.6b shows the import misinvoicing for the selected

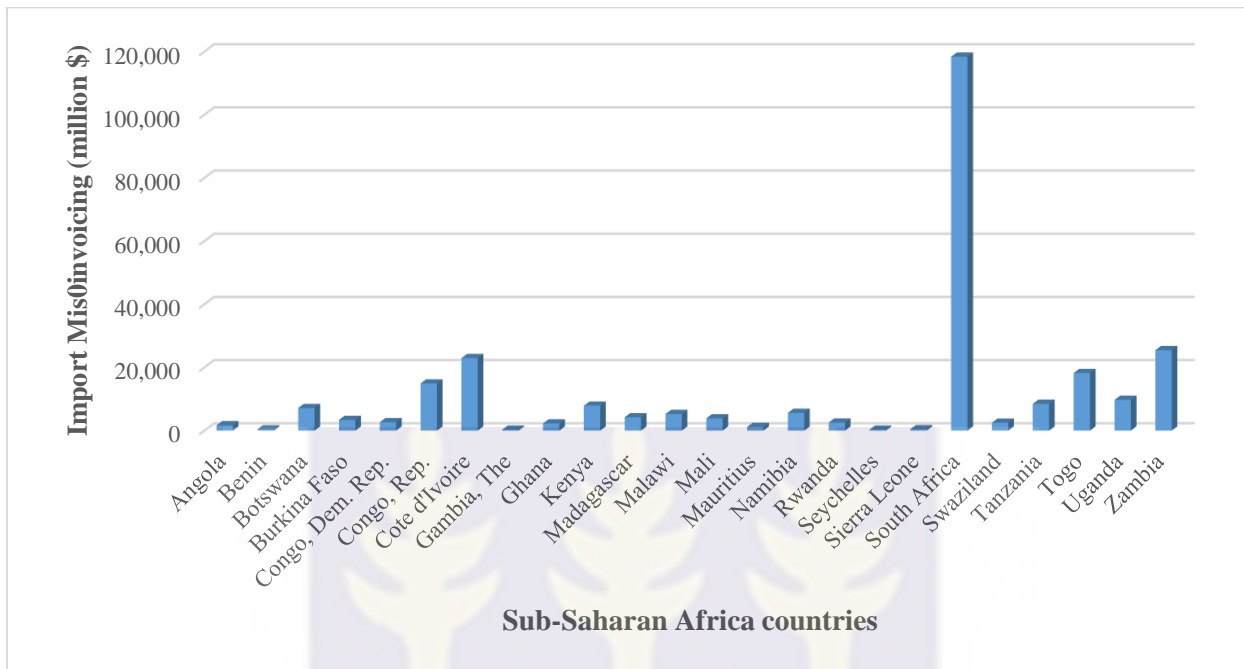
countries. South Africa recorded the highest import misinvoicing of about US\$118,376.1 million, followed by Zambia which had about US\$25,473.12 million. Gambia recorded the least value of about US\$293.0556 million and Benin with 396.7024 million. The figures are below.

Figure 3. 6A: Import misinvoicing (in million \$) for Sub-Saharan Africa (2003-2013)



Source: UN Comtrade database

Figure 3. 6B: Import misinvoicing (in million \$) for the selected countries (2003-2013)

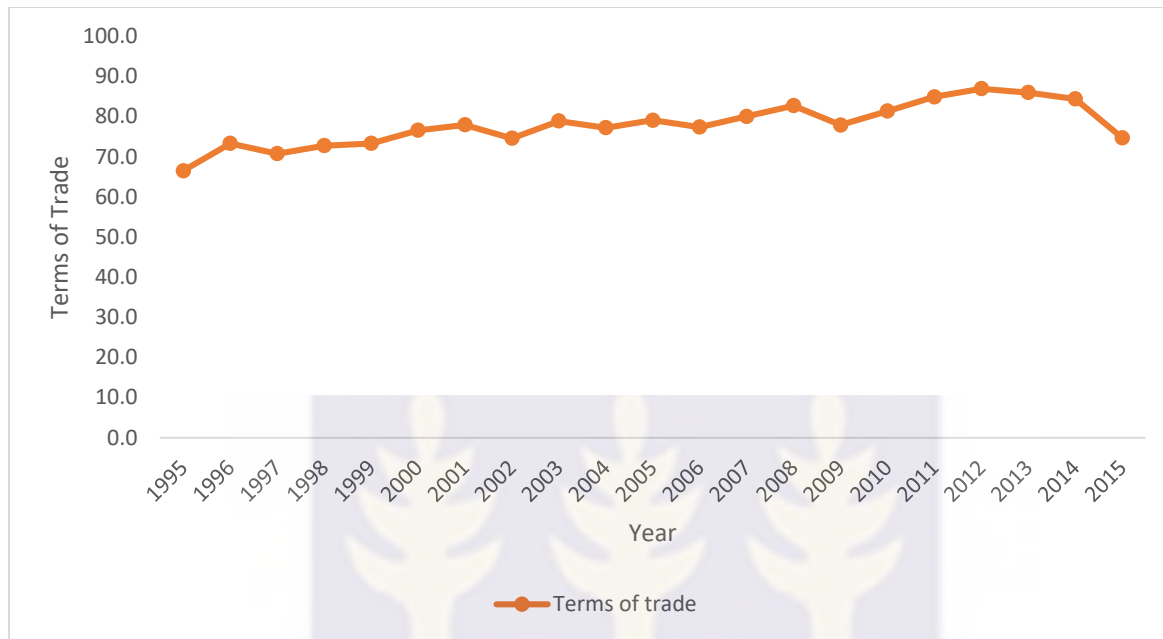


Source: UN Comtrade database

3.7 Trends in Trade liberalization in Sub- Saharan Africa

Trade liberalization does not necessarily increase trade neither does it affect the direction of trade between the two trading countries. There are a lot of proxies that can be used for this, but terms of trade were used in this analysis. The term of trade over the period has experienced a sustained growth and trade continues to improve over time. The trend is shown below.

Figure 3. 7: Trade liberalization (Annual %) for Sub-Saharan Africa (1995-2015)

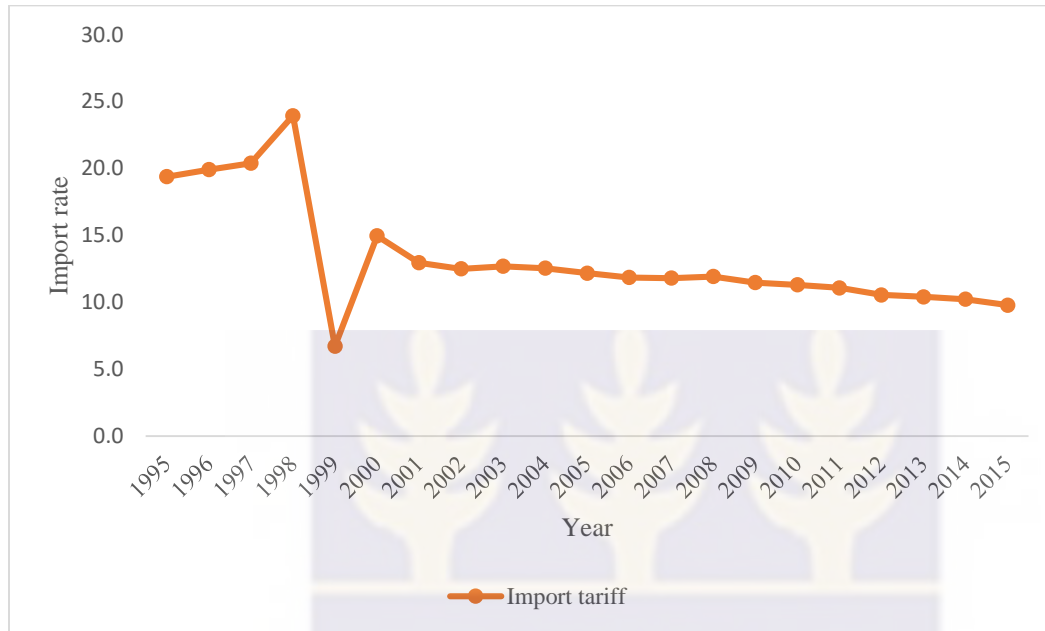


Source: World Development Indicators, (World Bank, 2016)

3.8 Trends in Import Tariff in Sub-Saharan Africa

Import tariff refers are employed to limit trade by making imported goods more expensive than locally manufactured goods. The introduction of trade liberalization has reduced the tariff imposed on imported goods and services. On the whole, most countries especially the West Africa countries charge almost the same rate due to the trade agreement they have in common. The import tariff was high in the 1990's but this has fallen over time due to the introduction of trade liberalization and other trade agreement.

Figure 3. 7: Import Tariff (Annual average of all goods %) for Sub-Saharan Africa (1995-2015)



Source: World Development Indicators, (World Bank, 2016)

3.9 Conclusion

This chapter provided a clear discussion on the nature of the Sub-Saharan African region taking into account the country groupings and trends in economic growth. It also gave an elaboration on some variables that affect trade income and the volumes as well. The next chapter looks at the methodology used in this study

CHAPTER FOUR

METHODOLOGY

4.0 Introduction

The chapter considers the theoretical framework of this study, advanced from theories. The data sources, the variables employed as well as present the econometric model and assessment strategy applied, the model used and the various statistical test.

4.1 Analytical Framework

4.1.1 Tax Rate and Revenue Generation

With the introduction of trade liberation and subsequent reduction in the tariffs rate, it is expected that the overall tax revenue will increase through the other forms of indirect taxation'.

Theoretically, more revenue is raised from highly elastic sectors with respect to national income. Higher levels of revenue can also be achieved by altering the factors that affect tax revenue. Such factors also known as the determinant of tax revenue include economic policies, quality tax administration as well as the level of tax rate. However, cautions must be taken in improving the revenue ratio in many African countries (Heller, 1975). The concept of the public decision-maker utility function is therefore employed in the study of the effect of import rate on import revenue in SSA as used by Heller (1975) and Ghura (1998).

4.1.2 Utility Function

In finding the effect of higher import rate on import revenue, in addition to the impact of other economic variables, the public decision-maker utility function (Ghura, 1998) is used, an extension of the tax model developed by Heller (1975). The utility function is given by;

$$U = U(Y - T, G, D; F + L), \quad (1)$$

$$U_{Y-T} \text{ and } U_G > 0,$$

$U_D \text{ and } U_{F+L} < 0$ if $D \text{ and } F+L > 0$, and

$$U_D \text{ and } U_{F+L} > 0 \text{ if } D \text{ and } F + L < 0$$

Where Y is GDP and T is tax revenue, D is the net domestic government borrowing; G is the total government expenditure The budget restraint is given by

$$T + F + L + D = G \quad (3)$$

Expanding the applied tax model by Leuthold (1991), we obtain as follows

$$\frac{T}{Y} = f\left\{\left(\frac{T}{Y}\right)^*, B, E, T\right\} \quad (3)$$

Following Heller (1975), the utility function is as follows:

$$U = a_1(Y - T - Y_s)^2 + a_3(G - G_s) - \frac{a_4}{2}(G - G_s)^2 - a_5D - \frac{a_6}{2}D^2 - a_7(F + L) - a_8(F + L)^2 \quad (4)$$

Empirically, a quadratic utility function is preferable to a log-linear function. Following Leuthold (1991), assume a simple linear functions of income, as follows;

$$G_{\$} = g_0 + g_1Y \quad (5a)$$

And

$$Y_{\$} = y_0 + y_1Y \quad (5b)$$

Maximizing (1) the tax revenue- GDP ratio:

$$\left(\frac{T}{Y}\right)^* = \left(\frac{\alpha + a_4g_0 - \beta y_0}{\beta + a_4}\right)\left(\frac{1}{Y}\right) - \left(\frac{a_4}{\beta + a_4}\right)\left(\frac{[F+L]}{Y}\right) + \left(\frac{[a_4g_1 - \beta y_1]}{\beta + a_4}\right), \quad (6)$$

where $\alpha = \left(-a_1 + a_3 - \frac{a_1a_4}{a_6} + \frac{a_4a_5}{a_6}\right)$ and $\beta = \frac{a_2(a_4 + a_6)}{a_6}$. Combining (3) and (6) yields

$$\frac{T}{Y} = f\left(\frac{1}{Y}, \frac{F+L}{Y}, B, E, T\right) \quad (7)$$

Since β is positive and α could either be positive or negative. The determinant of tax revenue's literature outlines a set of testable hypothesis. This research focuses on those hypotheses on income of interest; the tax base which is import tax revenue in this instance (a percentage of GDP), tax rate (import tariff), economic policies (inflation, government expenditure and growth rate), trade openness and external environment (exchange rate).

