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Essays on Sectoral Growth Composition, Foreign Debt and Social Welfare in Selected African Economies

by

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A thesis submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the Degree of Doctor of Philosophy in Economics

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DECLARATION

I declare that this thesis is my own unaided work. It is submitted for the award of the degree of Doctor of Philosophy in Economics, University of the Witwatersrand, Johannesburg. It has not been submitted to this university or any other university for any other degree or examination.

Anayochukwu Basil CHUKWU

Signed.....

Date: 25th day of March, 2016

DEDICATION

This work is dedicated to the Blessed Trinity and to the Virgin Mary, Mother of God. To my loving and caring wife, Bridget, and to my sons: Jefferson and Gerald.

ACKNOWLEDGEMENTS

First, I give thanks to God Almighty who has made this programme a success. I am deeply grateful and indebted to my supervisor, Professor Christopher Malikane for his passion concerning the work, his consistent encouragement, and guidance all through the various stages of the study. I am also grateful to my co-supervisor, Professor Tendai Gwatidzo, for his role during the course of the study. I sincerely thank Professor Oluyele Akinkugbe, Head, Department of Economics, and Professor Michael Samuel, Head, Department of Human Resources, University of the Witwatersrand, for their unflinching support and care especially when the challenges of the programme were tough. I also express my sincere appreciation to Taofeek Owoseni who through his comradeship, I began this journey of actualizing my dream. Special appreciation also goes to my colleagues at the Financial Markets and Macroeconomics, and African Economic Research Consortium (AERC) PhD units.

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ABSTRACT

This thesis focuses on sectoral growth composition, foreign debt and social welfare in selected African economies. Data for the study were obtained from *International Financial Statistics* (IFS), the World Bank (WB), United Nations Conference on Trade and Development (UNCTAD), United Nations Development Programme (UNDP) annual reports, and the Penn World Table (PWT). The thesis has 5 chapters. Chapter 1 is the general introduction. Chapters 2, 3, and 4 are stand-alone related papers on social welfare, external debt, and real exchange rate. Chapter 5 is the conclusion of the study.

Chapter 1 presents the background to the study, the motivating problems, the research objectives and questions, the significance of the study, the literature gaps, and contributions. The chapter ends with an outline on the organization of the study. Chapter 2 examines the impact of the composition of growth on poverty and inequality in 36 African countries. Specifically, the study demonstrates how changes in the composition of growth can affect the welfare of the segments of the population that are socially and economically deprived. While previous studies have presented different results for different continents, much of the findings show that in Africa, the primary sector is the most effective sector that improves the levels of poverty and inequality. This study re-examines this claim based on the belief that previous findings suffer from measurement bias in the estimation of parameters.

This study employed a measurement approach that corrected for the observed differences. The generalized method of moments (GMM) estimation technique was adopted, and the findings were robust, showing that rather than the much-touted primary sector, the secondary and tertiary sectors are actually the main drivers of welfare improvement in the African continent. It is therefore recommended that for a sustained welfare improvement strategy, policy-making institutions in Africa should as a matter of urgency adopt appropriate industrial policy targets on the secondary and tertiary sectors with specific focus on the construction, manufacturing, mining, wholesale, retail, and hotel sectors.

Chapter 3 investigates the impact of growth composition on external debt (ED) in selected African countries. Precisely, the study examines how each of the three productive sectors (agriculture, industry, and services) impacts on the level of ED in Africa. While many development studies have relied on aggregate output growth to investigate debt-growth dynamics, received literature shows that studies which examine the impact of growth on ED are scarce. Relying on two frameworks – "perfect capital mobility" of the Neoclassicals, and the "Dualism" theory, this study investigates the composition of the growth-debt relationship in Africa. The study applies the dynamic generalized method of moments (GMM) estimation technique to conduct its analysis. The results show that the composition of growth has significant effect on the levels of ED a country can maintain. Although, the results were lagged at different periods, the outcome suggests that the industrial (construction and manufacturing) and services sectors (wholesale, retail, and hotels – WRH) are the leading sectors that drive the growth-ED relationship. The result shows more robustness when a country's institutional quality, real interest rate, and current account balance were controlled for.

Chapter 4 examines the effectiveness of real exchange rate (RER) as a policy tool for industrial diversification. Economic experts have emphasized the need for industrial diversification, especially for developing countries. However, in spite of the numerous socio-economic gains associated with industrial diversification, little effort has been made in Africa to identify and develop the sectors that achieve higher output growth for the region. The effective management of real exchange rate (RER) has provided economies with the needed tool for achieving these growth objectives. Recent empirical literature finds that undervalued RERs help countries to achieve faster economic growth, while overvaluation of the RER slows economic growth. Furthermore, recent growth studies have shown that different sectors respond differently to changes in RER. This study shows that even though many of the previous works have drawn up policy recommendations from these researches, the findings may be driven by inappropriate estimation assumptions, which inevitably results in biased findings. When these assumptions are re-specified, the empirical findings for a sample of 36 countries suggest that in Africa, sectors such as agriculture, construction,

mining and utility lead to appreciation of the RER, while the manufacturing, transport and communications, "WRH" sectors, and "other" lead to depreciation of RER among countries. Although the coefficients for manufacturing, and transport and communications are not significant, this is probably due to the levels of development of the sectors within the African continent. Improving the level of development in these sectors therefore through appropriate economic policy framework will certainly impact on the strength of the coefficients of the three sectors, thereby leading to industrial revolution.

Chapter 5 concludes the study with a summary of the key findings from Chapters 2, 3, and 4 with highlights of the policy implications of the findings. The highlights include: (1) the need for policy frameworks that discourage continual channelling of resources into sectors other than the industrial and services sectors. (2) A policy thrust in favour of improving domestic sources of revenue through targeting specific subsectors of the industrial and services sectors with appropriate policy instruments. This will provide the needed resources that will reduce the high debt stock per aggregate national income of African countries. (3) A policy thrust that reverses the undermining of development in the manufacturing, and transport and communications sectors. The reversal will stimulate exports and aggregate economic growth through the policy of undervaluation of the RER. Concluding the chapter, the study suggests areas for further research.

TABLE OF CONTENTS

DECLARATION.....iii

DEDICATION.....iv

ACKNOWLEDGEMENTS.....v

ABSTRACT.....vi

TABLE OF CONTENTS.....ix

LIST OF TABLES.....xi

LIST OF APPENDICES.....xii

CHAPTER ONE: Introduction

1.1 Background to the Study.....1

1.2 Motivation for the Study.....4

1.3 Objectives of the Study.....6

1.4 Research Questions.....6

1.5 Significance of the Study.....6

1.6 Gap in the Literature.....7

1.7 Contributions of the Study……..…….....9

1.8 Organization of the Study.....10

CHAPTER TWO: The Impact of Growth Composition on Poverty and Inequality in Selected African Countries

2.1 Introduction.....11

2.2 Literature Review.....14

2.3 The Model.....18

2.3.1 Data Description and Estimation Technique….....20

2.4.1 Analysis of Results……..…….....20

2.5 Conclusion.....29

CHAPTER THREE: The Impact of Growth Composition on External Debt: Evidence from African Countries

3.1 Introduction.....31

3.2 Literature Review…….....33

3.3 The Model and Estimation Methodology.....41

3.3.1 Data Description and Estimation Technique.....42

3.4. Empirical Results.....43

3.5 Conclusion.....50

CHAPTER FOUR: Real Exchange Rate (RER) as a Policy Tool for Industrial Diversification and Growth in Africa

4.1 Introduction.....52

4.2 Literature Review….....54

4.3 The Model and Estimation Methodology.....57

4.3.1 Index of Under- or Overvaluation of Exchange Rate.....57

4.3.2 Real Exchange Rate and the Composition of Growth Equation……..…….59

4.3.3Data Specification and Estimation Technique.....60

4.4 Empirical results.....61

4.5 Conclusion.....66

CHAPTER FIVE: Conclusion and Policy Implications

5.1 Introduction.....68

5.2 The Impact of Growth Composition on Poverty and Inequality in Selected African Countries…..…….....68

5.3 The Impact of Growth Composition on External Debt: Evidence from African Countries…..……....70

5.4 Real Exchange Rate (RER) as a Policy Tool for Industrial Diversification and Growth in Africa……..……..……...70

5.5 Policy Implications and Recommendations of the Study.....71

5.6 Suggested Areas for Further Research.....72
Bibliography.....79

LIST OF TABLES

Table 1: Comparison of Composition of GDP……..……...…2
Table 2.1a: Sectoral Growth and Poverty Headcount Index using the Loayza and Raddatz (2010) estimation approach……..…….…….……..23
Table 2.1b: Disaggregated Sectoral Growth and Poverty Headcount Index using the Loayza and Raddatz (2010) estimation approach.....24
Table 2.2a Sectoral Growth and Poverty Headcount Index using the 'filtering' Process Approach due to Spill-over Effects (own model)…...……..25
Table 2.2b: Sectoral Growth (Disaggregated) and Poverty using the 'filtering' Process Approach due to Spill-over effects (own model)…….…...26
Table 2.3 Aggregated Sectoral Growth and Inequality using the 'filtering' Process Approach due to Spill-over effects …….……27
Table 2.4: Disaggregated Sectoral Growth and Inequality……....28
Table 3.1: An Outlook of Africa's External Debt Indicators……..……...39
Table 3.2: External Debt and Sectoral Growth Composition……..….. ……....46
Table 3.3: External Debt and Sectoral Growth Composition (Linear)……...47
Table 3.4: External debt and Sectoral Growth Composition (Non-Linear)……...48
Table 3.4.1: External Debt and Sectoral Growth Composition (Non-Linear)……...49
Table 4.1: Balassa-Samuelson Effect (BSE). OLS Panel Estimation……..……..59
Table 4.2: Agricultural Response to Change in RER……..…..…….....62
Table 4.3: Industry Response to Change in RER……...62
Table 4.4: Services Response to Change in RER……...63
Table 4.5:"Others" Response to Change in RER…….... 64

Table 4.6: "WRH" Response to Change in RER……..64
Table 4.7: Mining and Utility Response to Change in RER……..……...65
Table 4.8: Construction Response to Change in RER……...65
Table 4.9: Manufacturing Response to Change in RER……...66
Table 4.10: Transport & Communication Response to Change in RER…….....66
Table 4.11: Correlation Matrix between real Exchange Rate (RER) and different sectors…….……78

LIST OF APPENDICES

Appendix 1A: Descriptive Statistics (poverty and Sectors)……...73
Appendix 1B: Descriptive Statistics (Inequality and Sectors)……...73
Appendix 1C: Correlation Analysis (Gini coefficient and disaggregated Sectors)……...74
Appendix 1D: Correlation Analysis (Poverty and Sectoral disaggregation)…….74
Appendix 1E: Gini Index Values by Region, 1990-2008 (based on net income)……..74
Appendix 1F: Proportion of people living on less than $1.25 a day (Percentage)…….....75
Appendix 1G: Income and Multi-dimensional Poverty, by Region……..……75
Appendix 2 (a-c): Regional Output share in GDP by Sectors: US Dollars at current Prices and current exchange rates ……76

Chapter One: Introduction

1.1 Background to the Study

In the last couple of decades, the issue of high levels of poverty and inequality among developing countries has raised a lot of concern within the global community. A cursory observation shows that the levels of industrial development, institutional policy frameworks and high external debt profile account, to a large extent, for the abysmal level of social welfare in most developing countries, especially those of the African continent. A recent report by the United Nations Development Programme (UNDP, 2014) states that the current levels of poverty and inequality in Africa stand at 48 and 42 per cent respectively. A similar report on Africa by the United Nations Conference on Trade and Development (UNCTAD, 2014) states that the average annual growth rate of real output in the region rose from 1.8 per cent between 1980 and 1989 to 5.3 per cent in 2010. When this level of welfare and output growth is compared with those of other developing continents such as Asia and Latin America, it calls for great concern. For instance, while the recent Millennium Development Goals report (UNDP, 2014) puts the average levels of poverty and inequality in South-East Asian countries at 14 and 40 per cent respectively, those of the Latin Americas stand at 6 and 39 percent respectively.

Comparing Africa's output growth structure with those of Asia and Latin America also shows a similar trend (see Table 1). While Asian and Latin American countries have been able to improve their output growth rate by shifting emphasis from the agricultural to the industrial and services sectors, Africa is yet to achieve this feat. According to Van Donge et al. (2012: s8), "Unlike exporters of oil and primary commodities in Africa, however, South East Asian countries have succeeded in developing other exports and diversifying their economies into manufacturing, agro-industries, value-added services, and other activities that enable them to move up the value chain in the global economy".

Table 1: Comparison of composition of GDP*

		1970-1980	1980-1990	1990-2000	2000-2010	2010-2013
Agriculture %	Africa	16.4	15.6	14.4	14.3	13.8
	Latin America	10.2	9.3	6.1	4.9	4.8
	Asia	21.2	16.7	8.2	8.6	18.1
Industry %	Africa	28.0	27.5	27.0	27.9	20.3
	Latin America	37.9	38.8	29.6	30.0	28.7
	Asia	39.4	36.4	22.9	37.5	82.7
Services %	Africa	40.7	38.3	46.0	44.8	44.5
	Latin America	49.1	51.2	55.9	53.4	53.7
	Asia	35.1	40.9	29.8	46.0	45.2

*Author's computation. (Data source: UNCTAD Statistics, 2014)

A World Bank report on Africa (WB, 2013) stated that although individual economic sectors in sub-Saharan Africa have been growing (3.3 per cent for oil exporters; and 7.8 for metal exporters), the aggregate export growth in 2012 shows that export of goods and services contrast by 33.8 per cent. These statistics show that both the industrial and other export growth are seriously challenged by some internal structural rigidity. Similarly, the issue of high levels of external debt (ED) has also posed serious challenges to growth and development in the African region (Easterly, 2002 and Asiedu, 2003). Over the past few decades, high debt 'overhang' in Africa countries has led to the classification of the region as insolvent; not being able to meet their debt obligations to their creditors.

Going by the International Monetary Fund factsheet (IMF, 2015), out of the 36 countries classified under Heavily Indebted Poor Countries (HIPC), 30 are African countries. Although the HIPC Initiative and the Multilateral Debt Relief Initiative (MDRI) have been able to substantially reduce African countries' total debt burden to about 34 percent, the stock of external debt per aggregate national income in the region is still high and poses serious economic challenges. The inability of countries to manage this high debt stock through improvement in domestic sources of income is not only reflected in the rising debt profile, but also in the amount of resources devoted to economic and development activities. The attendant effects of high ED on the aggregate economy, especially for countries with less-developed economic infrastructure such as the capital market, is huge. While Edo (2002) affirms that high ED leads to crowding-out of future investment

opportunities, Christensen (2005), and Woo and Kumar (2015) report that high levels of ED lead to crowding-out of the private sector, resulting in slow economic growth.

Although much investment in terms of resources and efforts is channelled towards improving the productive base of sectors in order to generate additional resources to cushion the effects of high debt burden, these investments appear to have little impact on African economies. This is probably due to the knowledge gap in identifying the particular sectors that drive industrial growth. Unlike in Africa, Asian and Latin American countries have, through the approach of targeting specific sectors, attained industrial revolution which in turn has a positive impact on the level of welfare. The approach of targeting sectors to improve aggregate growth requires the application of appropriate trade and industrial policy.

The use of appropriate exchange rate (ER) policies in some emerging economies in recent times, has led to improvement in industrial diversification and growth (see van Donge et al. (2012)). According to Ghura (1993), and Collier and Gunning (1999), the growth 'miracle' of the Asian countries centres on the effective use of ER and trade policies, specifically, the policy of ER depreciation. A study by Dutta (2005) shows that leveraging on trade and industrial policy reforms, China was able to diversify its economy from agricultural to industrial sector-based, through the undervaluation of ER policy. However, the case of Africa is different, as the continent is yet to take full advantage of the opportunities which appropriate ER policy presents to improve trade and industrial growth. A study by Rodrik (2008) shows that the overvalued ER regime practice in Tanzania and Uganda between 1960 and 2000 affected trade and economic growth negatively in the two countries. Arize et al. (2000) report that an increase in ER uncertainty exerted a significant negative effect on export demand for 13 less-developed countries (LDCs), both in the short- and long-run.

1.2 Motivation for the Study

Although enough effort and resources have been invested in social and economic structures to cause a turnaround in Africa's growth architecture, these have not yielded the desired results as the levels of fiscal and social welfare challenges still remain worrisome (see Asiedu, 2003, and Ortiz and Cummins, 2011). According to a UNDP report (2014), about 1.2 billion of the over 7 billion world population live on $1.25 per day, and more than half of these are in Asia, while one-third are in Africa. A United Nations Millennium Development Goals report (MDG, 2014) also states that between 1990 and 2010, countries in South-East Asia were able to reduce the proportion of their population living below $1.25 per day from 45% to 14%. This significant progress towards one of the Millennium Development Goals is hardly observed in Africa, as the region has only managed a slight reduction in the population that lives below $1.25 per day from 56% to 48%.

With regard to inequality, the Africa society is ranked one of the most unequal, going by the high levels of inequality in the region. A recent study by Ortiz and Cummins (2011) put the inequality index (Gini coefficient) for Africa at 42.2%. Though the study reports a 4% decrease in inequality between 1990 and 2008, Africa is still regarded as one of the continents with the highest inequality rate despite huge resource inflows into the region. Asiedu (2003) argues that even though resource inflow into Africa is less, relative to the Asian continent, Africa has not been able to put the 'meager' resources to effective use so as to impact on social welfare. On the contrary, the Asian continent has effectively utilized its resources to improve welfare. Though the Asian continent is also ranked as one of the high unequal regions (40.4%), the poverty level in the region is much lower when compared with that of Africa, where the rates of poverty and inequality are almost at par.

Through the approach of targeting industrial growth, the governments of Asian and Latin American countries were able to improve the aggregate growth and social welfare status of the poor. According to Dutta (2005), through the approach of appropriate policy targets on trade and industrial development, China was able to diversify its economy from the agricultural to the industrial sector, with the share of GDP growing above two-thirds of

total aggregate growth in 2000. In Africa, however, countries still rely on the production of primary commodities whose impact on productivity, wages and profit is low (Gupta, 1993). The issue of external debt also plays a strategic role in the growth contours of the Chinese economy. A study by Sachs (1985) reports that China maintains a debt-growth structure that is able to free many resources for industrial growth. Conversely, the issue of high level of ED in Africa is a contending factor which has affected economic growth and social development.

Christensen (2005) examined the role of domestic debt markets in sub-Saharan Africa (SSA) and found that domestic debt interest payment exerts significant burden on the economy, and crowds out private sector lending. Presbitero (2012) asserts that a high stock of external debt creates uncertainty and distorts future inflow of external funds which are needed to boost investments and economic growth. However, in order to mitigate the effects of a high level of ED, many countries have resorted to alternative sources of revenue. According to Easterly (2002) and Johansson (2010), many policymakers have adopted high interest rates and taxes on capital stock for financing domestic economic activities, in place of the 'traditional' debt relief packages.

Aiyagari and McGrattan (1998) however state that these methods of financing economic activities, rather than improve growth and welfare, have proved to be inadequate because of geographical challenges which impact on economic activity. Despite the fact that these methods of financing economic activities have proven to be inefficient, policymakers in Africa are yet to fashion out appropriate policy frameworks to determine alternative domestic sources of revenue that can complement economic activities in the region. Similar to the issue of ED, appropriate exchange rate (ER) policy is another factor that is a challenge to Africa's economic growth and social development. Many studies suggest that a poorly managed exchange rate policy affects volume of trade and industrial growth negatively (Rodrik, 2008).

1.3 Objectives of the Study

The objectives of this study include to:

(i) Examine the impact of the composition of growth on poverty and inequality in selected African countries.

(ii) Examine the impact of the composition of growth on the level of external debt in selected African countries.

(iii) Examine the effectiveness of real exchange rate as a policy tool for industrial diversification.

1.4 Research Questions

The research questions include:

(i) Which sectors drive poverty and inequality reduction in selected Africa countries?

(ii) Which sectors drive external debt in selected African countries?

(iii) Does real exchange rate affect the growth composition of sectors in selected African countries?

1.5 Significance of the Study

The significance of this study is to show that, with appropriate targets for industrial development, the high levels of poverty and inequality in Africa can be reduced. This approach of targeting specific sectors for development, in order to reduce poverty and inequality has been used by most emerging economies. For instance, through targeting of their industrial sectors, Asian and Latin American countries were able to reduce the levels of poverty by a higher margin than achieved in African countries. A recent MDG report (2014) shows that between 1990 and 2010, China reduced the proportion of its population that lives below $1.25 per day from 60% to 12%. This is in sharp contrast to countries like Nigeria, Burundi, and South Africa where, between 2000 and 2013, average poverty rates stood at 68.4%, 68.3% and 18.1% respectively. While the levels of poverty and inequality are on the increase in most African countries, the opposite is the case in the Asian and Latin American countries. Reversing these trends therefore requires that African

policymakers have additional information on which of the productive sectors have higher capacities to improve the level of welfare in the region.

Secondly, improving domestic sources of revenue through the approach of targeting specific sectors will provide additional resources to cater for the high debt stock per aggregate national income which is a challenge to countries in Africa. Easterly (2002) and Johansson (2010) report that other than the 'traditional' debt relief packages for financing domestic economic activities, many developing countries' policymakers have also adopted high taxes on capital stocks, and maintaining high interest rates as means of raising additional funds for domestic economic activities. However, according to Aiyagari and McGrattan (1998), these methods of financing economic activities, rather than improve growth and welfare have proved to be inadequate because of geographical differences which impact on economic activity. Therefore, in order to stimulate economic growth in Africa, policymakers require appropriate policy frameworks to determine the sectors which have high productivity and revenue impact on the level of ED in the region.

Lastly, the use of appropriate exchange rate (ER) policies in some countries of Asia and Latin America has led to improvement in industrial diversification and growth, especially in developing economies such as China, Brazil, and Indonesia. However, the case of Africa is different, as the continent is yet to take advantage of an appropriate ER policy to improve trade and industrial growth. In order to reverse this trend, African policymakers need additional information to determine whether ER affects the composition of sectoral growth, and which of the sectors causes ER appreciation.

1.6 Gap in the Literature

There are three gaps in the literature that this study seeks to fill. Firstly, studies that examine the impact of sectoral growth composition on welfare do not take into account the fact that sectors are interdependent. Consequently, economic activity in one sector tends to spill over into others. This confounds the estimates of the impact of sectors on poverty

and inequality reduction. For instance, in Gemmell et al. (2000), the study found that a one percent increase in manufacturing GDP in Malaysia leads to a 0.67 percent increase in agricultural GDP, while a one percent increase in the services sector reduces agricultural GDP by 0.47. Although, this study and many others find that no single sector can effectively improve growth and welfare without the contribution of at least one other sector, the conclusion was reached without first filtering out the impact of one sector from another prior to empirical investigation.

The second gap the research seeks to fill is the scarcity of studies that examine the impact of composition of growth on the level of external debt. Many of the studies that examine debt-growth relations mainly focus on the impact of ED on aggregate growth output or, on the reverse causality. Fosu (1999) examined the impact of ED on growth in sub-Saharan Africa (SSA) and found that between 1980 and the 1990s, SSA's growth was affected negatively owing to a high debt burden. Christensen (2005) examined the role of domestic debt markets in sub-Saharan Africa (SSA) and found that domestic debt interest payment places a significant burden on the economy, and crowds out private sector lending. A similar study by Woo and Kumar (2015) also reported that high public debt slows economic growth in many countries both in the short and long run. However, Jayaraman and Lau (2009) reported a short-run positive bi-directional causal relationship between aggregate growth and ED. Lof and Malinen (2014) found a significant negative reverse impact of growth on debt. Puente-Ajovin and Sanso-Navarro (2015) reported that with the exception of Greece, there is a negative causal impact of real GDP growth on various levels of government debt.

The third gap is that studies that have examined the ER and growth relationship have either adopted aggregate growth or sector value added in GDP (e.g. Rodrik (2008)). These studies did not take into account that sectors may have different responses to ER change, which can affect the structure of the economy. However, studies have shown that the growth share of sectors in homogenous economies respond to changes in ER in a similar manner. Rodrik (2008) examined the impact of RER and economic growth in selected countries and found that RER affects the growth of homogenous economies in a similar

trend. Hua (2007) investigated the impact of RER employment in the manufacturing sector of China and found that appreciation of the domestic currency negatively affects manufacturing employment. While some of these studies are regional and cross-country based, this researcher is unaware of any such study that has been done specifically on the African continent for the purposes of examining the effectiveness of ER as a tool for industrial diversification.

1.7 Contributions of the Study

This study will therefore contribute to the literature in the following ways. In chapter two, the spill-over effects arising from the fact that sectors are inter-dependent are mitigated by applying a filtering process that uses a partial regression approach to isolate the 'pure' sector effects of one sector from another. In chapter three, considering the scarcity of studies that examine the impact of the composition of growth on the level of external debt, this research focuses specifically on African countries. Furthermore, it has been established that the impact of different sectors on the economic growth of different countries varies. Consequently, identifying the sectors which have higher foreign debt reducing impact on the level of external debt is important for the African region.

In chapter four, this study will make empirical contributions by showing the response of the growth rate of each of the sectors to changes in ER. Changes in ER have been found to impact on the growth composition of sectors differently. According to Rodrik (2008), undervaluation of real exchange rate (RER) boosts industrial growth for certain economies, while overvaluation worsens it. A study by Cherif (2013) also reports that overvaluation of RER worsens the economic growth of economies that depend on primary commodities, while it boosts the growth of primary-commodity-producing countries which are technologically advanced. Therefore, in examining the responses of the sectors to changes in ER, this study will utilize the 'pure' sectors' shares in GDP. This is because a study by Ngai and Pissarides (2008) has shown that there is interdependency among sectors. In order to mitigate the spill-over effects arising from the fact that the sectors are interdependent, this research shall first, filter out the spill-overs using a partial regression

approach and isolate the ‘pure’ sectors. The result obtained will then be adopted as the ‘real’ growth rate of the share of that sector in GDP.

1.8 Organization of the Study

The rest of this thesis is organized as follows: Chapter 2 investigates the impact of growth composition on poverty and inequality in selected African countries. Chapter 3 focuses on the impact of growth composition on external debt with evidence from African countries. Chapter 4 examines real exchange rate as a policy tool for industrial diversification in Africa. Finally, chapter 5 concludes the study with policy recommendations.

Chapter Two
The Impact of Growth Composition on Poverty and Inequality In Selected African Countries

2.1 Introduction

This study investigates the impact of the composition of growth on poverty and inequality in selected African countries. According to a United Nations Development Programme report (UNDP, 2014), about 1.2 billion of the world's population lives on $1.25 per day,[1] with more than half of these living in Asia and one-third living in Africa. A United Nations Millennium Development Goals report (MDG, 2014) also states that, between 1990 and 2010, South-East Asia reduced the proportion of its population that lives below $1.25 per day from 45% to 14%. China also reduced the proportion of its population that lives below $1.25 per day from 60% to 12%. Africa however, has not recorded similar significant progress towards one of the Millennium Development Goals as the continent, within the same period, was able to reduce the population that lives below $1.25 per day from 56% to 48%.

With regard to inequality, the Africa society is ranked one of the most unequal, going by the high levels of inequality in the region. A recent study by Ortiz and Cummins (2011) put the inequality index (Gini coefficient) for Africa at 42.2%. Though the study reports a 4% decrease in inequality between 1990 and 2008, Africa is still regarded as one of the continents with the highest inequality rate despite huge resource inflows into the region. Asiedu (2003) argues that even though resource inflow into Africa is less, relative to the Asian continent, Africa has not been able to put the 'meager' resources to effective use so as to impact on social welfare. On the contrary, the Asian continent has effectively utilized its resources to improve welfare. Though the Asian continent is also ranked as one of the high unequal regions (40.4%), the poverty level in the region is much lower when compared with that of Africa, where the rates of poverty and inequality are almost at par.

[1]The poverty measure of 1.2 billion people living on $1.25 per day is based on income measure definition. However, when the definition changes to include those that are deprived of education, health, and standard of living the figure is1.5 billion (see UNDP report, 2014). See appendix 2E, 2F and 2G for poverty and inequality distribution by region.

While the situation in Africa contradicts many empirical results, it however supports the findings of Ferreira and Ravallion (2008). Their study reports a direct relationship between higher inequality and poverty in Africa, Eastern Europe, Central Asia, and Latin America. The question that this study investigates is whether the composition of Africa's economic growth affects the ability of the continent to reduce poverty and inequality and to therefore foster inclusive growth. The structure of African economies remains resource and agriculture intensive. According to the African Union's Conference of Ministers of Industry, the African continent is the least-developed manufacturing region in the world (AU, 2008).

However, Hasan and Quibria (2004) found that the growth of the industrial sector drives poverty reduction in South East Asia. A similar view is expressed by the United Nations Industrial Development Organization (UNIDO), which notes that poverty reduction in South-East Asia has been a result of unprecedented industrialization (UNIDO, 2009). In the case of China in particular, the UNIDO report states that in China, "vast numbers of people have left agriculture to work in factories, as—in the past—did rural populations in the now industrialized world" (UNIDO Industrial Development Report, 2009: 5).

The significance of this study is twofold. Firstly, the discussion among African policymakers about the role of the industrial sector in reducing poverty is now gaining momentum. For example, the AU argues that "no country or region in the world has achieved prosperity and a decent socio-economic life for its citizens without the development of a robust industrial sector" (AU, 2008: 3). Secondly, there seems to be divergence of opinion between academic researchers and policymakers on whether the industrial sector is the main driver of poverty alleviation and inequality reduction. For example, Bezemer and Headey (2007:1345) argue that "there is overwhelming evidence from theory, history, and contemporary analysis that agricultural growth is a precondition to broader growth. A further important point is that agricultural growth is quintessentially pro-poor growth". Empirically testing these competing views within the African context is therefore of immense policy relevance.