4.1.3 Tax rate and import misinvoicing

This research adopted an approach by Brehn and Eichler (2011). Using the United States as the country that export goods (base country) to the selected African countries in this research, a domestic entrepreneur determines how much to report ($M-S^M$) from a given imported goods M . The domestic importer has to make two decisions concerning the number of goods to report. Firstly, he can decide under invoice imports, $S^M > 0$, or to over invoice imports $S^M < 0$.

Secondly, the importer also decides on the actual value of import to misinvoice, S^M , which will yield the highest expected profit.

$$E(\pi^M) = (1 - t^{inc})[R(M) - (1 + t^M)ep^{us}(M - S^M)] - (1 + V)ep^{us}S^M - prob(\backslash S^M \backslash; H)F,$$

With $\partial prob \backslash \partial S^M > 0, \partial^2 prob (\partial S^M)^2 > 0,$ and $\partial prob / \partial H > 0,$ (8)

Where $E(\pi^M)$ is the projected revenue, t^{inc} refers to the domestic tax

An importer with imports goods M from the United States who sells them at the domestic market earns R (M) in domestic currency units. The tariff- inclusive import costs that the importer reports is $(1 + t^M)ep^{us}(M - S^M), t^{inc}$, he realizes an after-tax profit of $(1 - t^{inc})[R(M) - (1 + t^M)ep^{us}(M - S^M)]$.

Rearranging equation (1) from the previous page, we can determine whether under invoicing or over invoicing exists:

$$E(\pi^M) = (1 - t^{inc})[R(M) - (1 + t^M)ep^{us}M] + [(1 - t^{inc})(1 + t^M) - (1 + V)]ep^{us}S^M - prob(\backslash S^M \backslash; H)F, \tag{8a}$$

The real exchange rate ($\varepsilon = ep^{us}/p^{dom}$) can also be used by dividing the importers expected profit (1a) by the domestic price index to get the profit in real terms;

$$\frac{E(\pi^M)}{p^{dom}} = (1 - t^{inc}) \left[\frac{R(M)}{p^{dom}} - (1 + t^M)\varepsilon M \right] + [(1 - t^{inc})(1 + t^M) - (1 + V)]\varepsilon S^M - prob(\backslash S^M \backslash; H)F/p^{dom}$$

Table 4. 1: Hypothesized impact of the determinants on Imports Misinvoicing

	Import Underinvoicing	Import Overinvoicing
BMP(v)	-	+
Tax on Income and Profit (t^{inc})	-	+

Import Tariffs (t^M)	+	-
Real Exchange Rate (ε)	+	+
Intensity of Prosecution (H)	-	-
Punishment Cost	-	-

4.2 The Empirical Model

To analyze the effect of import tariffs on import revenue and misinvoicing, the study used the system generalized method of moments. This method which is panel regression technique is employed Vong et al. (2009).

The model

A dynamic panel model contains lags of the dependent variables as one of the regressors to help remove any time in-variant specific effect as show below.

$$y_{it} = \alpha y_{i,t-1} + \beta' X_{it} + v_i + e_{it} \dots \dots \dots (11)$$

For $t = 1, \dots, T$ and $i = 1, \dots, N$. $E(e_{it}) = 0$, and $E(e_{it} e_{js}) = \sigma_e^2$ if $j = I$ and $t = s$, and

$E(e_{it} e_{js}) = 0$ otherwise.

This estimation technique assumes that:

$$E(v_i) = 0 \quad E(x_{it} v_i) = 0$$

The GMM assumes that, the first difference of the estimation model is taken, so as to remove the time invariant specific fixed effects, which is, v_i .

$$y_{it} - y_{i,t-1} = \alpha(y_{i,t-1} + y_{i,t-2}) + \beta'(X_{it} - X_{i,t-1}) + (e_{it} - e_{i,t-1}) \dots\dots\dots(12)$$

For $t = 1, \dots, T$ and $i = 1, \dots, N$

The equation can be re-written as,

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \Delta' x_{it} \beta + \Delta e_{it} \dots\dots\dots(13)$$

The GMM dynamic panel estimation model assumes strict exogeneity of the time varying independent variables, thus $E(x_{it} e_{it}) = 0$ for every t and s which makes the x 's valid instruments for the equation.

The model further assumes the following situations;

$$E[y_{i,t-2-j}(y_{i,t-1} - y_{i,t-2})] \neq 0 \dots\dots\dots(14)$$

$$E[y_{i,t-2-j}(e_{it} - e_{i,t-1})] = 0 \dots\dots\dots(15)$$

More specially, the following moment's conditions are assumed by the GMM dynamic estimation model, which when employed in the procedure produces an estimator which is efficient and consistent.

The first one is the moment conditions for the differenced equation;

$$E[y_{i,t-j} \cdot (e_{it} - e_{i,t-1})] = 0 \text{ for } j \geq 2; t = 3, \dots, T \dots\dots\dots(16)$$

$$E[x_{i,t-j} \cdot (e_{it} - e_{i,t-1})] = 0 \text{ for } j \geq 2; t = 3, \dots, T \dots\dots\dots(17)$$

And the second one is conditions for the different levels of regression;

$$E[(y_{i,t-j} - y_{i,t-j-1}) \cdot (v_i + e_{it})] = 0 \text{ for } j = 1 \dots\dots\dots(18)$$

$$E[(x_{i,t-j} - x_{i,t-j-1}) \cdot (v_i + e_{it})] = 0 \text{ for } j = 1 \dots\dots\dots (19)$$

In specifying the empirical model:

For the empirical estimation model, this study adopts the use of the estimation model as stated in the above by constructing a model based on the study objectives.

Empirical Models:

The dynamic model with the lagged variable is given as:

$$\text{ImRev}_{it} = \alpha \text{ImRev}_{i,t-1} + \rho \text{ImTar}_{it} + \beta X_{it} + v_i + e_{it} \dots\dots\dots (20)$$

To explain the impact of import tariffs on import revenue, we follow the studies of Ghura (1998), where the system GMM dynamic panel model is employed to investigate this relationship.

Misinvoicing is also explained by using the model below

$$\text{Misin}_{it} = \alpha \text{Misin}_{i,t-1} + \rho \text{ImTar}_{it} + \beta X_{it} + v_i + e_{it} \dots\dots\dots (20a)$$

v_i is the unobserved country-specific fixed effects while e_{it} is the error term. The subscript i represents the individual country and t denotes time period. α is coefficients of the lagged values of the dependent variables and ρ , and β are the coefficients of the other explanatory variables. The dependent variable for the first model is import revenue, whereas import misinvoicing is the dependent variable for the second model. The measure of import revenue used in this study is the Customs and other import duties as a percentage of Gross Domestic Product (ImRev_{it}). The $\text{ImRev}_{i,t-1}$ is the lagged value of the dependent variable for the first model. $\text{Misin}_{i,t-1}$ is the lagged value of the dependent variable for the second model. ImTar_{it} is the measure for import rate, which is measured by the average import tariff of all imported goods. X_{it} represents a vector of control variables, which include Exchange rate, Inflation, GDP, Government Expenditure, Trade

Openness and Trade Liberalization. These are variables that have been applied in previous studies (E.g. Adam et al, 2001 and Ghura, 1998).

From the technique of the GMM dynamic panel estimation model, the first difference of equation (11 and 11a) are taken to remove the country specific fixed effects;

$$(\text{ImRev}_{it} - \text{ImRev}_{i,t-1}) = \alpha (\text{ImRev}_{i,t-1} - \text{ImRev}_{i,t-2}) + \rho (\text{ImTar}_{it} - \text{ImTar}_{it-1}) + \beta' (X_{it} - X_{it-1}) + (e_{it} - e_{it}) \dots\dots\dots(21)$$

$$(\text{Misin}_{it} - \text{Misin}_{it-1}) = \alpha (\text{Misin}_{it-1} - \text{Misin}_{it-2}) + \rho (\text{ImTar}_{it} - \text{ImTar}_{it-1}) + \beta' (X_{it} - X_{it-1}) + (e_{it} - e_{it}) \dots\dots\dots(21a)$$

4.2.1 Diagnostic Tests

To ensure that the estimation results are reliable, we carry out a unit root test to examine whether or not the data is stationary.

4.2.2 Testing for Unit Roots in Panel Data

A unit-root test is conducted to determine the stationarity or otherwise of the panel data-set before carrying out any panel data estimation. The study tested stationarity of all variables employed. All panel unit roots begin with the following:

$$Y_{it} = \delta_i Y_{it-1} + \lambda X_{it} + \mu_{it}$$

If $|\delta_i| < 1$, Y_{it} is stationary. On the other hand, if $|\delta_i| = 1$, Y_{it} then contains a unit root.

The study will employ the Fisher type as proposed by Choi (2001) based on Augmented Dickey-Fuller test to examine the stationarity property of our panel variables. This is because of the asymptotic property of “T” being infinite and “N” being finite in the data; it does not also require a balanced panel and can be used for different lag length in different individual regressions. It

applies to any unit-root test (Baltagi, 2008). This type of test is conducted on all variables used in the estimation model. The Im-Pesaran-Shin (IPS) stationarity test is used to check for the robustness of this test and it also allows for an unbalanced panel data-set. This test is conducted on the null hypothesis as well, holding that all panels contain unit-root with the alternative that, the fraction of panels that follow stationarity is non-zero. With this, the null hypothesis is rejected for any of the variables containing a unit-root if the p-value that corresponds to the test statistic (specifically the $z-t\text{-tilde-bar}$) is substantially zero or otherwise accepted.

4.2.3 Multicollinearity Test

Multicollinearity is a state of very high intercorrelations or inter-associations among independent variables and if present in a data set the statistical inferences made about the data may not be reliable. Multicollinearity is caused by inaccurate use of dummy variables and inclusion of a variable which is computed from other variables in the data set. It can also result from the repetition of the same kind of variable and/or when the variables are highly correlated to each other. Multicollinearity can result in several problems, such as unprecised partial regression coefficient estimates, and high standard errors. It also makes it tedious to assess the relative importance of the independent variables in explaining the variation caused by the dependent variable. In the presence of high multicollinearity, the confidence intervals of the coefficients tend to become very wide and the statistics tend to be very small making it difficult to reject the null hypothesis of any data under study.