This study identifies two gaps in the literature. First is that studies that examine the impact of sectoral growth composition on welfare do not take into account the fact that sectors are interdependent. Consequently, economic activity in one sector tends to spill over into others. This confounds the estimates of the impact of sectors on poverty and inequality reduction. For instance, Gemmell et al. (2000) observed that a one percent increase in manufacturing GDP in Malaysia led to a 0.67 percent increase in agricultural GDP, while, a one percent increase in the services sector reduced agricultural GDP by 0.47. Although, this study and many others find that no single sector can effectively improve growth and welfare without the contribution of at least one other sector, this conclusion was reached without filtering out the impact of one sector from another prior to formal investigation.

Secondly, there is a dearth of studies that investigate the impact of the composition of growth on poverty alleviation and inequality reduction with a specific focus on Africa. Received literature shows that most of the studies on the impact of growth composition on welfare are either cross-country-sectors-specific analyses (e.g. Loayza and Raddatz, 2010), country-sectors-specific analyses (e.g. Suryahadi et al, 2009), or country-sector-specific analyses (e.g. Diao and Pratt, 2007).

The contribution of this study is as follows: First, building on the work of Loayza and Raddatz (2010), the spill-over effects arising from the fact that sectors are interdependent are mitigated by applying a filtering process that uses a partial regression approach. Second, the study is conducted for a panel of 36 African countries. Conducting this study specifically for African countries will reduce the effect of heterogeneity from different regions and make any inferences more accurate. Studies by Hayakawa (2007) and Alem (2015) have shown that empirical results are sensitive to the heterogeneity of samples. Therefore, by focusing on African economies, this study will contribute evidence-based solutions to Africa's welfare challenges.

The remainder of this study is structured as follows: Section 2reviews the different strands of literature on the effect of the composition of growth on poverty and inequality. Section

3 presents the research methodology, data and the estimation technique. Section 4 presents the empirical analysis of the results and robustness checks. Section 5 is the conclusion.

2.2 Literature Review

There are five main strands of literature on the impact of the composition of growth on welfare improvement. First are the studies whose findings show that the primary sector's growth reduces poverty and inequality. Second, are those in favour of the secondary sector. The third strand comprises those which state that the tertiary sector drives growth and welfare improvement while the fourth are those which posit that no sector has the sole capacity to reduce poverty and inequality without the complementarity of another sector. Lastly are those that did not find any relationship. Although views on these sectors hold in many instances, a study by Montalvo and Ravallion (2010) reports that the impact of the growth of these sectors on welfare differs across urban and rural communities within countries.

The first strand of literature shows how agricultural-based practice affects the economic fortunes of rural and urban economies. Reardon and Taylor (1996) examine the impact of agro-climatic shock on income inequality and poverty in three agro-ecological zones of Burkina Faso. The study finds that off-farm income increases inequality and poverty among the poorest households that have limited access to off-farm income, especially in areas where agro-climatic conditions are poor. Diao and Pratt (2007) examine the impact of the primary sector on poverty reduction in Ethiopia using a spatially disaggregated, economy-wide model. The study finds that agricultural growth improves rural poverty through the improvement of growth in cereals and other staple crops.

Ellis and Bahiigwa (2003) report that through policies that provide land and livestock, agricultural activity income of the poor tended to rise and poverty incidence reduced in Uganda. Furthermore, Ravallion and Chen (2007) investigate the uneven progress in China's poverty reduction strategy and find that economic growth in the agricultural sector plays a more significant role in reducing poverty than economic growth arising from the

industrial or services sectors. However, the study by Ravallion and Chen (2007) further reports that absolute inequality between the rural and urban poor converges at a later period even though at the initial period, the inequality in rural areas is less than in the urban regions. Montalvo and Ravallion (2010) examine the pattern of growth and poverty reduction in China and find that agriculture has been the main driver of poverty reduction since the 1980s. These studies observe that the channels by which the primary sector reduces poverty are through improvement in income and labour productivity.

According to Barette et al. (2001) and De Janvry and Sadoulet (2009), as income and labour productivity increase, more resources are made available to farmers who can then demand for more goods and services. Irz et al., (2001) report that a 1% improvement in labour productivity reduces the poverty count by 0.83%. Conversely, many authors have sought to find out if indeed agricultural growth affects growth in Africa. In this regard, Diao et al. (2010: 1375) state that "while agriculture-led growth has played an important role in reducing poverty and transforming the economies of many Asian countries, the strategy has not worked in Africa because most African countries have failed to meet the requirements for a successful agricultural revolution".

Christiaensen et al. (2011) posit that given the myriad of challenges facing the huge poor population, the share of agricultural growth has not been adequate to move the greater percentage of the population from absolute poverty level (living on $1 per day) to relative poverty state (living on $2 per day). Similarly, Zhang and Wan (2006) argue that relying on agricultural output growth to improve rural income in China is unsustainable given the numerous challenges facing the rural communities. If these challenges are to be mitigated then poor countries need to get their industrial policy right by instituting a framework that would help improve labour productivity and transfer the gains to tradable sectors.

The second strand of literature comprises those that find that poverty and inequality are best reduced by the manufacturing or industrial sector. Melloy (1999) shows that as large-scale capital investment is made in the industrial sector, efficiency improves, which in turn impacts positively on wage income. Hasan and Quibria (2004) in their study, find that the

industrial sector's growth drives poverty reduction in East Asia. However, the study argues that because countries engage in restrictive trade and industrial policies which inhibit the growth of labour-intensive manufacturing, growth from the industrial sector did not impact positively on the welfare of the poor. Loayza and Raddatz (2010) show that through improvement in labour-intensive sectors, growth emanating from the sectors impact positively on the relative income of the poor.

A related study by Christiaensen and Demery (2007) also reports that through the export-led growth channel, an economy that focuses on labour-intensive manufacturing improves the wage income of the poor relatively compared to other sectors. When income improves, its impact on general wellbeing and overall aggregate growth is positive. However, a study by Beck et al. (2005) did not find any evidence to support the assertion that the activities of the industrial sector reduce poverty. Rather, the study posits that there is a robust positive relationship between small industrial clusters and economic growth for developing countries.

The third strand of literature is the group that supports the services sector as the driver of welfare improvement. These studies provide robust empirical support for this justification. Suryahadi et al. (2009), adopting the generalized least squares (GLS) panel estimation, revisits the assertion that the services sector improves welfare. The study concludes that economic growth in the sector reduces urban and rural poverty in Indonesia. Similarly, Ferreira et al. (2010) rely on disaggregated GDP data by state and the sectors and report that growth in the services sector is more poverty reducing than growth in other sectors in Brazil; the channel being through human development and empowerment of workers. Another channel by which the services sector improves welfare is through trade and industrial policies. Rodrigues and Rodrik (2001) and Chang et al. (2009) show that through industrial policy improvement on trade openness, export of goods and services contributes positively to economic growth.

Otsuka and Yamano (2006) posit that growth in non-farm income is required to reduce income inequality/poverty among the rural poor in Asia and East Africa. The channel by

which the services sector reduces poverty and inequality has been identified to be through trade and improvement in trade and industrial policies. Analysing the services sector's transmission channel, Ferreira et al. (2010) submit that the health and education sectors played significant roles, not only in improving the impact of aggregate growth, but also in improving the poverty-reducing strength of growth in Brazil. Another channel by which the services sector advances welfare is through the improvement in trade and industrial policies. Although literature is scarce on the direct links between trade/ industrial policy and poverty-inequality dynamics, evidence abounds that growth emanating from trade of goods and services causes an increase in economic growth.

Deaton (1999) investigates commodity prices and growth in Africa and reports that a boom in prices of export commodities has significant positive impact on growth, while a slump in prices affects growth negatively. Isham et al. (2005) report that countries that rely on primary commodities such as cocoa and coffee for economic growth, perform poorly compared to countries with natural resources whose export contents are diffused with livestock and agricultural produce. In Montalvo and Ravallion (2010), policy change on industry towards access to finance and restriction on labour movement led to better improvement of growth, poverty and inequality in China right from the early 1980s. The study argues that although growth "imbalance" was seen across sectors in China, aggregate growth within the period was enough to improve welfare. Trade channel is another means by which poverty and inequality are reduced through improvement in aggregate growth.

The fourth strand of literature consists of those whose views reflect the inter-dependency of sectors. Ravallion and Datt (1996), show that the agricultural and industrial sectors jointly impact positively on growth and poverty reduction in India. Warr (2006) finds that for two decades, the combined growth of the agricultural and services sectors accounted for poverty reduction in four countries of Southeast Asia, although with the services sector contributing the greater percentage. Suryahadi et al. (2009) report that although the services sector growth reduces poverty in Indonesia more than any other sector, the agricultural sector plays a very significant role in poverty alleviation among the rural poor.

In sub-Saharan Africa, Thirtle et al. (2003) show that agriculture-led productivity contributes substantially to the reduction of poverty in the region.

Furthermore, a study by Pauw and Thurlow (2011) applied are cursive dynamic computable general equilibrium and microsimulation model to investigate the effect of agriculture on poverty and nutrition in Tanzania. The study reports that even though agricultural growth, particularly in maize, strengthens the growth-poverty relationship and enhances households' caloric availability, the average national growth of 6.1% is driven by the industrial and services sectors. The last strand of literature includes those that did not find any positive relationship between the impact of the composition of growth and welfare reduction. Modelling growth options and structural changes in middle-income countries, Breisinger et al. (2009) applied are cursive dynamic model and report that no sector's growth is enough to drive Ghana's economy to attaining the status of a middle-income country (MIC).

In summary, because of the differences in findings on the impact of growth composition on welfare, researchers and policy analysts have not been able to come up with the required framework that would solve the twin challenges of poverty and inequality in the Africa continent. In order to contribute to existing growth literature and provide the background for new policy prescriptions, this study adopts a framework that will reengineer the growth-poverty-inequality architecture. Believing in the existence of inter-sectoral dependency, knowledge of which of the sectors have higher welfare improving impact. T will provide policy experts the right view of each sectoral contribution to poverty and inequality reduction in Africa.

2.3 The Model

The model for this study is built on the theoretic framework by Loayza and Raddatz (2010). Recent growth literature has relied on this framework to justify the sources of variation in the impact of composition of growth on aggregate economic growth and welfare. The model framework demonstrates the mechanism by which improvements in

the composition of growth interacts with labour to improve a country's aggregate growth structure and welfare situation. Although this may differ or remain the same across countries, what differentiates one country from another is the rate and magnitude of spill-overs of sectors into one another. According to Christiaensen et al. (2011), if one sector employs more than the other and the rate of spill-overs is greater from the originating sector, then the contribution of that sector to welfare becomes greater than the other.
The model is stated as follows:

$$\hat{x}_{jt} = \beta_j + \widehat{\beta_i x}_{j,t-1} + \sum_{i=1}^{n} \beta_i \,.\, s_{ijt} \,.\, \hat{y}_{ijt} + \varepsilon_{jt} \qquad (1)$$

Where, $\hat{x}_j$ represents poverty measurement index (headcount ratio) and inequality measurement index (Gini coefficient) for country *j* at time *t*. The Gini coefficient is used because, according to Clarke (1995), it is strongly correlated with other measures of income inequality. The headcount and Gini indexes will show the extent to which sectors can drive poverty and inequality in the region. β_0, represents the equation intercept; β_i, represents the coefficient of the parameters; s_{ij} is the sectoral value added share in GDP for sector *i* and country *j*; $\hat{y}_{ij}$ represents the annual rate of change of sectoral value added in GDP for sector *i* and country *j*; *n* represents seven sectors;and ε_j is the error term.

This study differs from this model, first by introducing the derived values of spill-over effects from one sector to another as the 'real' sectoral contribution to growth at time *t*. Previous studies such as Loayza and Raddatz (2010) and Montalvo and Ravallion (2010) adopted sectoral value added in GDP without filtering out the effect of sectors on one another. A priori, the sign of the parameters is expected to be negative and β_i magnitude significant enough to allow for policy recommendations. The negative sign of parameters indicates that as the composition of sectoral growth improves, poverty and inequality is reduced by the same quantity it increased. This is in line with Ferreira et al. (2010). The *nth* value of parameters is to be estimated for 36 African countries for the agricultural sector, the disaggregated sectors of industry (which is comprised of manufacturing, mining and construction), and the services sector (which comprises transport, communication, and

wholesale, retail, hotel, education).[2] The regression specification weights for sectoral growth are based on the size of each sector relative to GDP growth which is found to reduce poverty.

2.3.1 Data description and estimation technique

The data used for the analysis in this study are panel time-series data on 36 African countries.[3]Due to the challenge of availability, the data is limited to the period for which they are mostly available – i.e.2000 to 2013. The poverty and inequality data annualized rate of change calculated in percentages. Data for poverty and inequality (dependent variables) were obtained from *PovcalNet* of the World Bank (2014) and UNDP annual reports of various years,[4] while data on different sectors and GDP were sourced from the UNCTAD database (2014). Following Siddiqui and Ahmed (2013), the estimation of the model is conducted using the generalized method of moments (GMM)-based Arellano-Bond linear dynamic panel approach. The purpose of adopting GMM is because, unlike other estimators, it provides the structure to control for endogeneity bias caused by unobserved country-specific effects, and other misspecification or over-identification of parameters challenge.

2.4 Analysis of Results

Table 2.1a presents the estimation for equation (1) using the 'growth share of sectors in GDP' following the Loayza and Raddatz (2010) approach. The results show that agriculture and industry are the most active sectors that drive poverty reduction. In Table 2.1b, when the three sectors were disaggregated into different subsectors, the results reveal that agriculture and the subsectors of industry – manufacturing and mining – are the most

[2] This disaggregation is based on International Standard Industrial Classification of all economic activities (ISIC. Rev. 4)

[3]The following countries were examined: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central Africa Republic, Congo, Congo DR, Cote d'Ivoire, Djibouti, Egypt, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Mali, Morocco, Mozambique, Namibia, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Tunisia, Uganda, and Zambia.

[4] The World Bank (2014) and UNDP data on inequality are complemented with statistics from Ortiz and Cummis (2011).

active sectors that drive poverty reduction. This result is in line with Loayza and Raddatz (2010) who also show that labour-intensive sectors drive poverty reduction among developing countries. Although, previous studies did not show the impact of investment in sectors overtime on poverty, this result presents the outcomes. The impact outcome of some sectors did not show consistency overtime. This may be due to the dynamic nature of the instrumental variables.

Second, even though this study controlled for endogeneity, conducting this study specifically for a particular region at different lag periods may have also contributed to the slight differences observed in the results. Table 2.2a shows the reaction of poverty overtime to the activity of the three sectors when the spill-over effects of sectors are filtered off. The results show that at the initial period *t* and period *t*-1, the services sector (*servs_rserv*) shows consistency in poverty reduction. Although the agricultural sector (*as_ra*) was active in period *t*-1, this impact is less when compared with the services sector. This result supports the findings of Ravallion and Datt (2002) and Ferreira et al. (2010) for India and Brazil respectively. The results however contradict the findings of Diao and Pratt (2007) and Diao et al. (2010) for African countries.