There are certain signals which is used to detect the degree of multicollinearity. One such signal is if the individual outcome of a statistic is not significant but the overall outcome of the statistic

is significant. In this instance, there will be a mixture of both significant and insignificant results showing the presence of multicollinearity. Also, if the sample is divided into two parts, and it comes out that the coefficients of the sample differ drastically, then it can be concluded that, multicollinearity is present in the analysis, making the coefficients unstable. Again, if it is observed that, there is a drastic change in the model by simply adding or dropping some variable, then it can also be concluded that, there is multicollinearity present in the data.

Multicollinearity can also be detected with the help of tolerance and its reciprocal, called variance inflation factor (VIF). If the value of tolerance is less than 0.2 or 0.1 and, simultaneously, the value of VIF 10 and above, then the multicollinearity is present and problematic.

Post-estimation Tests

In order to check for the accuracy of the system GMM estimator, two main post-estimation diagnostic tests were conducted:

- (i) Sargan test - to find out the validity of the internal instruments employed in the system GMM model;
- (ii) Autocorrelation test – to test for serial correlation of the error term.

4.2.4 Sargan Test

The Sargan test is a test used to check for over-identifying restrictions in a statistical model (Marquering and Verbeek, 2004). The null hypothesis is rejected, if the calculated P-value is less than 0.05. On the other hand, if the calculated p-value is more than 0.05, we fail to reject the null hypothesis and accept the alternative hypothesis. If the null hypothesis is accepted, the instruments

are assumed to have passed the test and are therefore considered to be valid instruments by this standard. The higher the p-value of the Sargan statistic the better, indicating that the all the instruments are strongly exogenous.

4.2.5 Autocorrelation Test

The presence of autocorrelation is tested for in the model, to find out whether the error terms are not correlated. The null hypothesis of the test is that there is no autocorrelation and is done for the differenced residuals. Usually, the autocorrelation test for the first order autoregressive process [AR (1)] rejects the null hypothesis, by the form;

$$\Delta \varepsilon_{(i,t)} = \varepsilon_{(i,t)} - \varepsilon_{(i,t-1)} \text{ and } \Delta \varepsilon_{(i,t-1)} = \varepsilon_{(i,t-1)} - \varepsilon_{(i,t-2)}$$

However, the autocorrelation test for the second order autoregressive process [AR (2)] is the first difference of utmost importance, since it will detect autocorrelation at levels (Edison et al, 2002).

4.2.6 Hausman Specification Test

Hausman (1978) specification test is used to test whether or not the explanatory variables are correlated with the disturbance term. Thus, this test examines the endogeneity of the explanatory variables. The issue of endogeneity is very important for the random effect estimation model since the estimator becomes inefficient when the regressors are endogenous (Marquering and Verbeek, 2004). When the regressors are found to be exogenous, the random effect estimator becomes a consistent and efficient estimator relative to the within estimator (Fixed effects).

The Hausman (1978) specification test is conducted on the null hypothesis that, the random effect and the fixed effects estimators are not incomparably different. Thus, $\text{plim} (\beta_{FE} - \beta_{RE}) = 0$.

The test follows a Chi-squared distribution with K degrees of freedom, where K is the number of elements in the estimator. The null hypothesis is not rejected, if the estimated probability value (p-

value) after comparing it with the conventional significance level of 0.05, is greater than 0.05, and it is concluded that, there is no significant difference between the random effect and the fixed effects estimator. Meaning, the regressors are not correlated with the error term, thus the random effect estimator is a consistent and efficient one. However, if the null hypothesis is not violated, the fixed effect and the random effect are consistent but the fixed effect is inefficient. On the other hand, if the estimated p-value is less than 0.05, we reject the null hypothesis and conclude that the random effect and the fixed effects estimator are significantly different. Meaning, the regressors are correlated with the error term so, the random effect is not an efficient estimator, thus, the fixed effects estimator is used, because, if the null hypothesis is violated, it implies that the fixed effects estimator is consistent but the random effect is inconsistent and biased.

4.2.7 Breusch and Pagan Lagrange Multiplier Test for Random Effects (LM Test)

The Breusch-Pagan Lagrange multiplier test is a test conducted to find out whether there is heteroskedasticity in the Random effects model. To test for homoskedasticity in the random effect estimator, which happens to be a transformed and more efficient OLS estimator? This is done because; the OLS estimator has homoskedasticity as one of its basic assumptions. The homoskedasticity property assumes that variance of the error terms must be constant over the fitted values in the model.

Thus, $\text{Var} [\varepsilon_i | X] = \sigma^2$, for all $i=1 \dots n$,

and

$\text{Cov} [\varepsilon_i \varepsilon_j | X] = 0$, for all $i \neq j$.

The assumption of homoskedasticity is very significant for the computation of appropriate standards errors and its corresponding t-tests.

The Breusch-Pagan LM test is conducted under the null hypothesis of homoskedasticity (Greene, 2012). In the decision-making process, the estimated p-value is compared with the conventional 0.05 significance level. If the estimated p-value is greater than 0.05, we fail to reject (accept) the null hypothesis and conclude that, the error terms exhibit the property of homoskedasticity. The implication is that the estimated standard errors and their associated t-tests are appropriate. However, if the estimated p-value is less than 0.05, we reject the null hypothesis and say that the error terms are heteroskedastic. Implying that, the model is wrongly specified or there is the presence of outliers in the model.

4.3 Definition of Variables and Expected Signs

4.3.1 Dependent Variable

The dependent variable of the study is Import Revenue as a percentage of GDP and import misinvoicing.

Import Revenue

These are levies imposed on imported goods and services for revenue or protection purposes and are collected by the customs authorities of a country. It refers to taxes collected on imports and it is based on the value of goods called ad valorem duty or the weight, dimensions, or other criteria of the item such as its size. It is one of the major sources of revenue for a country.

Import Misinvoicing

Import misinvoicing refers to the misreporting of importers trade, it could either be under-invoicing or over-invoicing. This practice is adopted by traders to transfer money illicitly across

borders, thus to foreign countries or in other words to keep their money in foreign accounts. The proxy used is the import misinvoicing in millions of U.S. dollars (nominal).

Estimating the Import Misinvoicing Data

The formula below is then used to derive the import misinvoicing

$$\text{Import Misinvoicing} = (M_{ia}/COIF) - X_{ai} M_{ia} (M_{ia} + M_{id})$$

Where M is imports, X is exports, and COIF is the cost of freight and insurance, which is taken to be 10% of the importing country's reported imports and is used to deflate the cost of imports for comparative analysis. The subscripts α represent advanced countries, thus the reporting country, d represent developing countries indicating the direction of the trade, and i is the nation.

Two main databases report trade statistics on a bilateral basis for all countries; the IMF's Direction of Trade Statistics (DOTS) database and the United Nation's Commodity Trade (UN Comtrade) database. However, this study used the UN Comtrade database because it provides a more reliable set of numbers on countries' external trade by products and has bilateral trade data for most countries at large.

4.3.2 Independent Variables

The variable of interest in this study is import tariffs.

Import Tariffs

A tariff or duty (used interchangeably) is a tax levied by Governments on the value including freight and insurance of imported goods and services. Varying tariffs are applied to different products by different countries. The proxy used is tariff rate.

Squared Import Tariff

The import tariff was squared to find out whether there is a threshold at which to increase import tariff. That is if a normal range exists for the tariff and to find the effect of increasing the tariff rate beyond that limit. The values used for import tariff was squared in the analysis.

4.3.3 Control Variables

Government Expenditure

Government expenditure has an ambiguous impact on import revenue. Government expenditure induces trade openness (Oyeleke and Akinlo, 2016) which in turn increases misinvoicing, Government expenditure is also used as a proxy for external indebtedness because of borrowing nature of most of the sub-Saharan African countries. This is because external debt signal fiscal crisis and it induces capital flight hence trade misinvoicing, it, therefore, has a positive impact on import misinvoicing. General Government final consumption expenditure is used as the proxy.

Trade Liberalization

There are two proxies for the degree of liberalization, the traditional measure of openness, which is defined as the international trade as a percentage of GDP. In this case, a much higher ratio is taken to represent greater trade liberalization, (Ebrill et al (1999) and Adam et al (2001) employed the traditional measure of trade openness). The second is a measure of economic policies that restrict or promote trade among trading countries, thus the value of trade (total of exports and imports) as a share of gross domestic product (GDP). Trade openness is used in this analysis and it is expected to have a positive impact on import revenue, this is because changes in relative prices, typically cause changes in the level and composition of imports.

Trade openness induces misinvoicing; this is because a larger trading sector induces investors to misinvoice, implying a positive impact on misinvoicing.

Inflation

It is the persistent increase in the general price levels for goods and services. It is measured as an annual percentage increase. Inflation measures expansion in the financial sector, as inflation rises, the amount of money one owns, buys a smaller percentage of a good or service. The value of the money does not stay constant when there is inflation; this has a negative impact on revenue generation. A lower level of inflation boosts the economy and motivates investors to keep their assets in the economy hence a positive impact on misinvoicing.

Interest Rate

The proxy used is Real interest rate (%) from the World Bank Database (2016) and it defined Real interest rate as the lending interest rate adjusted for inflation as measured by the GDP deflator. An increase in interest rate causes the economy to contract, which in turn rises unemployment and also lead to stagnation and lowering of tax revenue to Government. A rise in interest rate affects the local currency to appreciate making imports cheaper thereby increases import which in turn increases import revenue. It, therefore, has a positive relationship with import revenue. Due to hot money flows investors are more likely to invest in foreign banks and induced importers to over-report the value of their goods in order to laud money into foreign countries, thus a positive relationship with import misinvoicing.

GDP Per Capita Growth

There are some common indicators used as measurements for the growth of an economy. In this study, real GDP per capita growth was used. The definition of the World Data is; “GDP Per Capita

is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the product divided by midyear population". This measure evaluates the activities of an economy, and by using this indicator for all the chosen countries on the same currency, results can be properly compared. Another advantage of this proxy is that the population differences are also included in this indicator, which means the correct estimations can be computed. This is also used as a proxy for punishment to investors that misinvoice should one be caught; thus it measures the per capita the investor will lose should he be fined or imprisoned. The higher the GDP per capita, the lower the incentive to misinvoice. The GDP per capita growth rate has a negative impact on misinvoicing.

Exchange Rate

This is the value of one country's currency in terms of another currency. Altering this can directly change the domestic collections from imports. At any level of imports, depreciation in the real exchange rate would lead to an increase in the base of trade taxes in the domestic currency, thereby, lead to an increase in trade tax collections. In this case, a real depreciation causes a lower level of imports, which can offset some of the major collections promoted by higher domestic currency values. A real higher exchange rate can cause a shift in the composition toward a more price inelastic and also less heavily taxed goods, which include domestic substitutes and this, add to the factors that also account for lower revenues. Exchange rate, therefore, has a negative impact on import revenue.

4.4 The Data Source and Sample Size

The study makes use of annual data of 24 selected Sub-Saharan African countries over the period 1995-2015 for the import tariff and import revenue analysis. The study used panel data from the World Development Indicators (WDI) (World Bank Database, 2016) and World Economic Outlook (2016). It is however conducted for the period 2003 to 2013 for the import tariff and import misinvoicing analysis (this analysis could not be extended due to unavailability of the misinvoicing data for some of the years). This analysis uses misinvoicing data compiled by the Global Financial Integrity (GFI) from the United Nation's Commodity Trade (UN Comtrade) database.

The countries are Angola, Benin, Burkina Faso, Botswana, Congo, Democratic Republic, Congo Republic, Cote d'Ivoire, Gambia, Ghana, Kenya, Mali, Madagascar, Malawi, Mauritius, Namibia, Rwanda, Seychelles, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda and Zambia.

The data include import revenue as a percentage of GDP, import tariff, trade misinvoicing, inflation, exchange rate, trade openness, interest rate, government expenditure (% of GDP) and GDP per capita income growth. To facilitate the data analysis process, Stata 13.0 statistical package was used.

4.5 Conclusion

In summary, this chapter developed and presented the conceptual as well as methodological framework appropriate for doing this work. The model was developed from the theoretical formulations of both utility function and the theory of uncertainty. The chapter also described the estimation technique employed in this study. Annual time series data on import revenue, import

tariffs, trade misinvoicing, inflation, trade openness, interest rate, government expenditure to GDP, exchange rate and per capita GDP growth was employed for the study. The chapter also described the variables used and sources of data.



CHAPTER FIVE

DATA ANALYSIS AND DISCUSSION OF RESULTS

5.0 Introduction

This chapter describes the analysis of the data set used in order to help achieve the objectives of the study. The descriptive statistics of the data set is presented and it's followed by pre estimation sensitivity analysis tests. The systems generalized method of moments (GMM) estimation technique is used in the panel data-set estimation.

The first estimation examines the effect of import tax rate on import tax revenue, and the second estimation examines the impact of import tax rate on import misinvoicing. The chapter also gives a detailed insight of how the estimations are carried out to achieve the above-stated objectives of the study.

5.1 Descriptive Statistics

Panel data from 24 countries in Sub-Saharan Africa over the periods 1995-2015 (for the revenue analysis) and 2003-2013 (for the misinvoicing analysis) were surveyed for the study. Seven (7) different variables were employed in the study to test the effect of tax rate on tax revenue as well as misinvoicing, the import tariff was however squared which added up to eight (8). The country choices included in the study were based solely on the availability of data.

The critical statistics discussed included and the descriptive statistics of the variables are presented in Table 5.1.

Table 5. 1: Summary Statistics of Panel Data of Sub-Saharan Africa (1995-2015)

Variable	Observations	Mean	Std. Dev.	Min	Max
Import Revenue	335	24.89625	17.40174	1.726955	77.07555
Government Expenditure	485	107.4242	12.01698	59.18201	148.1836
Terms of Trade	502	78.26913	36.87302	25.04194	225.0231
Inflation	491	29.53421	227.1756	-35.83668	4145.108
GDP per Capita	504	4.787446	4.323546	-20.49085	35.22408
Exchange Rate	476	127.6503	957.0874	-10453.51	5719.655
Import Tariff	324	12.05855	4.983647	0.51	34.7
Interest Rate	395	7.923493	13.82377	-94.21994	52.25613
Import Tariff (squared)	324	170.1687	150.3625	0.2601	1204.09

Source: Author's computation (WDI, 2016; IMF, 2016 and WGI, 2016)

Table 5. 2: Summary Statistics of the Misinvoicing Panel Data of Sub-Saharan Africa (2003-2013)

Variable	Observations	Mean	Std. Dev.	Min	Max
Import Misinvoicing	240	1125.211	3029.451	0	28930.3
Government Expenditure	279	107.5829	12.36901	59.18201	148.1836
Terms of Trade	288	81.39727	36.84561	30.73252	225.0231
Inflation	287	7.804888	8.562057	-35.83668	98.22372
GDP per Capita	288	5.397003	3.562041	-7.65231	22.59305
Exchange Rate	274	155.9699	885.0791	-10453.51	2596.761

Import Tariff	242	11.47194	3.864619	1.19	23.02
Interest Rate	247	8.019509	9.910505	-22.71358	52.25613
Import Tariff (squared)	242	146.479	88.75637	1.4161	529.9204
Import Misinvoicing (log)	196	5.87642	2.990451	-29.39203	10.27264

Source: Author's computation (WDI, 2016; IMF, 2016 and WGI, 2016)

The mean values are reported in the third column. It measures the central tendency for the variables. For example, import tariff (squared) had the highest mean value for the first analysis while GDP per Capita growth rate had the least.

The fourth column is the standard deviation which measures dispersion. Higher values of standard deviation indicate greater dispersion or fluctuations in the variable. For instance, still in the first analysis, exchange rate, had the largest dispersion measured by its standard deviation value of 957.0874.

5.2 Pre Estimation Sensitivity Analyses

This section presents and discusses the pre-estimation sensitivity analysis to check stationarity properties of the variables.

5.2.1 Stationarity or Unit Root Test

The results of Stationarity tests are shown in Table 5.3. Before a panel data estimation that is efficient and unbiased is carried out, a panel data stationarity test is conducted. This is to determine whether the panel data-set is stationary or if it contains a unit-root and perhaps free from any time series processes. This test is important because it helps removes any biases in the estimation analysis that may accrue from time series processes. As a measure of robustness, two different unit

root test statistics were computed. The Augmented Dickey-Fuller (ADF) unit-root test and check for robustness by using the Im-Pesaran-Shin stationarity test. For the null hypothesis of the ADF unit root, it can be shown that all panels are non-stationary (unit-root), with the alternative hypothesis implying that, the panels are stationary. The null hypothesis of unit-root in the panel data-set is rejected in favour of the alternative hypothesis if the p-value is zero and otherwise accepted. The same process applies to the Im-Pesaran-Shin test.

Table 5. 3: Fisher Unit Root of Variables based on Augmented Dickey-Fuller

Variable	Test Statistic		Probability Value
	Structure of lag	Value	
Import Tariff (squared)	Level	13.9300	0.0000
Import Revenue	Level	9.4442	0.0000
Inflation	Level	23.2085	0.0000
GDP per capita	Level	25.8796	0.0000
Exchange Rate	Level	17.3672	0.0000
Import Tariff	Level	11.3625	0.0000
Government Expenditure	Level	7.0577	0.0000
Terms of Trade	Level	4.4135	0.0000
Interest Rate	Level	16.8637	0.0000
Import Misinvoicing	Level	7.0036	0.0000

Source: STATA 13 (Authors calculation with data from WDI and United Nation’s Commodity Trade (UN Comtrade) database.

Note: The modified inv. Chi-square Pm statistical values are used

The ADF results in table 5.3 above shows that, the p-value of all the variables, is zero. This allows the null hypothesis to be rejected for all the variables, and it can be concluded that all panels, are stationary. The Im-Pesaran-Shin test result in table 5.4 also has a p-value of zero for most of the variables showing that the panels are stationary. The Im-Pesaran-Shin test endorses the ADF test

that the panels are stationary, and can, therefore, conclude that, the panel data-set is stationary and there is no problem of time-series procedures or processes.

Table 5. 4: Outcome of the Im-Pesaran-Shin tests for stationarity

Variable	Test Statistic		Probability Value
	Structure of lag	Value	
Import Tariff (squared)	Level	-	-
Import Revenue	Level	-	-
Inflation	Level	-8.8921	0.0000
GDP per capita	Level	-9.3601	0.0000
Exchange Rate	Level	-7.1920	0.0000
Import Tariff	Level	-	-
Government Expenditure	Level	-	-
Terms of Trade	Level	-5.4796	0.0000
Interest Rate	Level	-	-
Import Misinvoicing	Level	-3.5996	0.0002

Source: STATA 13 (Authors calculation with data from WDI and United Nation's Commodity Trade (UN Comtrade) database.

Note: Import Tariff (squared), Import Revenue, Import Tariff, Government Expenditure and Interest Rate could not be tested because of lack of sufficient observations.

5.2.2 Multicollinearity test

The multicollinearity test result from the analysis follows the given rule of thumb, that the mean VIFs should be less than 10 (or equivalently, tolerances of more than .10). The result was 3.67 and 6.06 (shown in Table 5.5 and 5.6) for the first and second model respectively. It can be concluded that the analysis is free from multicollinearity problem and hence all the independent variables are fit for the analysis. The full is shown in appendices 6A and 6B.

5.3 Panel Data Estimation Results

5.3.1 Import Rate and Import Revenue

In the first objective, the study seeks to investigate the effect of import tax on import revenue in Sub-Saharan Africa.

The results shown below in Table 5.5 are the outputs of the systems GMM estimation panel data estimation. Import tariff, inflation, GDP per capita growth rate, terms of trade, interest rate, government expenditure and exchange rate are employed as independent variables.

Dependent Variable: Import Revenue

Table 5. 5: Table 5. 5: GMM Panel estimation results (1995-2015)

Explanatory Variable	Coefficient	Standard Errors (Robust)
Import Tariff	2.7291***	0.8466
Import Tariff (Squared)	-0.0859**	0.0350
Government Expenditure	-0.0343	0.2079
Terms of Trade	0.0715	0.0571
Inflation	0.0279	0.0561
Interest Rate	0.0352	0.0382
Exchange Rate	0.0005	0.0005
GDP per Capita	2.4266*	1.4421
Number of Observation	= 177	
Number of Groups	= 23	
Number of Instruments	= 15	
P-Value of AR (1)	0.350	
P-Value of AR (2)	0.965	
P-Value of Sargan test	0.756	
Mean VIF	3.61	

Source: Author's estimation with data from WDI (World Bank, 2016)

Note: One-step Systems GMM estimation results with robust standard error at *** p<0.01, ** p<0.05, * p<0.1. Probability values of diagnostic test are presented as well.

The above results from the systems GMM estimation suggest that; a positive and significant (at 1%) relationship exists between import tax (as a proxy by custom tariff) and import revenue. Thus,

an additional increase in import tax will lead to import revenue going up by 2.7291 unit. This suggests that the level of import tax rate in the sub-Saharan region increases with import tax revenue. Thus, a percentage increase in import rate will lead to 2.7291 unit rise in the import revenue. This result is consistent with the works of Cheeseman and Griffiths (2005), Omondi et al (2014) and also Nartey (2011) who had a positive but insignificant long-run effect of VAT tax rate on VAT revenue. The result, however, conflicts that of Ebrill et al (1999) which concluded that import tariff reforms don't imperatively affect trade tax revenue.

Squaring the import tariff, however, had a negative (also significant) impact on import revenue, meaning that, doubling the import tariff will result in a fall in the import revenue. This result confirms the theory of the Laffer curve which states that a contrary association exists between tax rate and tax receipts in the long run where higher tax is charged, thus higher tax revenue is achieved when increased in tax rate is low thus, tax rate rises with the tax revenue to a point and the revenue begins to fall after that point with a further rise in the tax rate. In agreement with the works of Ballard et al (1985), Canto, Joines and Lafer (2014) and Beck (1979). From the result above, squaring the import rate will lead to 0.0859 unit fall in the import revenue.

The coefficient of GDP is termed as tax buoyancy and it presents how a percentage change in income affects tax revenue. More specifically, it measures the automatic response of tax revenue to GDP changes excluding the discretionary changes in tax. A positive significant relationship exists between GDP (proxy as GDP per Capita growth rate) in this study, thus a percentage increase in GDP will lead to a rise of 2.4266 unit in import revenue. The coefficient of GDP (2.4266) is more than one implying that the tax buoyancy is elastic. It can, therefore, be said that a percentage rise in GDP income results in a positive and more than proportionate change in import

revenue. This confirms the works of Twerefou et al (2008) who found higher buoyancy for total tax in Ghana and that's of Bonga et al (2014).