Table 2b shows the disaggregated results for all the explanatory variables for equation (1).Unlike in Table 2.2a, there is a clearer view of the subsectors that are responsible for poverty reduction. At 1% significant level, the findings show that the subsectors with the greatest impact on poverty are the construction, manufacturing, "others," and the mining sectors with very little contribution from the agricultural sector. In Table 3, the impact of the sectors on inequality is shown. The results show that all three sectors were found to reduce inequality, although at different degrees. However, among the three sectors, the industrial and services sectors are the most active sectors that drive inequality reduction. On the other hand, the sectors that drive inequalityare the mining; wholesale, retail and hotels (WRH); and manufacturing subsectors. Specifically, the mining sector is consistent and has the highest impact on inequality at all the periods.

However, the wholesale, retail and hotels (WRH) and manufacturing subsectors performed better in some instances, especially when inequality rate was at the lowest point. Granted that the agricultural sector was rightly signed, which signifies that it reduces inequality, this study had some reservations in accepting this result. The reason for this is that growth literature has shown that an increase in agricultural activities, especially through technology, concentration of agricultural exports among large farm owners (see Ravallion 2001), and land appropriation by the wealthy (Bourguignon and Morrison, 1990; Adams, 2002; and Ravallion and Datt, 2002), increase the levels of inequality among poorer countries.

The concentration of resources in the hands of a few weakens economic growth structure and creates failure in the credit market. According to Ravallion and Datt (2002), when growth weakens and the credit market is affected, the poor are unable to exploit the growth opportunities for human and physical capital investment. In a similar vein, Otsuka and Yamano (2006) show that lack of state capacities to develop the labour market and human capital among countries creates the platform for labour-market failure, which leads to reallocation of labour by landowners from low-paying primary sectors to high-paying non-farm sectors. The evidence that the model in the study is appropriate and the results robust is manifested in the high J-statistics outcome in all the estimations.

Table 2.1a: Sectoral growth and poverty headcount index using the Loayza and Raddatz (2010) estimation approach.
Dependent Variable: Annual rate of change of poverty headcount ratio (dphc) at $1.25.

Regressors[5]	t	t-1	t-2	t-3
dphc(-1)	-0.256* (0.000)	-0.253* (0.001)	-0.231* (0.000)	-0.260* (0.001)
Xagric	0.605* (0.016)	-0.286* (0.021)	0.326* (0.026)	-0.095* (0.022)
Xindustry	-1.005* (0.023)	-0.965* (0.023)	0.518* (0.017)	0.702* (0.075)
Xservices	0.799* (0.019)	0.213* (0.017)	-1.906* (0.021)	0.144* (0.048)
J-statistic	33.560	28.831	35.231	27.909
Mean dep variable	-0.017	-0.017	0.010	0.018
S.D. dep variable	2.281	2.281	2.333	2.466
S.E. of regression	2.047	2.045	2.125	2.225
Sum sqrd residual	1529.155	1527.081	1486.146	1445.225
Instrument rank	37	38	37	39
Panel observations	369	369	333	296
Period sample	10	10	9	8

*1% significant. All regressions are lagged to (t-3) periods. GMM model variables are in first differences, therefore there is no intercept.
37 cross-sections fixed (first differences). White period instrument weighting matrix. Instruments: 2-step Arellano-Bond type: once lagged level of the dependent (DPHC-1)
Values in parentheses are standard errors. Start period (adjusted): 2003

[5] "xagric" stands for agriculture; "xindustry" stands for industry; and "xservices" represents services sector

Table 2.1b: Disaggregated sectoral growth and poverty headcount index using the Loayza and Raddatz (2010) estimation approach. Dependent Variable: Annual rate of change of poverty headcount ratio (dphc) at $1.25.

Regressors[6]		t-1	t-2	t-3
dphc(-1)	-0.258* (0.001)	-0.253* (0.001)	0.259* (0.005)	-0.268* (0.002)
xagric	1.445* (0.059)	-1.675* (0.049)	0.833 (0.620)	0.625* (0.160)
xmanufact	-5.901* (0.274)	-1.258* (0.533)	-0.764 (1.096)	0.557* (0.384)
xconstruct	7.246* (0.294)	8.954* (0.235)	-3.691 (3.791)	-18.608* (0.439)
xmining	-0.857* (0.037)	-1.290* (0.110)	1.961* (0.444)	0.410**(0.200)
xothers	8.092* (0.150)	-3.161* (0.301)	-26.741* (0.605)	-2.467* (0.307)
xtc	-15.093* (0.215)	7.684* (0.219)	45.922* (1.931)	14.100* (0.888)
xwrh	0.326* (0.033)	0.669* (0.053)	0.177* (0.349)	-0.663* (0.078)
J-statistic	31.985	27.572	31.976	31.030
Mean dep variable	-0.017	-0.017	0.010	0.018
S.D. dep variable	2.281	2.281	2.342	2.239
S.E. of regression	2.048	2.059	2.134	2.440
Sum sqrd residual	1514.171	1530.433	1782.890	1443.473
Instrument rank	38	38	37	38
Panel observations	369	369	333	296
Period sample	10	10	9	8

*1% significant. All regressions are lagged to (t-3) periods. GMM model variables are in first differences, therefore there is no intercept.
37 cross-sections fixed (first differences). White period instrument weighting matrix. Instruments: 2-step Arellano-Bond type: once lagged level of the dependent (DPHC-1)
Values in parentheses are standard errors. Start period (adjusted): 2003

[6] "xagric" stands for agriculture; "xmanufact" stands for manufacturing; "xconstruct" represents construction; "xmining" represents mining and utility; "xothers" represents "OTHERS" as classified by (ISIC.Rev4); "xtc" stands for transport and communications; and "xwrh" stands for wholesale, retail and hotels

Table 2.2a Sectoral growth and poverty headcount index using the 'filtering' process approach due to spill-over effects.
Dependent Variable: Annual rate of change of poverty headcount ratio (dphc) at $1.25.

Regressors[7]	t	t-1	t-2	t-3
dphc(-1)	-0.268* (0.000)	-0.259* (0.000)	-0.231* (0.000)	-0.260* (0.000)
as_ra	2.960* (0.024)	-0.986* (0.033)	-1.016* (0.011)	-0.234* (0.007)
indus_rinds	11.407* (0.093)	9.317* (0.130)	-3.582* (0.084)	-1.659* (0.022)
servs_rserv	-10.730* (0.235)	-1.656* (0.057)	1.125* (0.027)	4.616* (0.011)
J-statistic	35.612	33.097	35.897	31.824
Mean dep variable	-0.017	-0.017	0.010	0.018
S.D. dep variable	2.281	2.281	2.333	2.466
S.E. of regression	2.061	2.049	2.125	2.226
Sum sqrd residual	1535.756	1530.701	1485.568	1446.737
Instrument rank	37	37	38	38
Panel observations	369	369	333	296
Period sample	10	10	9	8

*1% significant. All regressions are lagged to (t-3) periods. GMM model variables are in first differences, therefore there is no intercept.
37 cross-sections fixed (first differences). White period instrument weighting matrix. Instruments: 2-step Arellano-Bond type: once lagged level of the dependent (DPHC-1)
Values in parentheses are standard errors. Start period (adjusted): 2003

[7] "as_ra" stands for agriculture; "indus_rinds" stands for industry; and "servs_rserv" stands for services

Table 2.2b: Sectoral growth and poverty headcount index using the 'filtering' process approach due to spill-over effects.
Dependent Variable: Annual rate of change of poverty headcount ratio (dphc) at $1.25.

Regressors[8]	t	t-1	t-2	t-3
dphc(-1)	-0.293* (0.002)	-0.259* (0.000)	-0.234* (0.001)	-0.035* (0.001)
as_ra	3.110* (0.115)	-0.270* (0.000)	-1.177* (0.095)	-0.064* (0.007)
cs_rc	-58.314* (1.343)	-51.025* (1.093)	16.918* (0.947)	2.820* (2.201)
mining_rmining	11.740* (0.628)	10.234* (0.536)	-2.343* (0.556)	-3.960* (1.264)
others_rothers	10.167* (0.620)	-3.520* (0.265)	-7.507* (0.552)	2.135* (1.380)
tc_rtc	-8.830* (0.537)	3.639* (0.230)	10.558* (0.369)	7.893* (0.918)
wrh_rwrh	1.196* (0.187)	0.141* (0.067)	-0.239* (0.057)	-0.274* (0.298)
ms_rm	-9.351* (0.348)	-9.278* (0.413)	-2.313* (0.266)	9.044* (1.282)
J-statistic	32.078	28.799	32.854	29.493
Mean dep variable	-0.017	-0.017	0.010	0.018
S.D. dep variable	2.281	2.281	2.333	2.466
S.E. of regression	2.065	2.070	2.134	2.440
Sum sqrd residual	1538.836	1546.672	1480.473	1714.781
Instrument rank	37	37	37	37
Panel observations	369	369	333	296
Period sample	10	10	9	8

*1% significant; **5% significant; ***10% significant. All regressions are lagged to (t-3) periods. Values in parentheses are standard errors. Start period (adjusted): 2003
GMM model variables are in first differences, therefore there is no intercept. 37 cross-sections fixed (first differences). White period instrument weighting matrix
Instruments: 2-step Arellano-Bond type: once lagged level of the dependent (DPHC-1)

[8] "as_ra" stands for agriculture; "cs_rc" represents construction; "mining_rmining", represents mining and utility; "ms_rm", stands for manufacturing; "tc_rtc", stands for transport and communications; "others_rothers", represents "OTHERS" as classified by (ISIC.Rev4); and "wrh_rwrh" stands for wholesale, retail and hotels

Table 2.3 Aggregated sectoral growth and inequality index using the 'filtering' process approach due to spill-over effects. Dependent Variable: Gini coefficient (dgini)

Regressors[9]	t	t-1	t-2	t-3
dgini(-1)	-0.381* (0.002)	-0.389*(0.003)	-0.338*(0.001)	-0.369* (0.001)
as_ra	-0.103*(0.012)	0.063* (0.013)	-0.174*(0.029)	0.281* (0.031)
indus_rinds	-0.361*(0.128)	-0.145** (0.061)	0.701*(0.058)	-1.028* (0.049)
servs_rserv	-0.515* (0.063)	-0.273*(0.069)	0.122** (0.060)	0.193* (0.023)
J-statistic	30.991	37.446	31.077	33.686
Mean dep variable	-0.002	-0.002	-0.002	-0.001
S.D. dep variable	0.215	0.215	0.201	0.201
S.E. of regression	0.171	0.171	0.164	0.162
Sum sqrd residual	10.338	10.379	8.617	7.435
Instrument rank	36	37	36	37
Panel observations	358	358	323	287
Period sample	10	10	9	8

*1% significant. All regressions are lagged to (t-3) periods. GMM model variables are in first differences, therefore there is no intercept.
36 cross-sections fixed (first differences). White period instrument weighting matrix. Instruments: 2-step Arellano-Bond type: once lagged level of the dependent (DPHC-1)
Values in parentheses are standard errors. Start period (adjusted): 2003

[9] "as_ra" stands for agriculture; "indus_rinds" stands for industry; and "servs_rserv" stands for services

Table 2.4: Disaggregated sectoral growth and inequality index using the 'filtering' process approach due to spill-over effects.
Dependent Variable: Gini coefficient (dgini)

Regressors[10]	t	t-1	t-2	t-3
dgini(-1)	-0.381* (0.004)	-0.304* (0.006)	-0.332* (0.005)	-0.365* (0.005)
as_ra	-0.032 (0.053)	0.046 (0.054)	-0.179* (0.042)	0.252* (0.094)
cs_rc	0.781 (0.649)	1.089* (0.410)	2.701* (0.402)	2.820* (2.201)
mining_rmining	-0.108 (0.289)	-0.459 (0.306)	-1.360* (0.206)	-0.017 (0.303)
others_rothers	0.564 (0.566)	0.172 (0.495)	-0.235 (0.255)	-0.397* (0.245)
tc_rtc	1.250* (0.345)	1.009*** (0.576)	-0.368 (0.451)	-0.555** (0.283)
wrh_rwrh	0.015 (0.048)	-0.143 (0.121)	0.217* (0.072)	0.014 (0.063)
ms_rm	0.487* (0.177)	-0.118 (0.183)	0.791* (0.154)	-0.664* (0.225)
J-statistic	28.289	28.177	29.418	27.872
Mean dep variable	-0.002	-0.002	-0.002	0.011
S.D. dep variable	0.215	0.215	0.201	0.201
S.E. of regression	0.171	0.179	0.163	0.161
Sum sqrd residual	10.259	11.162	8.407	7.262
Instrument rank	36	36	36	36
Panel observations	358	358	323	287
Period sample	10	10	9	8

*1% significant; **5% significant; **10% significant. All regressions are lagged to (t-3) periods
GMM model variables are in first differences, therefore there is no intercept. 36 cross-sections fixed (first differences). White period instrument weighting matrix
Instruments: 2-step Arellano-Bond type: once lagged level of the dependent (DPHC-1).Values in parentheses are standard errors. Start period (adjusted): 2003

[10] "as_ra" stands for agriculture; "cs_rc" represents construction; "mining_rmining", represents mining and utility; "ms_rm", stands for manufacturing; "tc_rtc", stands for transport and communications; "others_rothers", represents "others" as classified by (ISIC.Rev4); and "wrh_rwrh" stands for wholesale, retail and hotels.

2.5 Conclusion

The high levels of poverty and inequality in Africa are manifested in the standard of living of the greater percentage of the population in the continent. Relative to other poor continents, the African continent has been ranked as one of the regions with the lowest standard of living. Although the region is richly endowed with abundant human and material resources, this is yet to translate into growth and development, going by the high levels of poverty and inequality. This is probably due to the countries' choices of investments in the productive sectors. Over the past few decades, almost all the countries of Africa have invested heavily in the agricultural sector which many researchers have noted as a sector with a strong driving role in poverty and inequality reduction.

However, in spite of these investments in the agricultural sector, the level of welfare is still on the decline. This contrasts with those of Asian countries, where welfare has improved considerably owing to appropriate targeting of specific sectors which are known to impact positively on welfare. In view of the challenges of continual welfare decline in Africa, this study undertakes to reinvestigate the impact of the three key sectors on poverty and inequality reduction in Africa, using an existing model. An empirical study is conducted to determine which of the sectors contributes more to poverty and inequality reduction. In recent times, different researchers have undertaken this form of study with evidence thatthecontributions from unskilled labour-intensive sectors and services drive poverty and inequality reduction among developing countries (see Loayza and Raddatz, 2010; and Ferreira et al, 2010).

This study therefore reexamines this finding specifically for the African region using a different estimation approach. While previous studies adopted 'sectoral share in GDP' as the annual contribution of each sector to gross domestic product in the economy, this study differs because of the understanding that sectors are interdependent; and because the activity of one sector spills over into others. In order to mitigate the spill-over effects therefore, the study first 'filters' out the spill-over effects and isolates the 'pure' sector effects before estimation. The findings are summarized as follows: One, although the agricultural sector at time *t* reduces the poverty level, the impact level is very low when compared with those of the services and industrial sectors whose influence on poverty is larger.