Government expenditure and Trade openness had an insignificant impact on import revenue. The insignificant impact of Government expenditure on import revenue can be associated with the fact that, some of the Government spending (expenditure) in the sub-Saharan African region do not facilitate economic activity which brings about economic growth and in turn improve the trading sector of the various economies and import revenue. Moreover, since trade liberalization (proxy as terms of trade) constitutes the sum of imports and exports as a share of GDP, it could be that trade liberalization favor exports more than import in the sub-Saharan African and properly has had no impact on import revenue. This result, however, is not consistent with both Adam et al (2000) that concluded that tax yield rises with neither favorable terms of trade nor that of Khattry and Mohan Rao (2002) which had an inverse relationship. The insignificant impact could also be that most countries in the region even though importing, may not be importing enough to strongly boost import revenue, hence the insignificant effect. For example, falling commodity prices in recent times on the global market is really affecting countries in this region, since most import revenue is charged on the price of the commodities.

The inflation, exchange rate and interest rate all had insignificant result from the model. This can be associated to the fact that most Sub- Saharan African countries institutions are inefficient and in effect breeds corruption, political instability and macroeconomic instability in the region. As a result, most of the countries failed to accumulate the effect of changes in this macroeconomics due to structural and environmental factors. For instance, Adam et al (2000), stated in their work that, most of the countries, they studied failed to eliminate the distortions in the exchange rate due to structural and environmental factors resulting in low levels of revenue. Differences in behavioral

responses to the same changes in the equilibrium real exchange rate also accounted for 15-30% of the discrepancies all leading to a fall in the revenue. This result is consistent with Nartey (2011) which also had an insignificant relationship between inflation and VAT revenue.

5.3.2 Misinvoicing and Import Tariff

The second objective of this study is to find out the effect of import tax rate on import misinvoicing in Sub-Saharan Africa.

We first consider the estimated effects of the control variables as shown in Table 5.6 below.

Dependent Variable: Import Misinvoicing

Table 5. 6: Outcome of Systems GMM dynamic panel estimation (2003-2013)

Explanatory Variable	Coefficient	Standard Errors (Robust)
Import Tariff	0.2947**	0.3025
Import Tariff (Squared)	0.0076	0.0115
Government Expenditure	-0.0569**	0.0246
Terms of Trade	-0.0188*	0.0154
Inflation	0.0682	0.0417
Interest Rate	0.0132	0.0218
Exchange Rate	-0.0001**	0.0001
GDP per Capita	0.0248	0.2962
Number of Observation	= 124	
Number of Groups	= 22	
Number of Instruments	= 107	
P-Value of AR (1)	0.842	
P-Value of AR (2)	0.876	
P-Value of Sargan test	0.583	
Mean VIF	6.08	

Source: Author's estimation with data from UN Comtrade data and WDI (World Bank, 2016)

Note: One-step Systems GMM estimation results with robust standard error at *** p<0.01, ** p<0.05, * p<0.1. Probability values of diagnostic test are presented as well.

The result from the above table shows a positive significant impact of an import tariff on import misinvoicing. Thus, a percentage increase in the import tax rate leads to a 0.2947 rise in import misinvoicing. This confirms the findings of Brehn and Eichler, (2011) and Biswas and Sengupta (2010), which shows that increase in the tariff rate induces importers to increase import under-invoicing since the benefits outweigh the cost at this point. In the case of increased tax rate, import over-invoicing is reduced but import under-invoicing is increased (Brehn and Eichler, 2011), this result can, therefore, mean that, the effect a higher tax rate has on import under-invoicing is so drastic that it outweighs the effect on import over-invoicing, hence the positive impact of import rate on misinvoicing.

Squaring the import tariff do not have any significant impact on import misinvoicing, this can be that increasing the import tariff to a point (in the long run) do not necessarily influence one's decision to either misinvoice or not but rather other factors such as the probability of being caught and the profit from misinvoicing. This could also be attributed to the weak institutions and regulations of the customs officials in the region which is not able to collect and protect the proceeds from the increased tariffs, and the inefficiency of the administrative system which is not able to smoothly operate under a strong and stable macroeconomic environment (Borenstein et al., 1998).

Government expenditure had a negative but significant impact on import misinvoicing, thus a percentage rise in Government expenditure decreases misinvoicing by 0.0569 unit. Government expenditure is used as a proxy for external indebtedness, and a negative relationship implies that Government of the countries in sub-Saharan Africa does not misinvoice import in order to increase the external debt for their personal gains. This is not consistent with the finding of Patnaik et al

(2010), which concluded that Government expenditure is positively related to capital flight and thus misinvoicing.

Trade openness was negative but significant, thus an improvement in the terms of trade reduces misinvoicing by 0.0188 units. This means that the realization of the terms of trade such as reducing import tariff and custom quotas reduces import misinvoicing. Thus easy importation of goods reduces misinvoicing but contradicts the finding of Patnaik et al (2010) that shows that a larger tradable sector induces misinvoicing.

Inflation and interest rate had an insignificant effect on misinvoicing. Maintaining macroeconomics policies like stable inflation and interest rate reduces misinvoicing because it boosts the confidence of investors in the country (Patnaik et al, 2012). The insignificant impact can be as a result of unexplained factors and other noticeable factors such as low level of custom institutions which do not encourage the confidence of importers.

The exchange rate has a negative but significant effect on misinvoicing, meaning a rise in the exchange rate (depreciation) will lead to a fall in misinvoicing by 0.0001unit, thus a percentage rise in the exchange rate will lead to 0.01% fall in misinvoicing, a relatively low value but significant. A depreciation (higher) exchange rate is expected to induce import misinvoicing (Buehn and Eichler, 2011) since the purchasing power parity of the foreign currency increases and more profit is earned from misinvoicing hence a positive relationship. The result from the regression was however negative and this can be due to the weak institutions in the regions, the impact of the exchange rate changes was not fully absorbed by the countries making misinvoicing not that profitable during that period.

GDP per capita growth had a positive but insignificant impact on misinvoicing in sub-Saharan Africa, this is used as a proxy for punishment if one is caught for misinvoicing (Buehn and Eichler, 2011). This insignificant relationship can be related to the fact that GDP per capita in these regions is relatively small which do not serve as a deterrent to offenders. This confirms to the study of Buehn and Eichler (2011) which shows that a higher risk of appropriation reduces misinvoicing but it was also however insignificant.

The result from the first model shows that import revenue is improved by increased in import tariff and also increased in the GDP per capita, showing a buoyant international trading system of the region. The import revenue, however, falls when the import tariff is increased excessively, implying that the region import trade is discouraged from higher import tariff.

The second model also shows that import misinvoicing is increased with higher import tariff but reduced with expansion in Government expenditure, favourable trade liberalization and exchange rate. It can be concluded that imports (both revenue and misinvoicing) in general are better off with favourable and stable macroeconomics variables

Post-estimation Test Results

To conclude that the GMM estimator is efficient and accurate, post-estimation tests are conducted to test for the validity of the instruments used as well as serial correlation. Table 5.5 and 5.6 reports the results of these post-estimation tests as well.

The serial correlation test was done on the null hypothesis of no autocorrelation. For the first analysis, the result from the autoregressive of the first order [AR (1)] fails to reject the null hypothesis at the 0.05 significance level with a probability value (p-value) of 0.350. The AR (1) test is normally not considered a reliable test due to some hitches related to its construction in the

Systems GMM model. Test for the autoregressive of the second order [AR (2)] is more reliable. The p-value from this test in this analysis is 0.965, the null hypothesis is failed to be rejected because the p-value exceeds the conventional 0.05 significance level, and conclude that, serial correlation does not exist in the systems GMM dynamic panel estimation for the first model.

The AR (1) test for the second model was is 0.842, and the [AR (2)] 0.876. the [AR (1)] is still not considered but the [AR (2)] is rather considered. The null hypothesis is failed to be rejected because the p-value exceeds the conventional 0.05 significance level, and again conclude that serial correlation does not exist in the systems GMM dynamic panel estimation for the first model.

The Sargan test, checks for the validity of the instrument employed, and is also conducted on the null hypothesis (i.e. the over-identifying restrictions are valid).

The p-value for the Sargan test is 0.756 and 0.583 (shown in Table 5.5 and 5.6) for the first and second model respectively and both exceeds the significance level of 0.05. the null hypothesis is failed to be rejected and concludes that, validity in the over-identifying restrictions. The implication is that it confirms the validity of the instruments employed in the panel estimation model are valid and thus, the instrument is exogenous as a group.

From the result of the post-estimation test, the systems GMM estimator is endorsed as an efficient and consistent estimator for the model.

5.4 Conclusion

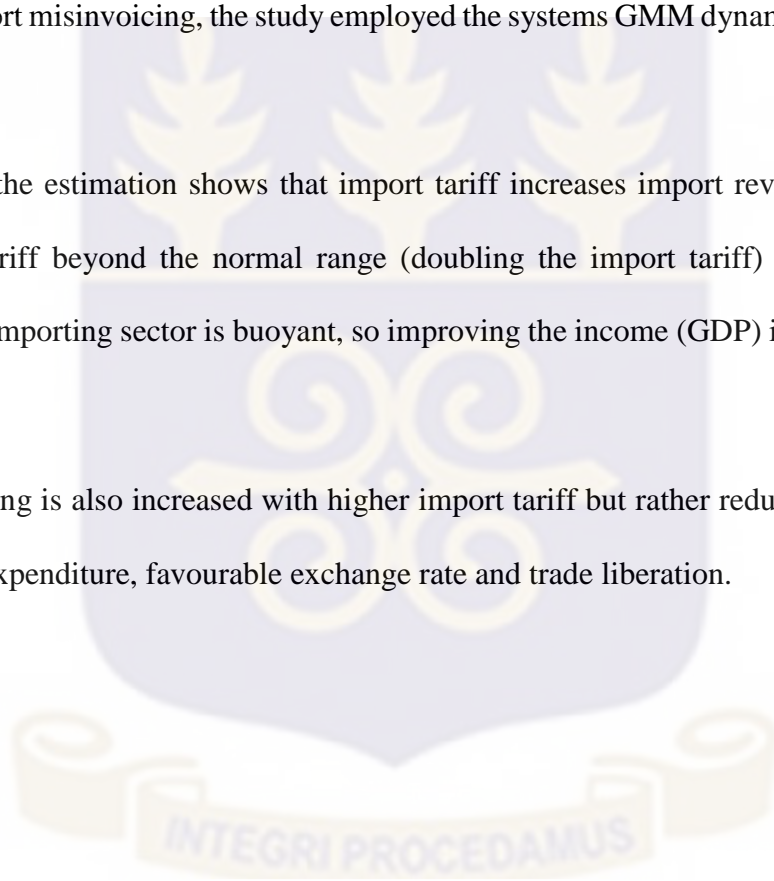
The chapter presented analyses of the panel dataset for twenty-four (24) nations to assess the impact of import tax rate on the import revenue as well as import tax rate on import misinvoicing in Sub-Saharan Africa.

The results were also presented and discussed to provide insights into the findings as well as also relate findings to previous studies.

Before the estimation of the baseline regression, a unit root test was first conducted in determining the stationarity or otherwise of the data used. Using both Augmented Dickey-Fuller (ADF) test and the Im-Pesaran-Shin stationarity, the stationarity of panel dataset was confirmed and hence free from time series processes. In order to investigate the impact of import tax rate on import revenue and import misinvoicing, the study employed the systems GMM dynamic panel estimation model.

The result from the estimation shows that import tariff increases import revenue to a point but increasing the tariff beyond the normal range (doubling the import tariff) reduces the import revenue and the importing sector is buoyant, so improving the income (GDP) increases the import revenue.

Import misinvoicing is also increased with higher import tariff but rather reduced with expansion in Government expenditure, favourable exchange rate and trade liberation.



CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

This chapter presents and summarizes conclusions of results as well as the study findings. Similarly, the study made some recommendations for policy as well as future research. The first section of this chapter looks at the summary and conclusions of the study while the subsequent section presents the recommendations of the study. The final section of this chapter details the limitations of the study.

6.1 Summary

The study sought to probe the effect of import tax on import revenue for a panel of twenty-four (24) countries in the Sub-Saharan Africa region for the period 1995-2015, it also finds the impact of import tax on import misinvoicing for a panel of 24 countries for the period 2003-2013. The Systems Generalized Method of Moments (GMM) estimation technique was used in the panel data-set. This study differs from other existing literature, in that, apart from checking for the impact of an import tariff on import revenue and misinvoicing, it also checks for the effect of other macroeconomics on import revenue and misinvoicing. The study was motivated by mixed evidence from the empirical literature on the impact of a tax rate on tax revenue and misinvoicing (Keen and Baunsgaard, 2005).

The system GMM result from the first analysis shows that import tariff and GDP per capita has a positive and significant impact on import revenue, doubling the import tariff also has a significant but negative effect. Trade liberalization, inflation, interest rate and exchange rate all had a positive

but insignificant effect on import revenue whereas Government expenditure had a negative insignificant effect.

The result from the second analysis also shows that import tariff has a positive and significant effect on import misinvoicing. Government expenditure, trade liberalization and exchange rate all had a positive significant effect on import misinvoicing. Doubling the tariff rate, inflation, interest rate and GDP per capita all had a positive but insignificant effect on import misinvoicing. The second model also shows that import misinvoicing is increased with higher import tariff but reduced with expansion in Government expenditure, favourable trade liberalization and exchange rate. It can be concluded that imports (both revenue and misinvoicing) in general are better off with favourable and stable macroeconomics variables.

6.2 Conclusions

In recent years, countries in the sub-Saharan African region have undergone series of risks factors, such as, depreciation of some local currencies, shortages of electricity with adverse effect on the industrial sector, expansionary fiscal policy, unstable economy due to political and social disturbances and the dumping of waste goods onto the market of some of the countries. Moreover, the sharp increase in instability in the prices of goods in the global international markets coupled with fluctuations in the exchange rate and the introduction of trade liberation. All these have affected the import revenue of the sub-Saharan African region with an increase in the expenditure of Governments and difficulties in financing these expenditures due to the unavailability of enough revenue.

Most of the importers in this region also misinvoice their import in order to invade high levied tariffs. These misinvoicing is expected to reduce with the introduction of trade liberation which reduces import tariffs and eliminates most of the trade barriers.

It is in the pursuit of these new developments that this study seeks to investigate the effect of an import tariff on both import revenue and import misinvoicing. The following conclusion was made following the result of the system GMM analysis.

Import tariff and GDP per capita have a positive and significant impact on import revenue, doubling the import tariff also has a significant but negative effect in the first analysis. It can be concluded that even though, import revenue is improved by increased in import tariff, increasing the tariff beyond the normal limit (by doubling it) will discourage import and reduced the import tariff. This shows that the import revenue sector in the region possess the characteristics of the Laffer curve, exhibiting both positive and prohibitive side, and increasing the import tariff beyond the maximum point (normal range) reduces the import revenue, (Canto, Joines and Lafer, 2014 and Beck, 1979). In this case, Government should take precautions in determining the import tariff in order to maximize the import revenue and mobilize enough revenue for the running of the economy. The import sector is found to be a buoyant sector, in this case increasing the per capita increases the import revenue. It, therefore, shows how important is it for the Government to undertake projects that will increase GDP per capita, which in effect will increase the import revenue of the regions.

Results from the second analysis indicate that import tariff is still positive and significant on import misinvoicing. This shows that increasing the tariff within normal range discourages importers from misinvoicing import thereby an improvement in the collection of import tariff over the period. Increasing the tariff beyond the normal range (doubling the tariff) however, does not have any

significant impact on import misinvoicing. This could be attributed to the weak institutions and regulations of the customs officials in the region who are not able to collect and protect the proceeds from the increased tariffs, and the inefficiency of the administrative system which is not able to smoothly operate under a strong and stable macroeconomic environment (Borenzstein et al., 1998).

Factors such as an increase in Government expenditure, improvement in trade liberalization and favourable exchange rate reduces import misinvoicing. This shows that importers in the sub-Saharan African countries do not evade tariff in their countries in the existence of improvement in government expenditure. This can be seen as an appreciation on their behalf. Trade liberalization and favorable exchange rate make import easy and feasible in the region thereby reducing import misinvoicing.

It can be concluded from both analyses that; higher imports tariff significantly increases import revenue but reduces import misinvoicing respectively. Increasing the tariff over the normal range however significantly reduces import revenue but insignificantly affect import misinvoicing. From this, Governments in the region can caution themselves to regulate the tariff within the normal range and also to maintain a stable macroeconomic system in order to maximize import revenue and reduce import misinvoicing.

6.3 Recommendations for Policy

The study recommends the following based on the findings and conclusion:

Governments of this region are encouraged to monitor and maintain the import tariff within the normal range, where maximum import revenue is mobilized which is enough for the running of the economy. Increasing the tariff beyond such limit reduces the import revenue.

The import sector is found to be a buoyant sector, in this case increasing the per capita increases the import revenue. It, therefore, recommended that governments should undertake projects that will increase GDP per capita, which in effect, will increase the import revenue of the regions.

Based on literature and pieces of advice from tax experts, it can be concluded that indirect taxes, in this case, import tariff, has greater capacity in improving domestic revenue than the direct taxes (this was evident in the buoyancy of the sector which was found to be elastic), it is therefore recommended that Governments should equip establishments that administer the import tariff to get the maximum output from it. Such institution in this instance is the custom service.

The study also recommends that there should be a deliberate effort to motivate investors especially importers to fulfil their tax obligations. Since it is the customers who bear the final tax burden. This can be in the form of making import process speedy, effective and expeditious than had previously existed. There should be the issue of receipts that will confirm the payment of import taxes in the various countries.

Governments of these countries must promote some macroeconomic systems like trade liberalization and government expenditure which significantly affect import misinvoicing.

The traditional literature on import misinvoicing has always been focused on customs duties evasion and economic instability. It is therefore recommended that import tax should be monitored to avoid an increase in import misinvoicing, the import tax laws must be revised and strengthened.

Customs agencies should treat with the highest level of scrutiny, all trade transactions involving a tax haven. Fines to import misinvoicing must be restructured to deter people from misinvoicing.

Governments must again significantly boost their customs enforcement, equip and train personnels for enhanced detection of premeditated misinvoicing of trade transactions, mostly through access to real-time world market pricing information at a full commodity level.

6.4 Suggestions for Future Studies and Limitations

The analysis from this study ignored issues like tax mobilization system and the existence of macroeconomic factors which affect the import revenue sector. A research could be conducted in such area to determine how these mechanisms affect the imposition of the import tax rate. Another research can be done on the general public to find out if they know the actual usage of import tax returns as well as the effect of tax compliance.

There is also an issue of loss of imports during the transportation process due to theft and accidents. Using the values of misinvoicing as given was somehow a challenge since data on accidents was not available. This gap can be used to undertake further studies.

Finally, a research can be conducted to find the effect of import misinvoicing on import revenue, to find out whether a relationship exists between the two variables.

The broad summary of data indicates that import misinvoicing is still high, suggesting a further study on import misinvoicing. This study examines evidence from SSA. It was realized that with the introduction of trade liberalization, import misinvoicing reduced, it is therefore important to research into other different macroeconomic and institutional variables affecting misinvoicing, since these variables differ in industrial and emerging economies. Moreover, this research was

focused on the effects of import rate on misinvoicing ignoring issues like tax administration and the political states of the countries involved. The above analysis makes it clear that more research can and should be done to further identify areas for improvement.

The study focused on investigating the effect of import tax on import revenue and import misinvoicing in Sub-Saharan Africa. An important feature which has confronted most researchers especially in Africa is the availability of data. Only twenty-four (24) Sub-Saharan African countries were selected for the study because of unavailability of data for some of the countries. This means that some variables could have been omitted as a result of lack of available data.

Data on the variables are not consistently within the time frame, thus from 1980 to 2015 which was the original sample period of the study. As a result of that, the study had to settle on 1995 to 2015 as the study period for the import tariff and import revenue analysis and 2003-2013 for the import tariff on the import misinvoicing analysis and even with that, some countries still needed to be dropped. It is also worthy to emphasize here that, no country actually had consistent data on all the chosen variables for the period under study. This compelled the study to conduct the various estimations using an unbalanced panel dataset. This can have an impact on the efficiency of the results of the study in ways that may be undesirable.

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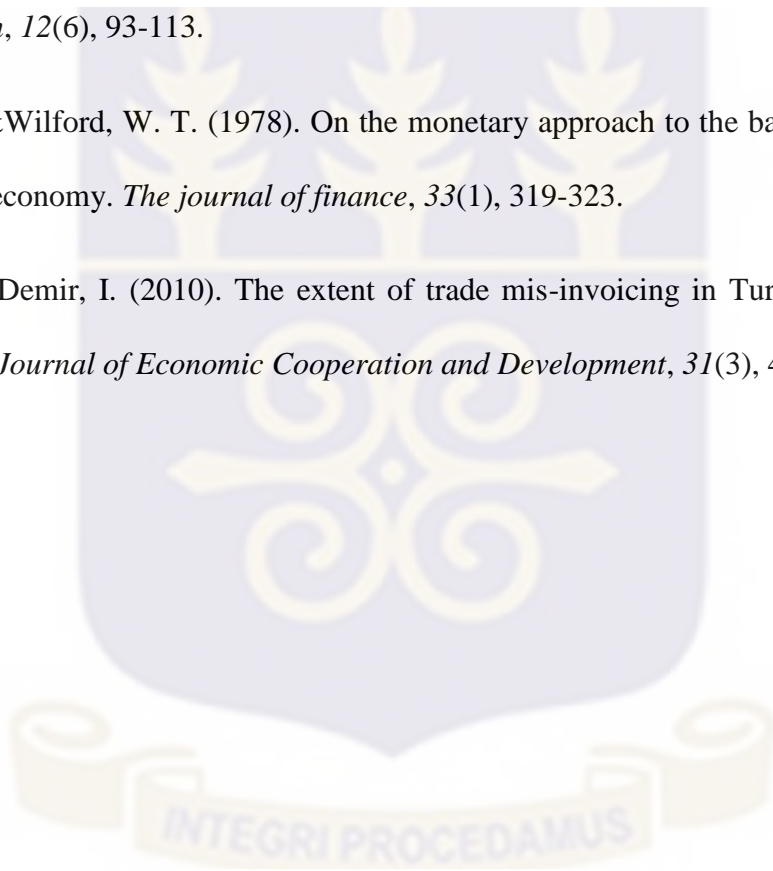
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APPENDICES