This finding reinforces the earlier position of this study on the misconception of the agricultural sector as the main driver of poverty reduction in Africa. Two, even though the agricultural sector's coefficient is observed to be rightly signed on inequality, the study finds it very challenging to accept the result, especially going by the views expressed in Adams (2002) and Ravallion and Datt (2002). These views suggest that when agricultural growth improves through technology, concentration of agricultural exports among large farm owners and land appropriation by the wealthy, levels of inequality increases among poorer countries.

Going by the above findings therefore, this study argues that a policy framework that continues to transfer resources into the agricultural sector rather than the industrial and services sectors is counterproductive and may not be able to improve the welfare condition in the African region. Further, this study argues that relying on the previous approach of adopting the "sectoral share in GDP" in estimating the impact of sectors on poverty or inequality will continue to give biased results. Researchers therefore need to retool their measurement criteria to enable them understand the growth-poverty-inequality dynamics in all situations.

Chapter Three

The Impact of Growth Composition on External Debt: Evidence from African Countries

3.1 Introduction

According to Easterly (2002) and Asiedu (2003), the issue of high ED among developing economies has taken a worrisome and challenging dimension. Over the past few decades, high debt 'overhang' in Africa has led to the classification of the region as insolvent; not being able to meet its debt obligations to its creditors. Going by the International Monetary Fund factsheet (IMF, 2015), out of the 36 countries classified under Heavily Indebted Poor Countries (HIPC), 30 are from Africa. Although the (HIPC) Initiative and the Multilateral Debt Relief Initiative (MDRI) have been able to substantially reduce African countries' total debt burden to about 34 percent, the stock of external debt per aggregate national income in the region is still high and poses serious economic challenges (see Table 3.1).

Presbitero (2012) posits that a high stock of external debt creates uncertainty and distorts future inflow of external funds which are needed to boost investments and economic growth. The challenge facing the African continent therefore is how to reduce the high level of ED so as to mitigate future uncertainty and distortions in investments and growth structures. One way this can be done is by strengthening the domestic productive base to generate additional revenue. Some countries in Asia and Latin America have been able to improve their level of ED through movement from the primary to secondary sector. However, the African case is different as countries still rely on primary sector activity as the main source of revenue for growth and development.

The significance of this study is based on the need to investigate the impact of growth composition on Africa's ED. Easterly (2002) and Johansson (2010) report that other than the 'traditional' debt relief packages for financing domestic economic activities, policymakers in many developing countries have also adopted high taxes on capital stocks, and maintaining high interest rates as means of raising additional funds for domestic economic activities. However, according to Sachs and Warner (1995), and Aiyagari and McGrattan (1998), these methods of financing economic activities, rather than improve growth and welfare, have proved to be inadequate because of geographical differences which impact on economic

activity. Improving fiscal and external imbalances in Africa requires a more practical approach by economic experts to stimulate growth in the domestic sector. Loayza and Raddatz (2010) have shown that adequate investment in labour-intensive sectors drives economic growth and improves welfare.

Therefore, in order to stimulate economic growth in Africa, policymakers require the appropriate policy framework to determine the sectors with higher productivity and revenue impact that can improve the level of ED in the region. The gap this study identified in the literature is as follows: firstly, though there is a large volume of literature on ED in Africa, there is a scarcity of studies that examine the impact of the composition of growth on the level of external debt. Received literature has mainly been on the impact of ED on economic growth. Fosu (1999) examined the impact of ED on growth in sub-Saharan Africa (SSA) and found that between 1980 and the 1990s, SSA's growth was affected negatively owing to a high debt burden.

Iyoha (1999) investigates the impact of external debt on economic growth in sub-Saharan African countries and finds that a high debt burden affects investments negatively in the region. Edo (2002) examines the ED problem in Nigeria and Morocco and finds that the challenges of ED are severe and adversely affect investments in the two countries. Christensen (2005) examines the role of domestic debt markets in sub-Saharan Africa (SSA) and finds that domestic debt interest payments exert significant burden on the economy, and crowds out private sector lending. Similarly, Woo and Kumar (2015), report that high public debt slows economic growth in many countries both in the short and long run.

However, despite the negative impact of the high level of ED on growth, little effort is being made by African economies to strengthen the domestic capacity of sources of revenue. Rather, emphasis has been on attracting more foreign inflows which many studies have found to be inadequate in providing the needed resources for growth and development. Sectoral contributions have therefore been identified to be an alternative and better resource provider. According to Montalvo and Ravallion (2010), sectoral growth provides an economy with the necessary resources that impact on the level of economic progress. The question is, which sectors have the capacity to provide higher resources to drive economic growth and by extension reduce the level of external debt in Africa?

De Janvry and Sadoulet (2009) assert that the primary sector is the most effective sector. However, Warr and Wen-Thuen (1999) and Ferreira et al. (2010) report that the secondary and tertiary sectors respectively have more capacity to provide higher resources for economic progress. The present study makes the following contributions: Firstly, given the scarcity of studies that examine the impact of the composition of growth on the level of external debt, this study focused specifically on African countries. Secondly, it has been observed that the impact of the different sectors on economic growth of different countries differs. Consequently, identifying the sectors with higher foreign-debt-reducing impact on the level of external debt is vital for the African region.

Although studies such as Gupta (1993) and Dutta (2005) have shown that the manufacturing sector has a higher impact on productivity growth and profits, this research investigates further by examining the impact the growth of these sectors has on the level of external debt in Africa. In doing this, this study shall not adopt the conventional approach where the share of sectoral value added in GDP is adopted. The approach of share value added in GDP may not be a clear method of determining the contribution of sectors to GDP since there is inter-sectoral dependency among sectors, which gives rise to spill-over effects. In order to mitigate the spill-over effects arising from the fact that sectors are inter-dependent, this study applies a filtering process that uses a partial regression approach to isolate the 'pure' sector effects before estimation.

The rest of the paper is structured as follows: Section 2 reviews existing literature on the debt-growth nexus in developed and developing countries; Section 3 presents stylized facts and the research methodology and data estimating techniques; Section 4is a panel cross-sectional empirical analysis of the impact of the composition growth on the level of external debt in Africa. The results will be subjected to various forms of robustness checks following (Baum et al., 2013) to account for heterogeneity and endogeneity bias. Section 5 concludes the study.

3.2 Literature Review

Development studies on the debt-growth relationship have relied on the neoclassical and endogenous growth theories to establish how external resources aid the acceleration of the economy's twin objectives of growth and development. In the past, most of these studies centred on developed economies, but recent studies, such as Henry and Arslanalp (2006) and

Johannson (2010) have shifted focus to emerging and developing economies. However, in spite of the skewness in studies along the different economic divides, findings on the debt-growth nexus differ across time and space. For instance, the study by Elmendorf and Mankiw (1999) shows that short-run debt is capable of stimulating aggregate demand and national income, while long-run debt is likely to crowd out capital and reduce income. However, Cohen (1993) argues that although it may have been proven that ED (through debt servicing) crowds out investments, strategic and efficient rescheduling of debts will crowd in investments.

Jorda et al. (2013) show that credit build-ups during economic 'boom' periods heighten the vulnerability of economies. However in periods of post-political uncertainty, excess credit appears to be associated with longer periods of output growth. This view is also expressed by Woo and Kumar (2015:1) who posit that "public debt has an important influence over the economy in both the short run and the long run". Although time horizon matters in debt-growth relations, the impact of debt on growth also differs across different economic structures. Sen et al. (2007) examine the effect of debt overhang on economic growth in Asia and Latin America using dynamic and system GMM. The study reports that the impact of high debt burden on growth is moderate among Asian countries, but is severe in Latin America. Johannson (2010) examines the impact of debt relief on investment and growth among a sample of 188 developing countries and finds that even though there is no evidence of growth effect from debt relief, there is evidence that debt relief promotes investment and growth among countries not classified as HIPCs.

Furthermore, a study by Reinhart and Rogoff (2010) relied on data from 44 developed and emerging economies spanning about two hundred years to examine the relationship between growth and debt. The study shows that a debt-GDP ratio of above 60% and 90% reduces economic growth in emerging and developed countries respectively, and correlates with higher inflationary trend. Woo and Kumar (2015) investigate the effect of high public debt on growth for advanced and emerging economies and also find that the magnitude of debt and its impact on growth differ in developed and emerging economies. The study shows that while debt above 60% affects growth negatively in emerging economies, it becomes negative to growth at 90% for developed economies. For developing economies, Asiedu (2003) shows that for small open economies, a debt/government revenues ratio above 250% or debt/exports ratio above the threshold point of 150% is negative to growth.

Pattillo et al. (2011) examine the impact of ED on growth for 93 developing countries using a system-GMM technique. The study reports that an increase in ED reduces growth by 3.5% after controlling for endogeneity. Herndon et al. (2013) report that given that the impact of debt on growth varies across countries, the negative impact of debt on growth is 2.2% at threshold above 90%. This finding is also in line with Egert (2015) who shows that debt beyond 50% threshold is negative to growth for most economies.

Development literature has examined several channels through which ED may affect output growth in developing countries. Firstly, is through the debt 'overhang' hypothesis, a situation by which higher debt discourages or postpones future inflow of resources for investment (Pattillo et al., 2002 and Hennessy, 2004). Specifically, Pattillo et al. (2002:2) posit that "if there is some likelihood that, in the future, debt will be larger than the country's repayment ability, expected debt-service costs affect foreign investment and harm growth. Potential investors will fear that the more a country produces, the more it will be "taxed" by creditors to service the ED, and thus they will be less willing to incur costs today for the sake of increased output in the future". Besides the debt overhang theory, high ED may also affect growth through the "incentive" and "resource" mechanism channel, which oftentimes affects growth and investments. Relying on a small macro-econometric model, Iyoha (1999) suggests that through the "disincentive" and "crowding out" effects channel, higher ED depresses investment growth in sub-Saharan Africa.

In Johannson (2010), the transmission channel points towards the "incentive" and "resource" mechanism. According to the study, while a low debt stock acts as incentive to inflow of external funds for further investments, reduced debt service payments provide additional resources for injection into the economy. A similar study by Imbs and Ranciere (2005) indicates institutions as the channel through which debt impacts on growth and development. This view also holds for Asiedu (2003) and Henry and Arslanalp (2006). Specifically, Henry and Arslanalp (2006:1) state that "the principal obstacle to investment and growth in the world's poorest countries is the fundamental inadequacy in these countries of the basic institutions that provide the foundation for profitable economic activity.

Cordella et al. (2010) report that quality institutions play a significant positive role in reducing the effect of debt on investment, while weak institutions aggravate the effect of debt

on investment, thus leading to a negative marginal effect on per capita growth. Corsetti et al. (2013) report that through the high 'sovereign risk channel', corporate entities' borrowing cost is affected. The findings from their study indicate that while the sovereign risk channel amplifies the effects of cyclical shocks on the economy, fiscal retrenchment can help restrict the risk of macroeconomic instability and even sustain economic activity. Aizenman et al. (2007) posit that high public debt leads to sluggish growth within economies when externalities generated by public goods raise the productivity of private investment and employment.

However, Presbitero (2012) investigates the impact of public debt on growth among developing countries and reports that the reason why debt is negative to growth among developing countries is due to weak institutions and macroeconomic policies which characterize most developing economies. Ramzan and Ahmed (2014) adopt the autoregressive distributed lag (ARDL) cointegration approach in their study on the impact of ED on growth in Pakistan and find that ED has a negative impact. However, this trend reverses in the presence of sound macroeconomic policy.

Even though most studies agree with the conventional view on the negative impact of high debt burden on growth, some studies do not share this view. De Aghion and de Hinestrosa (1995), and Martin (2009) argue that ED burden may actually not lead to negative economic growth if there is a careful policy trade-off between growth and price dynamics. Citing the case of Mexico as an example, de Aghion and de Hinestrosa establish that the country was able to negotiate a debt relief package that gave it the leeway to adopt the appropriate policy-mix which improved aggregate demand. A study by Hausmann et al. (2007) reports that an economy that depends solely on primary agricultural commodities export rather than on manufactured exports will continue to experience domestic challenges in terms of output growth. Xu (2010), Lee (2011), and Jarreau and Poncet (2012) show that regions that specialize in sophisticated exports tend to grow faster economically than those that maintain the "traditional' export orientation. This is because traditional exports exhibit higher aggregate volatility which affects output performance.

It has been established that output growth and debt sustainability are positively related. However, many studies have shown that certain debt thresholds are unsustainable if economic growth rates are inconsistent. Cohen (1996) reports that debt is unsustainable when

the level of debt is not consistent with the growth pattern of output. Asiedu (2003: 616) states that "a country's external debt is deemed not sustainable if the net present value of debt/exports ratio is above the threshold point of 150% or for small open economies, when the NPV of debt/government revenues is above 250%". Chamon (2007) submits that debt is unsustainable for debtor countries if the combination of state-contingent securities and mechanism controls which allow debtor nations to fail are not eliminated. Afonso and Jalles (2013) find that debt becomes sustainable when a country's debt-GDP ratio rises above the threshold of 90%. Above this point, growth becomes negative. Doi et al. (2011) show that maintaining a debt-GDP threshold which is beneficial to the economy requires that government revenue/GDP rises consistently between 40 and 47%.

Although several studies have estimated different threshold limits for different countries, what is consistent is that the threshold point for developing countries is two times that of developed countries. This is because, according to Presbitero (2012:618) "industrialized countries are better able than developing ones to borrow and use domestic and foreign financing in a productive way, without paying the costs in terms of disincentive to investment, capital flight, policy volatility and crowding out, which generally go hand in hand with large debts".

However, in spite of the plethora of studies that have established the debt-growth threshold, a study by Pescatori et al. (2014) did not find any evidence of a particular debt threshold which compromised growth. Rather the study found that "the association between debt and growth at high levels of debt becomes rather weak when one focuses on any but the shortest-term relationship."(p.14).Therefore, when an economy properly accounts for its borrowed funds, the impact on economic growth is significant and substantial. Given the challenges in domestic income and the need to increase the revenue base to meet fiscal activities among the economies of the African region, there is an urgent need to examine the relationship between the economic sectors and debt burden in Africa. Striking the right balance between the composition of growth and level of ED becomes paramount. Studies on the impact of debt on growth have been found to differ across different economies given the heterogeneousness of various economies.

To summarize, the present study adds to the existing literature in the following ways. Firstly, there is a dearth of empirical studies on this topic. Although findings establish the African

economy as agriculture based, the sector's ability to generate the needed funds for growth and development is less evident as noticed in Africa's growth statistics. Depending on the manufacturing or services sector as sources of income has proven to be more suitable as has been observed in the Asian continent and some Latin American countries. Therefore, conducting a study specifically for the African region will help contribute to existing literature and improve the understanding of the debt-growth dynamics in Africa. This becomes necessary in view of the nature of the African debt profile which has impacted negatively on the growth and development of the region.

At present, Africa's domestic revenue is low because of its weak productive base. The region needs to effectively maintain a revenue structure that has the capacity to augment foreign inflows and thereby further economic activity. This study will contribute significantly to achieving this. Secondly, conducting this form of research requires that the sectoral share in GDP is adopted. This study however differs a bit on this due to the understanding that sectors are interdependent. In order to mitigate the spill-over effects arising from sectoral interdependence, a filtering process is applied that uses a partial regression approach to isolate the 'pure' sector effects before estimation.

Table 3.1 – An Outlook of Africa's External Debt Indicators

	Debt outstanding, at year end of 2012				Total debt outstanding (as % of GDP)				Debt Service (as % Exports of goods and services)			
		Of Which : (as % of total)										
	Total (Million USD)	Multilateral	Bilateral	Private								
Country	2011	2011			2011	2012 (e)*	2013 (p)*	2014 (p)	2011	2012 (e)	2013 (p)	2014 (p)
Algeria	4 405.00	0.1	60.2	39.7	2.7	2.1	2	2.1	5.2	2.3	2.4	2.3
Angola	20 496.60	2.1	36.1	61.7	24.9	20.7	20.4	20.6	7.3	7.8	7.4	8.1
Benin	1 202.70	69.6	30.4	0	18.3	17.3	18.8	19.2	5.5	6.3	6.8	7.8
Botswana	3 156.40	57.3	0	42.7	21.2	21	21	19.3	7.1	6.7	6.5	6.8
Burkina Faso	1 158.50	71.9	129	-101	13.1	13.5	14.3	14.5	4.8	4.1	3.9	3.9
Burundi	523.7	50.8	44.3	4.8	38	29.1	27.5	26.3	4	4.7	9.3	13.5
Cameroon	1 944.60	28	71.9	0.1	8.2	8.5	10	11	4	4.4	3.7	3.3
CAR	355.0	6.1	93.9	0	17.9	19	17.9	16.1	5	10.2	9.4	9
Chad	1 925.90	81.9	18.1	0	18.1	17.2	19.7	21.2	2.4	2.1	3.3	2.3
Comoros	258.6	71.4	26.2	2.3	48.7	36.3	35.7	31.8	9.2	10.3	9.7	10.8
Congo	4 731.90	44.3	55.7	0	36	36.8	35.7	35.8	11.4	9.3	6.8	4.8
CDR	2 619.10	6.4	52	41.6	22.1	20.6	21.1	20.1	1.4	1.3	1	0.9
Côte d'Ivoire	17 511.60	19.4	36.9	43.7	76.3	51.1	55.7	54.2	5.7	7.6	9.9	10.2
Djibouti	648.4	55.9	44.1	0	65.9	55.5	57.6	57.2	10.5	10.8	10.8	11.1
Egypt	34 934.00	27.3	63.5	9.2	15.8	15.3	17.7	17.3	12.2	11.4	11.2	11.3
Eq.Guinea	1 326.00	0	99	1	9.1	9.8	10.4	8.4	0.4	1.9	2.2	3.4
Eritrea	934.8	63.1	36.9	0	35.8	29	25	22.6	13.1	8.1	7.1	5.7
Ethiopia	6 630.80	39.6	60.4	0	25	21.7	19.8	21.1	6.9	10.3	12.2	16.1
Gabon	2 784.00	15.3	35.3	49.4	21	16.7	17.1	19.8	4.1	4.9	4	4.5
Gambia	386.0	57.1	42.9	0	40.3	33.5	35.3	32	35.2	28.3	29.5	29.9
Ghana	9 617.30	29	44.9	26.1	29.9	25.4	26.9	28.3	4.9	6.4	4.2	3.1

Guinea	3 193.60	61	39	0	67.4	59.6	59.6	57.5	9.2	6.2	4.6	5
Gui-Bissau	173.4	40.4	59.6	0	20.5	18.6	21.6	19.9	0.7	1	4	8.7
Kenya	8 606.90	43.6	53.6	2.8	26.9	27.8	26.8	27.1	4.5	6	6.2	13.6
Lesotho	787.5	80.5	19.5	0	36.1	46	54.8	54.1	3.9	4.9	5.7	4.9
Liberia	129.0	13.3	86.7	0	13	12.1	19	25	1.1	0.7	0.9	1.4
Libya	5 573.50	0	57.4	42.6	7.6	16.2	7.6	6.4	0	0	0	0
Madagascar	4 965.70	51.6	0	48.4	56.8	51.5	50.7	46.6	15.9	8.7	9.6	9.1
Malawi	908.0	52.6	47.4	0	17.5	16.7	15.3	12.9	1.8	2.2	2.7	4.2
Mali	2 709.90	68.3	31.7	0	28.8	24.5	23.7	25.5	6.5	5.7	4.5	4.9
Mauritania	3 756.00	54.1	44.1	1.8	101.9	76.3	85.9	69.5	5.8	6.5	10.9	10.4
Mauritius	1 744.20	40.8	14.6	44.5	18	17.1	17.1	17.4	4.6	4	3.6	4.3
Morocco	23 451.70	38.9	43.7	17.5	25.8	23.6	24.9	24.8	7.6	7	6.6	6.1
Mozambique	6 999.50	56.3	3.3	40.4	76	54.1	55.6	54.6	14.4	23.8	28.3	24.2
Namibia	4 275.80	0	19	81	38.4	34.9	36.4	34.3	12.8	10.2	10	9.6
Niger	1 001.60	62.2	37.8	0	18.3	21.3	22.4	25.1	4.2	2	2.8	2.6
Nigeria	5 799.00	36.6	63.4	0	2.9	2.7	2.6	2.5	0.3	0.5	0.5	0.5
Rwanda	1 007.10	74.3	25.7	0	17.9	18.6	18.3	17.9	5.6	15.7	11.9	10.1
Senegal	6 968.80	50.8	0	49.2	54.1	58.5	64.3	65.2	15.5	8.6	9.1	7.4
Sierra Leone	866.1	39.5	60.5	0	45.5	42.9	40.3	37.5	2.9	6.2	6	6.9
South Africa	111 462	1.3	6	92.7	30.7	33.6	38	39.1	34.4	34.3	38.7	40.9
Swaziland	474.0	35.4	43.5	21.1	12.8	10.9	10.7	10.3	3.9	3.2	3.5	3.5
Tanzania	8 304.70	47.4	38.7	13.9	36.2	38.9	39.1	37.8	3.4	3.5	4.8	5.5
Togo	574.3	34.7	65.3	0	18	19.8	23.9	25.6	3.2	3.7	3.6	3.9
Tunisia	22 040.30	34.2	22.7	43.2	50.9	49.8	53.2	54	11.7	10.4	9.8	9.1
Uganda	4 675.30	67	0	33	26.4	28.7	27.2	27.5	9.3	8.9	9.9	10.1
Zambia	7 550.50	22.2	5.5	72.3	44.1	35.5	35.6	31.1	2.5	5.4	4.1	3.4
Zimbabwe	10 725.70	25.3	25.3	49.4	114.3	196.8	196.6	188.8	16.4	19.9	22.3	26.4
Africa	412 843	22.4	32.5	45.1	23.9	23.5	24.1	24.2	10.4	10	10	10.4

Sources: African Economic Outlook, 2013; *(e) - exact; (p) – projected

3.3 The Model and Estimation Methodology

The model for this study is built on the two-sector theoretic model of Loayza and Raddatz (2010) and the neoclassical and endogenous framework according to Pattillo et al. (2011). While the two-sector framework explains the mechanism through which resources and labour interact to impact on growth and welfare, the neoclassical and endogenous model, under the assumption of perfect capital mobility, shows how debt can lead to positive growth. However, literature has established a causal relationship between growth and levels of ED. Checherita-Westphal and Rother (2012: 1396) argue that "low or negative growth rates of per capita GDP are likely to induce higher debt burdens". However, Johansson (2010) shows that high debt burden has a significant negative relationship with investment and economic growth. Therefore, in determining the impact of the composition growth on the level of ED, the model is stated as follows:

$$\hat{d}_{jt} = \delta_j + \widehat{\delta_\iota d}_{j,t-1} + \sum_{i=1}^{n} \delta_i \,.\, s_{ijt} \,.\quad \hat{y}_{ijt} + \sum_{i=1}^{n} \rho_i . c_{jt} \;\; + \varepsilon_{jt} (1)$$

$$i = 1,2,.....N;\ j = 1,2,.....T$$

Where, *i,j,t* represents sector, country and time respectively; $\hat{d}_j$represent the rate of change of the ED defined as debt-to-GDP ratio; δ_0 is the intercept;δ_i, represents the coefficient of the parameters;s_{ij}, represents share of each sector in GDP; $\hat{y}_{ij}$ represents annual rate of change of sector value added in GDP; *n* represents seven main sectors of each economy; and the parameter *c* connotes vector of control variables for country *j*; and ε_t is the error term at period *t*. This study adjusts the model by setting ED as the dependent variable and sectoral growth as explanatory variables. This will enable the research determine the impact of sectoral growth on the level of ED burden. Baum et al. (2013) and Afonso and Jalles (2013) set growth as the dependent variable.

Many studies have examined the causal relationship between ED and growth. Jayaraman and Lau (2009) report a short-run positive bi-directional causal relationship between aggregate growth and ED. Dritsaki (2013), however, identifies a long-run unidirectional causality relationship between economic growth and ED. Similarly, Lof and Malinen (2014) find a significant negative reverse impact of growth on debt. Puente-Ajovin and Sanso-Navarro

(2015) report that with the exception of Greece, there is a negative causal impact of real GDP growth on various levels of government debt. Therefore, following Puente-Ajovin and Sanso-Navarro (2015), this study sets ED as the dependent variable. In addition, rather than adopt the aggregate growth rate as in previous studies, this study adopts 'real' sector value added in GDP. The 'real' sector value added is obtained through a partial regression approach which filters out spill-over effects arising from the fact that sectors are interdependent.

In controlling for some specific variables, this study introduces current account balances, following Easterly (2002); real interest rate, (Ardagna et al., 2007, and Baum et al., 2013); and rule of law (Kraay and Nehru, 2006). However, while the sign outcome of parameters may differ across countries, perhaps due to geographic disparities, a priori expectation for current account balance and rule of law is positive. Meanwhile, empirical literature on the relationship between public debt and interest rates is diverse. A significant number of recent studies suggest that a high level of debt may contribute to rising sovereign long-term interest rates. Ardagna et al. (2007) find that high debt-to-GDP leads to lower negative interest rates in the short run, at a threshold below 66% and a positive long-run impact when the ratio is above 146% threshold.

3.3.1 Data description and estimation technique

Annual data for 36 African countries[11]for the period 2000 to 2013 were obtained from the World Bank (WB, 2014), *International Financial Statistics* (IFC, 2014), and UNTCAD statistics (2014). Following Siddiqui and Ahmed (2013), the estimation of the model is conducted using the "two-step" Arellano-Bond GMM estimator. The (GMM) estimator will enable the research correct for autocorrelation, heterogeneity and endogeneity challenges caused by unobserved country-specific effects (see Powell and Bird, 2010). According to Siddiqui and Ahmed (2013: 25), "To control for endogeneity, the difference GMM estimator adds lagged levels of the endogenous regressors in addition to using the exogenous variables as instruments. This is because the error term in first difference equation...tends to be correlated with lagged levels of the endogenous regressors".

[11]The following countries were examined: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central Africa Republic, Congo, Congo DR, Cote d'Ivoire, Djibouti, Egypt, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Mali, Morocco, Mozambique, Namibia, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Tunisia, Uganda, and Zambia.

Previous studies that examine the debt-growth relationship adopted different estimating techniques to establish their findings. Prominent among these are those that adopt the panel GMM estimating approach owing to the fact that the estimator provides a wider range of econometric options in determining the interactions between various instrumental variables. Applying a two-step (Arellano-Bond, 1991) estimating technique, this study will establish the role sectors can/or have played in determining the debt-growth architecture in Africa. Specifically, this study intends to show that relying on the primary sector as a sure means of providing the required revenue for financing debt obligation may be one of the main reasons why Africa's debt level is high relative to output growth.

3.4 Empirical Results

Table 3.2 presents the results of the estimation of the impact of aggregated composition of growth on ED. The results show that although the industrial and services sectors are rightly signed only the industrial sector shows significant impact on level of ED at 1%. This indicates that a 10% increase in investment in the industrial sector has a 66% capacity to reduce the level of ED in Africa. The results of the control variables are broadly consistent with theoretic expectations. Measurement of institutional quality, captured by Country Policy and Institutional Assessment (CPIA), shows a negative significant impact on level of ED. This result shows clearly that institutional quality is weak, giving rise to mismanagement and misallocation of resources. This finding is in line with the studies by Easterly (2002) and Asiedu (2003) that also report a negative impact of institutional quality among HIPCs. The result for current account balances shows a negative sign, which means that the current account balances of African countries in the past decade have been in deficit.

Although the impact on ED is marginal, the total effect on level of debt may be insignificant when compared with the effects of other control variables. The real interest rate outcome conforms with the view of Ardagna et al. (2007) which states that a high debt-to-GDP leads to low negative interest rates. Low interest rates translate to lower interest payments on domestic loans which encourage further borrowing for investments and economic growth, while higher interest payments increase the amount of resources for interest repayment. However, in spite of the lower interest rates charged on external loans by creditors, the impact did not reflect much on ED; this is evident from the various levels of ED within the lag period.

Table 3.3 gives a clearer view of which subsectors of the industrial sector have more robust impact on the level of ED. From the results, it is observed that the construction and manufacturing sectors have greater capacity to reduce the level of ED. For instance columns one (1) and two (2) show that a 1% increase in the level of investment in the construction and manufacturing sectors has the capacity to reduce ED by 7 and 9% respectively. Although the findings show that other subsectors such as wholesale, retail and hotels ("WRH") also have the capacity to reduce ED, the impact is less when compared to the subsectors of the industrial sector. This result reinforces the views of the AU that "no country or region in the world has achieved prosperity and a decent socio-economic life for its citizens without the development of a robust industrial sector" (AU, 2008: 3). Also, the result agrees with those of Loayza and Raddatz (2010) which state that with appropriate investment in the labour-intensive sectors, economic growth and welfare will improve.

These results from the industrial and services sectors are not surprising given the level of foreign direct investments (FDI) into the two sectors in recent times. According to the recent World Bank report (2013) on sub-Saharan Africa, "*Africa's Pulse*", "while the extractive industry sector dominates in terms of the value of overall FDI flows, investment in the services sector, notably among infrastructure-related projects in construction, transportation, electricity, telecommunication and water, has been expanding" (p.4). The impact of the control variables are felt at different stages of estimation. Although the effect of the variables on ED is not felt much when disaggregated, their joint impact is enough to sway the direction of subsectors to the services sectors of the economy. Tables 3.4 and 3.4.1 present the nonlinear function of the model that shows the subsector of services, that is, "others" as the only subsector that has a consistent nonlinear relationship with ED.