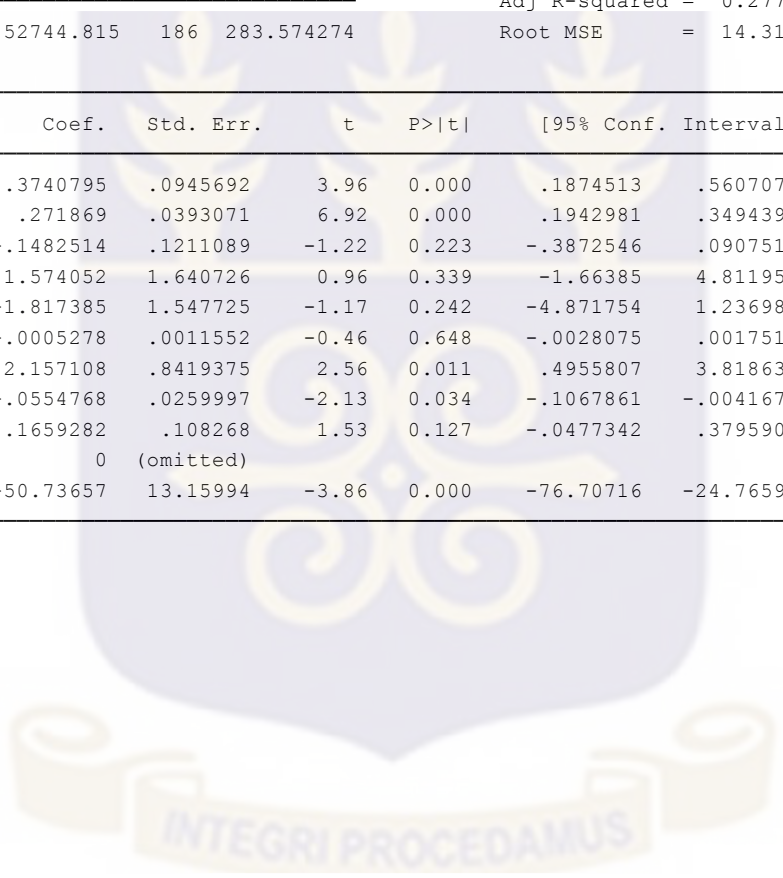
Appendix A: Import Revenue Analysis

Appendix 1A: Pooled regression for Import Revenue Analysis

```
. reg imrev gne tot inf gdpp gdp exr imr imr2 rate r
note: rate omitted because of collinearity
```

Source	SS	df	MS	Number of obs =	187
Model	16483.3468	9	1831.48298	F(9, 177) =	8.94
Residual	36261.4682	177	204.867052	Prob > F =	0.0000
				R-squared =	0.3125
				Adj R-squared =	0.2776
Total	52744.815	186	283.574274	Root MSE =	14.313

imrev	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
gne	.3740795	.0945692	3.96	0.000	.1874513	.5607077
tot	.271869	.0393071	6.92	0.000	.1942981	.3494399
inf	-.1482514	.1211089	-1.22	0.223	-.3872546	.0907518
gdpp	1.574052	1.640726	0.96	0.339	-1.66385	4.811954
gdp	-1.817385	1.547725	-1.17	0.242	-4.871754	1.236985
exr	-.0005278	.0011552	-0.46	0.648	-.0028075	.0017518
imr	2.157108	.8419375	2.56	0.011	.4955807	3.818636
imr2	-.0554768	.0259997	-2.13	0.034	-.1067861	-.0041675
rate	.1659282	.108268	1.53	0.127	-.0477342	.3795905
rate	0	(omitted)				
_cons	-50.73657	13.15994	-3.86	0.000	-76.70716	-24.76598



Appendix 2A: Random effect regression for import revenue

```
. xtreg imrev gne tot inf gdpp gdp exr imr imr2 rate, re
```

```
Random-effects GLS regression           Number of obs   =       187
Group variable: country                 Number of groups =        23

R-sq:  within = 0.4503                   Obs per group:  min =         2
      between = 0.0018                               avg   =        8.1
      overall  = 0.0455                               max   =        19

                                           Wald chi2(9)    =    110.15
corr(u_i, X) = 0 (assumed)                Prob > chi2     =     0.0000
```

imrev	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
gne	-.1396988	.0796406	-1.75	0.079	-.2957915	.0163938
tot	.0471929	.0410755	1.15	0.251	-.0333137	.1276994
inf	.0172485	.0653097	0.26	0.792	-.1107562	.1452532
gdpp	-1.428366	1.646428	-0.87	0.386	-4.655307	1.798574
gdp	1.141593	1.594582	0.72	0.474	-1.98373	4.266916
exr	-.0001064	.0005041	-0.21	0.833	-.0010944	.0008816
imr	.0238013	.4445177	0.05	0.957	-.8474374	.89504
imr2	.0279882	.0136028	2.06	0.040	.0013272	.0546493
rate	.1470475	.0659331	2.23	0.026	.0178211	.276274
_cons	26.25799	11.54233	2.27	0.023	3.635436	48.88054
sigma_u	10.737144					
sigma_e	5.4864546					
rho	.79295885	(fraction of variance due to u_i)				

Appendix 3A: Breusch-Pagan Lagrangian Multiplier test for Random Effect

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{imrev}[\text{country},t] = Xb + u[\text{country}] + e[\text{country},t]$$

Estimated results:

	Var	sd = sqrt(Var)
imrev	283.5743	16.83966
e	30.10118	5.486455
u	115.2863	10.73714

Test: $\text{Var}(u) = 0$

chibar2(01) = 339.46
 Prob > chibar2 = 0.0000

Appendix 4A: Correlation Matrix

. pwcorr
 (countrycode ignored because string variable)

	year	country	imrev	gne	tot	inf	gdpp
year	1.0000						
country	0.0000	1.0000					
imrev	-0.3367	0.0331	1.0000				
gne	0.0670	0.3644	0.2396	1.0000			
tot	0.1126	-0.0909	0.1353	-0.2581	1.0000		
inf	-0.1406	-0.1393	-0.0163	-0.1077	0.0868	1.0000	
gdpp	0.0547	0.0502	-0.0894	0.0076	0.0343	0.0414	1.0000
gdp	0.0524	0.0165	-0.1242	0.0111	-0.0622	0.0496	0.9726
exr	0.0511	-0.0175	0.0302	-0.0359	0.0096	-0.0037	-0.0071
imr	-0.3564	-0.0416	0.0939	-0.0282	-0.0200	-0.0231	-0.0474
rate	0.0535	0.0866	0.1385	0.1514	-0.2061	-0.5431	0.0138
imr2	-0.3987	-0.0222	0.1262	-0.0631	0.1092	-0.0229	-0.0125

Appendix 5A: Fixed effect with import revenue

```
. xtreg imrev gne tot inf gdpp gdp exr imr imr2 rate, fe
```

```
Fixed-effects (within) regression      Number of obs   =      187
Group variable: country                Number of groups =       23

R-sq:  within = 0.4623                  Obs per group:  min =       2
      between = 0.0459                      avg =      8.1
      overall  = 0.0025                      max =      19

                                          F(9,155)       =      14.81
corr(u_i, Xb) = -0.3425                  Prob > F       =      0.0000
```

imrev	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
gne	-.1842369	.0804733	-2.29	0.023	-.3432028	-.025271
tot	.0235366	.0440073	0.53	0.594	-.0633948	.110468
inf	.0408605	.0628297	0.65	0.516	-.0832524	.1649734
gdpp	-3.85062	1.74932	-2.20	0.029	-7.306205	-.3950355
gdp	3.52079	1.696873	2.07	0.040	.168809	6.872772
exr	-.0001018	.0004713	-0.22	0.829	-.0010327	.0008291
imr	-.0127488	.4210049	-0.03	0.976	-.8443963	.8188988
imr2	.0280311	.0128843	2.18	0.031	.0025796	.0534825
rate	.1372431	.0644347	2.13	0.035	.0099597	.2645265
_cons	25.51046	11.02562	2.31	0.022	3.730587	47.29033
sigma_u	17.149293					
sigma_e	5.4864546					
rho	.90715227	(fraction of variance due to u_i)				

```
F test that all u_i=0:      F(22, 155) =      47.71      Prob > F = 0.0000
```



Appendix 6A: Multicollinearity Test

Variable	VIF	1/VIF
imr2	11.44	0.087421
imr	11.14	0.089735
tot	1.42	0.705760
gne	1.17	0.857637
gdpp	1.09	0.916625
inf	1.07	0.936891
rate	1.05	0.949457
exr	1.02	0.980799
Mean VIF	3.67	

Appendix B: Import Misinvoicing Analysis

Appendix 1B: Pooled regression for Import misinvoicing Analysis

```
. reg immis2 gne tot inf gdpp gdp exr imr imr2 rate r
note: rate omitted because of collinearity
```

Source	SS	df	MS	Number of obs =	141
Model	162.601433	9	18.0668259	F(9, 131) =	1.62
Residual	1461.54003	131	11.1567941	Prob > F =	0.1160
Total	1624.14146	140	11.6010105	R-squared =	0.1001
				Adj R-squared =	0.0383
				Root MSE =	3.3402

immis2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
gne	-.0837486	.0278177	-3.01	0.003	-.1387787	-.0287185
tot	-.0205724	.0114214	-1.80	0.074	-.0431665	.0020218
inf	.0731783	.0656348	1.11	0.267	-.0566631	.2030197
gdpp	.2101291	.5238204	0.40	0.689	-.8261126	1.246371
gdp	-.3112164	.5117579	-0.61	0.544	-1.323596	.7011628
exr	-.0000164	.0002843	-0.06	0.954	-.0005789	.000546
imr	.0797246	.4063805	0.20	0.845	-.7241929	.8836421
imr2	-.006912	.0154248	-0.45	0.655	-.0374259	.0236019
rate	.0024253	.0321154	0.08	0.940	-.0611065	.0659572
rate	0	(omitted)				
_cons	17.18739	3.881723	4.43	0.000	9.508417	24.86637

Appendix 2B: Random effect regression for import misinvoicing

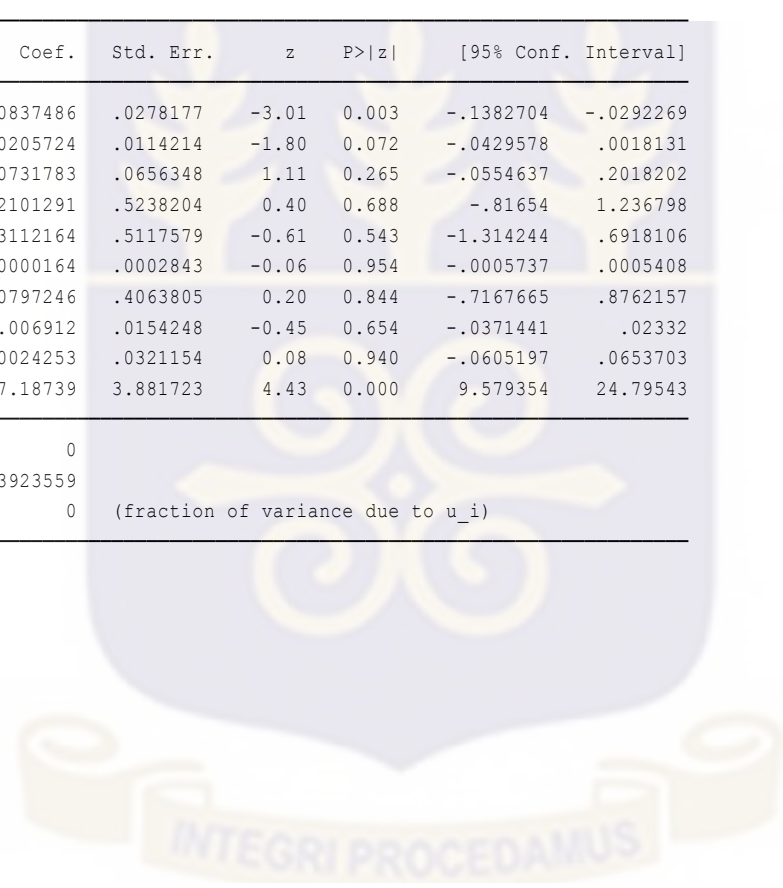
```
. xtreg immis2 gne tot inf gdpp gdp exr imr imr2 rate, re

Random-effects GLS regression           Number of obs   =       141
Group variable: country                 Number of groups =        23

R-sq:  within = 0.0001                   Obs per group:  min =         1
      between = 0.7531                               avg =        6.1
      overall  = 0.1001                               max =        10

                                           Wald chi2(9)     =       14.57
corr(u_i, X) = 0 (assumed)                Prob > chi2      =       0.1033
```

immis2	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
gne	-.0837486	.0278177	-3.01	0.003	-.1382704	-.0292269
tot	-.0205724	.0114214	-1.80	0.072	-.0429578	.0018131
inf	.0731783	.0656348	1.11	0.265	-.0554637	.2018202
gdpp	.2101291	.5238204	0.40	0.688	-.81654	1.236798
gdp	-.3112164	.5117579	-0.61	0.543	-1.314244	.6918106
exr	-.0000164	.0002843	-0.06	0.954	-.0005737	.0005408
imr	.0797246	.4063805	0.20	0.844	-.7167665	.8762157
imr2	-.006912	.0154248	-0.45	0.654	-.0371441	.02332
rate	.0024253	.0321154	0.08	0.940	-.0605197	.0653703
_cons	17.18739	3.881723	4.43	0.000	9.579354	24.79543
sigma_u	0					
sigma_e	3.3923559					
rho	0	(fraction of variance due to u_i)				