Although the agriculture sector and the services subsector (WRH) may be appropriately signed at some stages in the two columns, they did not show any significance. The result outcome for the control variables in Table 3.4, column 1 is consistent with the initial result in Table 3.2, column 5. However, in Table 3.4, there is a slight difference in the sign outcome for the test of institutional quality (CPIA). While the sign outcome for interest rate shows consistency with negative signs in Tables 3.3 and 3.4, this is not in line with the initial findings which have a positive sign. In spite of these slight inconsistencies in the outcomes of

the control variables at some stages, the overall results show that the variables are significant factors in the growth-debt relations as demonstrated in previous studies.

Table 3.2: External Debt and Sectoral Growth Composition: GMM Estimation. Dependent Variable: Annual rate of change of external debt/GDP ratio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
dexdebt(-1)	-0.004848	0.005413	-0.895592	0.3711
as_ra	0.036954	0.144442	0.255838	0.7982
indus_rinds	-0.666266	0.219895	-3.029931	0.0026*
servs_rserv	-0.170588	0.414482	-0.411570	0.6809
Dcpia	-0.846154	0.010145	-83.40782	0.0000*
real_intr	-0.071587	0.002379	-30.09426	0.0000*
Dcurrenta	-0.004872	0.000426	-11.42897	0.0000*

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.025262	S.D. dependent var	0.178526
S.E. of regression	0.129838	Sum squared resid	6.119441
J-statistic	36.88728	Instrument rank	8

*1% significant
GMM model variables are in first differences, therefore there is no intercept. 36 cross-sections fixed (first differences). White period instrument weighting matrix
Instruments: 2-step Arellano-Bond type: once lagged level of the dependent (DEXDEBT-1). Cross sections included: 37White period instrument weighting matrix

Table 3.3: External Debt and Sectoral Growth Composition: GMM Estimation. Dependent Variable: Annual rate of change of external debt/GDP ratio

Regressors[12]	Linear function (t-1)	(t-2)	(t-3)	(t-4)	(t-5)
dexdebt(-1)	-0.052* (0.017)	-0.050* (0.015)	-0.260* (0.014)	0.241* (0.019)	0.006 (0.007)
as_ra	0.254* (0.0717)	0.251** (0.125)	-0.170* (0.065)	0.285* (0.091)	0.027 (0.147)
cs_rc	-7.843* (1.873)	-7.175* (1.936)	-6.442* (1.520)	-7.724* (2.081)	0.262 (1.511)
mining_rmining	2.723* (0.557)	1.736* (0.508)	-1.007* (0.647)	2.187* (0.592)	0.530 (0.467)
others_rothers	0.294 (0.486)	-0.651 (0.454)	0.446 (0.372)	0.183 (0.561)	-0.292 (0.562)
tc_rtc	0.747 (1.061)	1.374** (0.681)	0.744 (0.823)	0.419 (1.189)	1.644** (0.650)
wrh_rwrh	-0.216* (0.043)	-0.120*** (0.056)	-0.240* (0.032)	-0.134** (0.058)	-0.035 (0.043)
ms_rm	-0.708 (0.516)	-0.925** (0.380)	0.514 (0.412)	-0.757*** (0.465)	0.499 (0.516)
dcurrenta		-0.026*(0.001)			-0.005* (0.001)
real_intr			0.097*(0.004)		-0.067* (0.004)
dcpia				0.687*(0.021)	-0.874* (0.024)
J-statistic	36.267	36.128	36.259	36.372	36.722
Mean dep variable	0.025	0.025	0.025	0.025	0.025
S.D. dep variable	0.179	0.179	0.178	0.178	0.178
S.E. of regression	0.174	0.137	0.163	0.166	0.131
Sum sqrd residual	10.973	6.802	9.611	9.987	6.113
Instrument rank	9.000	10.000	10.000	10.000	12.000
Panel observations	370	370	370	370	370
Periods	10	10	10	10	10

*1% significant; **5% significant; ***10% significant. Once lagged level of the dependent (DEXDEBT-1). GMM model variables are in first differences, therefore there is no intercept. White period instrument weighting matrix. Instruments: 2-step Arellano-Bond type: Values in parentheses are standard errors. Cross sections included: 37

[12]"as_ra" stands for agriculture; "cs_rc" represents construction; "mining_rmining", represents mining and utility; "ms_rm", stands for manufacturing; "tc_rtc", stands for transport and communications; "others_rothers", represents "others" as classified by (ISIC.Rev4); and "wrh_rwrh" stands for wholesale, retail and hotels.

Table 3.4: External Debt and Sectoral Growth Composition: GMM Estimation. Dependent Variable: Annual rate of change of external debt/GDP ratio

	Non-Linear function			
Regressors[13]	(t-1)	(t-2)	(t-3)	(t-4)
dexdebt(-1)	-0.001 (0.006)	0.080* (0.006)	-0.090* (0.005)	-0.009* (0.002)
as_ra^2	-0.150 (0.473)	0.106 (0.555)	-0.088 (0.332)	0.613 (0.629)
cs_rc^2	23.589** (11.299)	17.088** (8.025)	26.771*** (16.080)	20.455 (14.708)
mining_rmining^2	3.762 (2.597)	4.475* (1.681)	3.462 (3.344)	2.429 (4.559)
others_rothers^2	-9.400* (2.332)	-9.364* (2.468)	-5.312* (1.722)	-5.761*** (3.156)
tc_rtc^2	30.696* (8.873)	26.452* (8.241)	20.079* (3.875)	17.317** (6.846)
wrh_rwrh^2	-0.028 (0.029)	-0.037 (0.030)	0.033 (0.022)	0.076** (0.037)
ms_rm^2	6.980*** (3.572)	8.664** (4.116)	0.988 (3.807)	-1.354 (8.367)
dcpia	-0.910*(0.025)	-1.098*(0.009)		
real_intr	-0.064*(0.004)		-0.155*(0.001)	
dcurrenta	-0.006*(0.001)			0.001*(0.000)
J-statistic	36.628	36.660	36.780	36.926
Mean dep variable	0.025	0.025	0.025	0.025
S.D. dep variable	0.179	0.179	0.179	0.179
S.E. of regression	0.129	0.121	0.148	0.169
Sum sqrd residual	5.977	5.296	7.941	10.274
Instrument rank	12	10	10	10
Panel observations	370	370	370	370
Periods	10	10	10	10

*1% significant; **5% significant; ***10% significant. Once lagged level of the dependent (DEXDEBT-1). GMM model variables are in first differences, therefore there is no intercept. White period instrument weighting matrix. Instruments: 2-step Arellano-Bond type: Values in parentheses are standard errors. Cross sections included: 37

[13]"as_ra" stands for agriculture; "cs_rc" represents construction; "mining_rmining", represents mining and utility; "ms_rm", stands for manufacturing; "tc_rtc", stands for transport and communications; "others_rothers", represents "OTHERS" as classified by (ISIC.Rev4); "wrh_rwrh" stands for wholesale, retail and hotels; dcpia, stands for country policy and institutional assessment; real_intr stands for real interest rate and dcurrenta stands for current account balance.

Table 3.4.1: External Debt and Sectoral Growth Composition: GMM Estimation. Dependent Variable: Annual rate of change of external debt/GDP ratio

	Non-Linear function			
Regressors	(t-1)	(t-2)	(t-3)	(t-4)
dexdebt(-1)	-0.012 (0.007)	0.271* (0.011)	-0.264* (0.007)	-0.046* (0.005)
as_ra^2	0.389 (0.507)	0.317 (0.788)	0.636 (0.515)	0.377 (0.791)
cs_rc^2	2.979 (10.886)	28.219*** (15.253)	6.937 (14.850)	19.066*** (10.823)
mining_rmining^2	5.334*** (2.856)	-0.069 (3.988)	2.673 (5.684)	5.685** (2.396)
others_rothers^2	-8.989* (2.253)	-10.237* (3.279)	-2.338 (2.833)	-9.957* (3.101)
tc_rtc^2	19.311** (7.937)	29.177* (7.015)	12.288* (3.868)	18.208** (7.908)
wrh_rwrh^2	-0.002 (0.027)	0.085** (0.037)	0.080** (0.033)	0.027 (0.032)
ms_rm^2	8.153** (3.496)	0.858 (6.510)	-3.867 (8.121)	8.686 (6.284)
dcpia	1.167*(0.015)	0.749*(0.013)		
real_intr	-0.184*(0.002)		-0.099*(0.001)	
dcurrenta	-0.014*(0.000)			0.027*(0.000)
J-statistic	36.793	36.802	36.874	36.756
Mean dep variable	0.025	0.025	0.025	0.025
S.D. dep variable	0.179	0.179	0.179	0.179
S.E. of regression	0.105	0.168	0.166	0.139
Sum sqrd residual	3.925	10.202	9.931	7.001
Instrument rank	12	10	10	10
Panel observations	370	370	370	370
Periods	10	10	10	10

*1% significant; **5% significant; ***10% significant. Once lagged level of the independent GMM model variables are in first differences, therefore there is no intercept.
White period instrument weighting matrix. Instruments: 2-step Arellano-Bond type: Values in parentheses are standard errors. Cross sections included: 37

3.5 Conclusion

This study examines the impact of the composition of growth on the level of ED in selected African countries. Although previous studies have centred on the impact of ED on growth, the study relies on the perfect capital mobility assumptions of the neoclassical and endogenous growth model to show how growth in the productive sectors can impact on ED. The choice of this approach is based on the fact that very few studies have examined the impact of growth on ED. Also, one of the challenges Africa is facing is fiscal imbalance owing to the structure of its domestic productive base which provides the region with inadequate resources for further growth. In a bid to correct this imbalance, many countries have resorted to the 'traditional' debt relief packages, and imposing high taxes and interest rates to finance domestic economic activities. However, these approaches have found to be inadequate in providing the needed resources for growth (see Aiyagari and McGrattan, 1998).

The act of targeting specific sectors has proven to be an alternative to the fiscal challenges for many economies. This study therefore examines the impact of the productive sectors to ascertain the ones that have higher capacity to impact on the level of ED. From the results, it is interesting to note that one of the reasons why the African continent is constantly faced with fiscal imbalances is weak policy choice in investing in the productive sectors with little resource capacity. Rather than the much-touted agriculture sector as the main driver of economic growth in Africa, it is observed that the industry and services sectors are responsible for increase in revenue in many African countries. However, from the policy point of view, much attention and resources are still being channelled into the agricultural sector rather than the industrial and services sectors.

In trying to identify the sub sectors that are responsible for this growth drive, the study notes that the construction, manufacturing, and wholesale, retail and hotels are the subsectors that have more capacity in driving the levels of ED even after controlling for institutional and macroeconomic factors. Also, this study has been able to establish that the relationship between external debt and economic growth is true and nonlinear. The study shows that sectors that are responsible for driving the growth-debt dynamics in Africa are construction, mining, transport and communication. Therefore, for the levels of ED in the African region to be reduced, the continent's policymakers need to channel resources towards the industrial and services sectors rather than the agriculture sector which has been found to have less capacity

in impacting ED. The idea of resorting to the ‘traditional’ debt relief packages and imposing high taxes and interest rates for financing domestic economic activities might not provide the much needed resources for growth and development.

CHAPTER FOUR

Real Exchange Rate (RER) as a Policy Tool for Industrial Diversification and Growth in Africa

4.1 Introduction

This section examines the role of RER policy as a tool for industrial diversification in Africa. Unlike in many other developing continents such as Asia, and some countries of Latin America, where industrial revolution has assisted in transforming the entire economic space, Africa's case has remained challenging. Following what many have described as the "Dutch disease" syndrome and other issues as discussed in Stein (1994), Sachs (1999), and Collier and Gunning (1999), the problem of weak industrial growth has not only affected aggregate growth but has also impacted negatively on the level of welfare. Although some of the issues that have led to this precarious situation are debatable, one that stands out in the literature is the issue of the "Dutch disease" syndrome – a system in which investment in the non-tradable sectors leads to appreciation of the exchange rate (ER). While the findings of different studies on the impact of ER on an economy may differ, experts agree that poorly managed industrial and trade policies negatively affect economic growth.

Collier and Gunning (1999) and Sachs (1999) opine that weak domestic trade and industrial policies affect growth negatively. Similarly, Eichengreen (2007) and Rodrik (2008) state that a poorly managed ER policy is detrimental to economic growth. Accordingly, if weak domestic policies affect growth negatively, then internal policy reforms are required to stimulate industrial growth. This scenario has played out successfully in China's domestic policy reforms. According to Dutta (2005), through trade and industrial policy reforms, China was able to diversify its economy from the agricultural to the industrial sector with the share of GDP growing above two-thirds of the total aggregate growth in 2000. However, Africa is yet to adopt this process to diversify its economy from the agricultural to the industrial or services sectors. This is probably due to the underdevelopment of market structures, weak industrial sector (Stein, 1994) and the issue of ER misalignment (Mohamad and Jusoff, 2008), which are characteristics of most developing economies.

This study is significant because there is the need to assess the effectiveness of RER as a policy tool for industrial diversification within the African context. Studies have proven ER to be an important component of industrial diversification and economic growth. According to Ghura (1993), and Collier and Gunning (1999), the growth 'miracle' of the Asian countries centres on the effective use of ER and appropriate trade policies. Specifically, the adoption of depreciation of ER as a policy framework acts as a catalyst to 'economic boom' in the region. A study by Dutta (2005) shows that China was able to diversify its economy from the agricultural to the industrial sector by leveraging on trade and industrial policy reforms through an undervalued ER regime. Rodrik (2008) also affirms that undervaluation of ER leads to growth while overvaluation in ER leads to resource reallocation to productive sectors which have less economic importance. Revising this trend therefore requires that African policymakers have additional information to enable them determine whether RER affects the sectoral composition of growth or not, and if it does, which of the sectors causes ER appreciation or depreciation.

This study has identified the following gap in the growth literature. Previous studies have been able to investigate the impact of ER on aggregate economic growth. Hua (2007) finds a direct relationship between ER and economic growth. Similar studies by Bleaney and Greenaway (2001) and Max Corden (2009) also find a robust relationship between ER, trade, and economic growth. The studies state that the impact depends on the structure of the economy, and on the ER policy practice. Zhang (2001) reports that during China's central planning period, RER misalignment led to chronic overvaluation in the ER. Schnabl (2008) reports that ER volatility has direct negative impact on the economic growth of countries with open capital accounts in the EMU periphery. While effective ER management is positive to growth, mismanagement of ER affects growth negatively. Even though there is a plethora of studies on ER and growth, there are fewer studies that have examined the impact of ER on the composition of sectoral growth in African countries.

Furthermore, studies that have examined ER and growth either adopted aggregate growth or sector value added in GDP. However, these studies did not take into account that sectors may have different responses to ER change, which can affect the growth of the economy. Studies have shown that sectoral growth response to ER change is similar for homogenous economies. Rodrik (2008) examines the impact of RER and economic growth in selected countries and finds that RER affects the growth of homogenous economies in a similar trend.

Hua (2007) investigates the impact of RER employment in the manufacturing sector of China and finds that depreciation of ER negatively affects manufacturing employment. However, while some of these studies are regional and cross-country analyses, literature is scarce on studies that specifically focus on the African continent.