Appendix 3B: Breusch-Pagan Lagrangian Multiplier test for Random Effect

Breusch and Pagan Lagrangian multiplier test for random effects

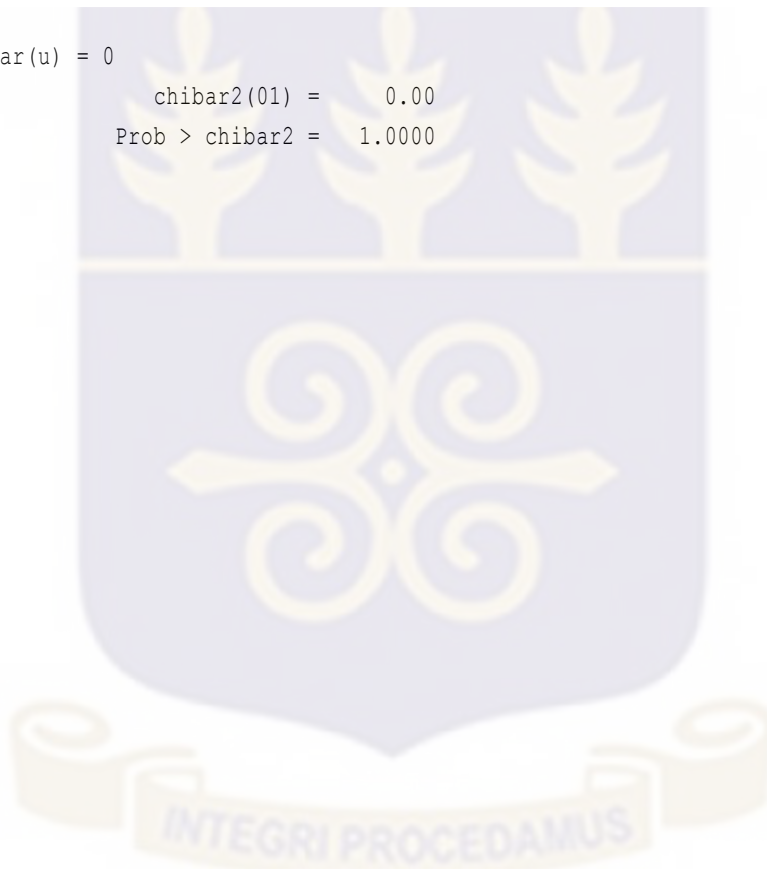
$$\text{immis2}[\text{country},t] = Xb + u[\text{country}] + e[\text{country},t]$$

Estimated results:

	Var	sd = sqrt(Var)
immis2	11.60101	3.406026
e	11.50808	3.392356
u	0	0

Test: $\text{Var}(u) = 0$

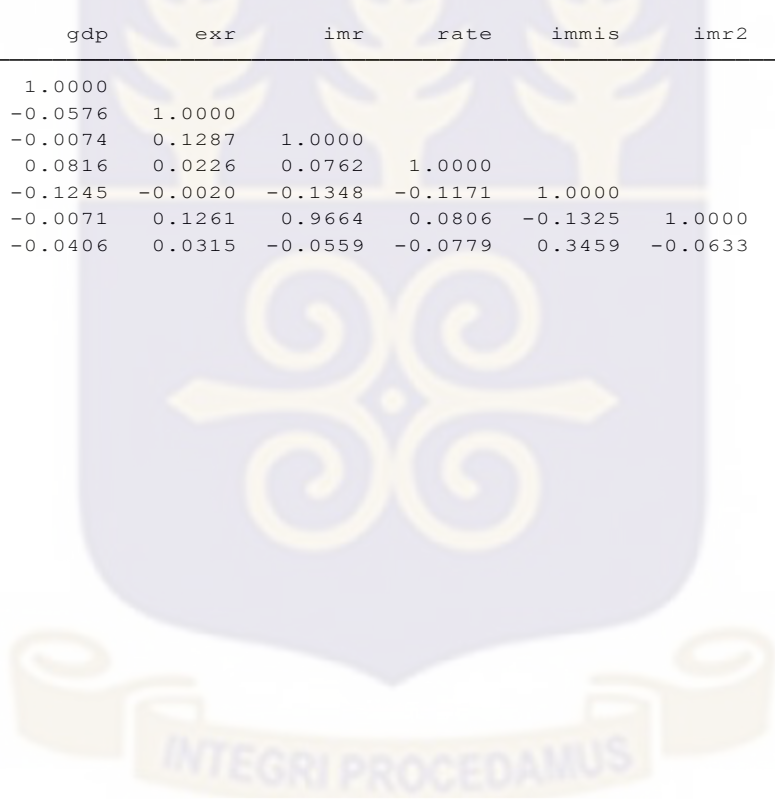
chibar2(01) = 0.00
Prob > chibar2 = 1.0000



Appendix 4B: Correlation Matrix

```
. pwcorr
(countrycode ignored because string variable)
```

	year	country	imrev	gne	tot	inf	gdpp
year	1.0000						
country	0.0000	1.0000					
imrev	-0.2231	-0.0312	1.0000				
gne	0.0961	0.3529	0.1639	1.0000			
tot	0.0760	-0.0517	0.1401	-0.3104	1.0000		
inf	-0.1328	-0.0665	-0.1068	-0.0371	0.0810	1.0000	
gdpp	-0.0107	0.0407	-0.1144	-0.1161	0.0575	0.0526	1.0000
gdp	-0.0013	-0.0121	-0.1394	-0.1196	-0.0783	0.0935	0.9616
exr	0.0767	0.0039	0.0236	-0.0318	0.0175	0.0195	-0.0781
imr	-0.1917	-0.0792	0.0395	-0.0149	-0.2027	-0.0848	-0.1543
rate	0.0215	-0.1310	0.1422	0.1141	-0.1044	0.0388	0.0264
immis	0.1279	0.2106	-0.2373	-0.1438	-0.0770	-0.0470	-0.0874
imr2	-0.2013	-0.0987	0.0022	-0.0770	-0.0883	-0.1142	-0.1228
immis2	0.0482	0.0073	-0.1678	-0.2340	-0.0428	0.1166	-0.0337
	gdp	exr	imr	rate	immis	imr2	immis2
gdp	1.0000						
exr	-0.0576	1.0000					
imr	-0.0074	0.1287	1.0000				
rate	0.0816	0.0226	0.0762	1.0000			
immis	-0.1245	-0.0020	-0.1348	-0.1171	1.0000		
imr2	-0.0071	0.1261	0.9664	0.0806	-0.1325	1.0000	
immis2	-0.0406	0.0315	-0.0559	-0.0779	0.3459	-0.0633	1.0000



Appendix 5B: Fixed effect with import revenue

```
. xtreg immis2 gne tot inf gdpp gdp exr imr imr2 rate, fe

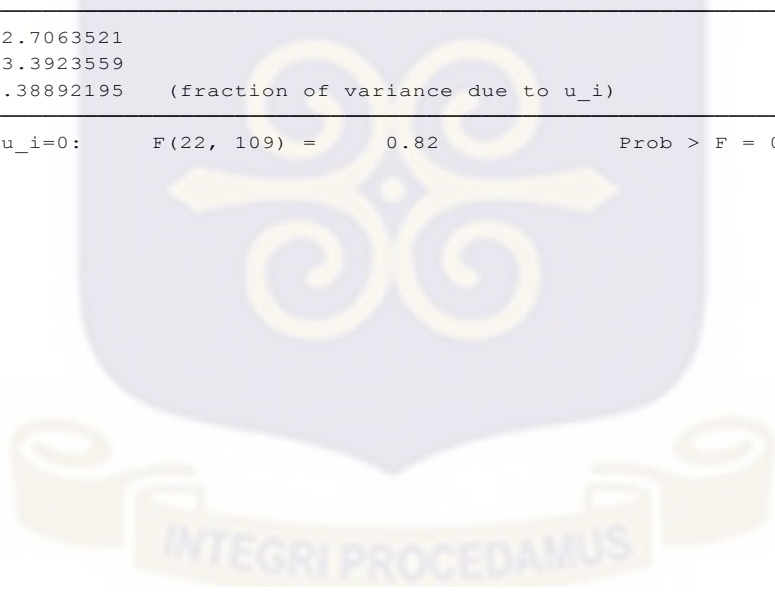
Fixed-effects (within) regression           Number of obs   =       141
Group variable: country                    Number of groups =       23

R-sq:  within = 0.0328                    Obs per group:  min =        1
        between = 0.0058                  avg =           6.1
        overall = 0.0013                  max =           10

corr(u_i, Xb) = -0.7607                    F(9,109)        =        0.41
                                                Prob > F         =       0.9268
```

immis2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
gne	.0782129	.0586003	1.33	0.185	-.0379311	.1943568
tot	-.0360262	.0374915	-0.96	0.339	-.1103331	.0382807
inf	.0664358	.0934621	0.71	0.479	-.1188029	.2516746
gdpp	-.295673	1.178561	-0.25	0.802	-2.631542	2.040196
gdp	.2444441	1.157126	0.21	0.833	-2.048944	2.537826
exr	.0000198	.0003163	0.06	0.950	-.000607	.0006467
imr	-.1105147	.9702839	-0.11	0.910	-2.033586	1.812556
imr2	.0034446	.0363051	0.09	0.925	-.068511	.0754003
rate	.0214356	.056241	0.38	0.704	-.0900323	.1329034
_cons	-.0855819	8.994261	-0.01	0.992	-17.91191	17.74075
sigma_u	2.7063521					
sigma_e	3.3923559					
rho	.38892195	(fraction of variance due to u_i)				

F test that all u_i=0: F(22, 109) = 0.82 Prob > F = 0.6974



Appendix 6B: Multicollinearity Test

Variable	VIF	1/VIF
imr	21.06	0.047480
imr2	20.69	0.048328
tot	1.43	0.700453
gne	1.18	0.846360
inf	1.09	0.917560
gdp	1.07	0.934803
rate	1.07	0.938737
exr	1.02	0.978944
Mean VIF	6.08	