The contribution of this research therefore is as follows: Firstly, rather than adopt aggregate growth as the dependent variable as is the case with previous studies, this study shall adopt sectoral growth as the dependent variable. Secondly, in order to show how sectors respond to changes in ER, this research will first identify the 'real' contribution of each sector in GDP. This is because studies have shown that there is inter-sectoral dependence among sectors and the activity of sectors tends to spill over into each other. Therefore, in order to mitigate the spill-over effects arising from the fact that sectors are interdependent, this research shall first, filter out the spill-overs through the partial regression approach and isolate the 'pure' sectors. The result obtained will then be adopted as the 'real' contribution of that sector to gross domestic product (GDP). This research shall specifically be conducted for African countries to fill the literature gap, and to determine whether RER affects the composition of sectoral growth in the region.

4.2 Literature Review

There have been debates among researchers over which ER shift (under- or overvaluation) promotes aggregate growth. Much of the evidence is in favour of undervaluation; only a few studies support overvaluation. Sachs and Warner (1997) show that depreciation (or undervaluation) of domestic currency impacts positively on growth and investment for countries that export manufactured goods. Hua (2007) investigates the impact of RER in China's manufacturing sector between 1993 and 2002. The study finds that in China, appreciation of the domestic currency creates distortion on employment generation in the manufacturing sector. Similarly, Galindo et al. (2007) examine the impact of ER depreciation in Latin America, using econometric evidence supports. The study finds that depreciation of ER negatively impacts on employment growth in countries whose manufacturing sector activities are under the liability of a foreign currency.

Paudel and Burke (2015) examine the implications of ER policy on export performance in Nepal between 1980 and 2010. The study finds that appreciation (or overvaluation) of RER is

associated with a reduction in the country's merchandise exports by around two-fifths. Studies have shown why there is bound to be distortion in the tradable sector when domestic currency appreciates. According to Cherif (2013) and Van der Ploeg and Venables (2013), as domestic currency appreciates, it leads to a decrease in the prices of imports and an increase in the prices of exports, and this crowds out production factors from tradable to non-tradable sectors. This view is similar to that expressed by Rodrik (2008), who stated that overvaluation is "associated with foreign currency shortages, rent-seeking and corruption, unsustainably large current account deficits, balance of payment crises, and stop-and-go macroeconomic cycles"(p.366).

According to Thomas (1999), when a country's economy is faced with a balance-of-payments challenge, it leads to a drop in demand for that country's currency which creates downward pressure in the currency market. Aguirre and Calderón (2005) argue that economies with the highest inflation rates suffer the largest RER appreciation in the succeeding periods. The effectiveness of ER and its impact on economies depends on the appropriate management of policies of different ER regimes (under- or overvaluation). However, empirical investigations have shown that the policy swing under different ER regimes throws up different growth outcomes for different countries. Rodrik (2008), in a cross-country study confirms this view. The study reports that an overvalued ER regime practice in Tanzania and Uganda between 1960 and 2000 affected the two countries' trade and economic growth negatively. However, for Mexico, the findings show inconsistent results as the economy experienced growth during the period of currency appreciation.

A similar cross-regional study by Fang et al. (2009) further confirms Rodrik's findings which show that different forms of ER regimes affect the export revenue of the eight Asian countries studied differently. While ER appreciation affected the Japanese currency market negatively, depreciation (or undervaluation) had no impact on Malaysia and Singapore's currency markets. Many more studies have been linked to different regime outcomes of RER (that is, over- or undervaluation) on exports and aggregate growth. In the study by Dekle and Ryoo (2007), their findings show that among the major industries in Japan, an appreciation in the domestic currency by 1% reduces export volume by 0.02 to2.9%. Also Mohamad and Jusoff (2008) find exchange rate variability and misalignment to have significant impact on export growth in Southeast Asian economies.

Aguirre and Calderón (2005) examine the growth effects of RER misalignments and economic performance in 60 countries over the period 1965-2003. Using a panel and time series co-integration approach, the study finds that while the large size of RER misalignments and undervaluation reduces growth, low-size undervaluation promotes growth. Reporting further, the study states that a reduction of the average degree of overvaluation of RER from 5 to 2% will stimulate developing economies' aggregate growth rate by up to 30%. Conversely, if overvaluation increases by 5%, growth will be reduced by 56%. Rodrik (2008) reports that undervaluation causes improvement in growth, especially in developing economies. However, this positive impact on growth disappears when the sample of coverage is reduced for developed economies alone.

The relationship between ER uncertainty and export growth has also been examined. Although the findings of the foremost studies on this relationship are ambiguous, growth literature have not been able to provide a standard reason for the ambiguity. De Vita and Abbot (2004) suggest that the reasons for the ambiguity could either be the choice of proxy of ER risk/uncertainty or as a result of inappropriate estimation techniques. While the search for the cause of ambiguity in still on-going, evidence abounds in the growth literature on the different ways in which ER uncertainty impacts export growth. Arize et al. (2000) reported that an increase in ER uncertainty had significant negative effects on export demand for 13 less-developed countries (LDCs), both in the short-run and in the long-run. Chou (2000) however reports that ER uncertainty showed a long-run negative impact on exports of manufactured goods and mineral fuels in China.

Eichengreen and Gupta (2013) examine the response rate of merchandise, as well as traditional and modern services exports to changes in RER for 66 countries. The study finds that the modern services export response to change in RER is almost twice those of merchandise and traditional services exports. Specifically, a 10% depreciation in RER accelerates modern services' growth by 2.3%. Caglayan and Demir (2014) investigate the impact of exchange rate uncertainty and currency appreciation on firm level productivity growth in Turkey and find that RER volatility and appreciation affect the productivity growth of export-oriented firms negatively. This view aligns with that of Eichengreen (2007), who stated that "keeping the real exchange rate at competitive levels and avoiding excessive volatility are important for growth" (p.9).

Bleaney and Greenaway (2001) investigate the impact of terms of trade and RER volatility on investment and growth in 14 sub-Saharan African countries. The study finds that growth and investments are enhanced with depreciation of RER when production and export of primary commodities are improved. Serven (2003) examines the empirical link between RER uncertainty and private investment in least developed countries (LCDs). The study finds that RER uncertainty has a significant negative effect on investment for countries with high trade openness and less developed financial systems. According to Sachs et al. (1995), trade liberalization leads to higher economic growth in open economies, than in closed economies.

4.3 The Model and Estimation Methodology

The model for this study is built on the theoretic growth model following Rodrik (2008). The framework shows how the aggregate growth rate of a country can be affected by a change in ER (that is, under- or overvaluation). Although, the effects of a change in ER on the composition of growth are ambiguous among theoretic and empirical studies, received literature show that the impact of ER on growth depends on the ER, growth, and the investment policy objectives of a country. For instance, Sachs and Warner (1997) report that depreciation of ER stimulates growth and investments in countries that export manufactured goods. Among countries that engage in primary commodities export, Cherif (2013) posits that overvaluation of RER worsens the growth structure of economies that depend on primary commodities, while it boosts the growth of other primary commodity countries that are technologically advanced. Therefore, in order to determine the effectiveness of the real exchange rate on Africa's growth composition, the index of over- or undervaluation will be estimated first. Rodrik (2008) reports that adopting this approach will effectively determine the impact rate of ER policy on economic growth.

4.3.1 Index of under- or overvaluation of exchange rate: The Balassa–Samuelson effect

Since ER is the measure of domestic currency per foreign currency, arriving at an index of under- or overvaluation for domestic currency requires that a generally acceptable standard is adopted taking into account the differences in price levels across countries. According to Sekkat and Varoudakis (2000), domestic prices of tradables and non-tradables are influenced by the RER; which is a measure of the relative prices of tradables to non-tradables in an economic space. Rodrik (2008) reports that RER plays a significant role in the convergence

of national income between various forms of economies. Arriving at an acceptable price index therefore, requires that the price level is adjusted for the Balassa-Samuelson effect (BSE).

BSE adjusts for domestic price level across board using the purchasing power parity (PPP) index – an index measure of ER between countries so that the purchasing power of their currencies are at par. According to Frankel (2006), relative PPP presents less difficulty when comparing price levels across countries. Therefore, following the early works of Frankel (2006), Rodrik (2008), and Berg and Miao (2010) in computing for "undervaluation", first RER is expressed as a ratio of nominal exchange rate (NER) and purchasing power parity (PPP). Thus,

$$ln\tau_{it} = ln\left[\frac{X_{it}}{P_{it}}\right]$$

Where i, t is the index for countries and time respectively, $In\tau_{it}$represents log of real exchange rate (RER), X_{it} stands for logNER and P_{it} represents log of PPP. Both values of NER and PPP are expressed in unit per US dollar. Given that prices of non-tradables are cheaper in developing countries, there is the need to adjust for BSE. Therefore, in accounting for BSE, the value of RER on GDP per capita (γ) for all countries is regressed following Rodrik (2008) thus:

$$ln\tau_{it}^{*} = \delta + \varphi ln\sum_{j}^{1} y_{it} + f_t + r_t + \varepsilon_{it} \qquad (1)$$

Where $ln\tau_{it}^{*}$ represents the Balassa-Samuelson (BS) adjusted; δ stands for intercept; y_{it} represents GDP per capita; f_t , r_t stands for fixed and random effects for time period[14] and ε_{it} stands for error term. The value and sign of φ determine the magnitude and direction of BSE which indicates whether RER is undervalued or overvalued. Following the above equation therefore, the value of φ is estimated as 0.043 (see Table 1). In arriving at the index of under– or overvaluation (ω), the difference between log sum of RER and log fitted value is taken from BS adjusted as in Rodrik (2008), and Eichengreen and Gupta (2013) Hence,

$$ln\omega_{it} = In\tau_{it} - ln\tau_{it}^{*}$$

[14]Equation (1) shall be estimated through the ordinary least squares (OLS) approach.

According to Rodrik (2008), if $ln\omega_{it}$is greater than one (unity), it indicates that the value of the domestic currency to foreign currency is lower (that is, undervaluation) showing that prices of goods and services are cheaper relative to that of the foreign currency. However, If $ln\omega_{it}$is below unity (i.e. less than one), it then signifies that that the domestic currency is overvalued; meaning that prices of goods and services are expensive relative to foreign goods and services. Following the above procedure, the study estimate shows an undervaluation of ER with value greater than unity (2.9). Taking a logarithm transformation of the value yields 0.46[15]

Table 4.1: Balassa-Samuelson Effect (BSE). OLS panel estimation. Dependent variable: Log (RER)

Variable	Coefficient	Standard Error	t-Statistic	Prob.
C	1.263918	0.115223	10.96931	0.0000*
LOG(GDPPC)	0.043409	0.015250	2.846396	0.0046*
R-squared	0.017960	Mean dependent var		1.591631
Adjusted R-squared	-0.064061	S.D. dependent var		0.097088
S.E. of regression	0.100150	Akaike info criterion		-1.688589
Sum squared resid	4.443299	Schwarz criterion		-1.358687
Log likelihood	444.1056	Hannan-Quinn criter.		-1.558923
F-statistic	0.218972	Durbin-Watson stat		0.659832
Prob(F-statistic)	1.000000			

*1% significant level. Total panel (balanced) observation: 481

4.3.2 Real exchange rate and the composition of growth equation

In this section, the effect of RER on the composition of growth is analysed. Traditional and modern theories (e.g. Rodrik, 2008 and Paudel and Burke, 2015) that examine the impact of ER export and aggregate growth are contrasted by comparing how different productive subsectors of the economy respond toward changes in ER. The regression specification follows the pioneer work of Rodrik (2008) but with slight modifications. The equation is stated as follows:

$$g_{it} = \alpha_i + \beta g_{i,t-1} + \rho lnY_{i,t-1} + \delta lnE_{it} + \vartheta lnX_{it} + u_{it} \quad (2)$$

[15] Rodrik (2008) report 0.48 even though the study is a single panel cross-country analysis

In equation 2, the dependent variable *g* represents the annual growth rate of share of sectors *i* in GDP for each of the seven subsectors – agriculture, manufacturing, mining, construction, and those of the services sectors, as classified by the International Standard Industrial Classification (ISIC, Rev. 4) at time *t*; α, stands for intercept; the independent variables include *Y*, which represents growth rate of real GDP per capita for country *i* and the log level *t*; and *E* represents change in exchange rate type for country *i* at time *t* and the log level. $u_{it}$is reported as the error term and corrected for possible autocorrelation. Following Eichengreen and Gupta (2007), this model is extended by including other control variables and the interaction of these controls with change in ER. Thus,

$$g_{it} = \alpha_i + \beta g_{i,t-1} + \beta \Delta . lnY_{i,t-1} + \delta \Delta . lnE_{it} + \vartheta X_{it} + \emptyset X_{it} . \delta \Delta . lnE_{it} + u_{it} \quad (3)$$

Where *X* represents sets of control variables that interact with change in ER and economic growth. The value of ER that would be utilized for estimation will be that obtained from the difference in value of the index of under- or overvaluation, which is,$ln\omega_{it}$.As established in the growth literature, different relationships exist for the parameters due to country differences. The regressions are estimated using a panel GMM for 36 countries for 14years. The economic criterion between ER and sectoral growth depends on the ER regime and its management. Doganlar (2002) and Galindo et al. (2007) report that when ER is effectively managed, it enhances economic growth; but when poorly managed, it affects growth negatively. However, *a priori* expectation for the sign and magnitude of RER is positive as this underlines undervaluation. Meanwhile, for openness, government effectiveness and per capita GDP the sign is expected to be positive, while inflation is expected be negative because, according to Mejı´a-Reyes et al. (2010) negative inflation "provokes inefficient allocation of resources due to distortions in relative prices and higher administration costs for firms" (p.2492).

4.3.3 Data specification and estimation technique

Data for the research are annual time-series data spanning the period 2000 to 2013 for 36 African countries.[16]Data on purchasing power parity (PPP), official ER, inflation and

[16]The following countries were examined: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central Africa Republic, Congo, Congo DR, Cote d'Ivoire, Djibouti, Egypt, Ethiopia, Gabon, Gambia, Ghana,

openness (defined as import plus export divide by GDP) were obtained from the World Bank (2014). Real GDP and sectoral values were sourced from the UNCTAD database (2014). The economic criterion between ER and real GDP is ambiguous given that different forms of exchange rate regimes impact differently on the growth model for the various economies which, according to Rodrik (2008), is due to dissimilarities in domestic activities. Following Siddiqui and Ahmed (2013), the estimation of the model is conducted using the generalized method of moments (GMM)-based Arellano-Bond linear dynamic panel approach. The GMM was adopted because, unlike other estimators, it provides the framework to control for endogeneity bias caused by unobserved country-specific effects, and other misspecifications or over-identification of parameters challenge.

4.4 Empirical Results

Tables 4.2, 4.3 and 4.4 present the results of the response rate of the three key sectors (agriculture, industry and services) percentage change in RER and log RER. The results of the coefficient of change in log RER are negative for the three sectors. However, in the case of log RER, even though the results almost show a similar trend, only the industrial sector came out positive. A critical observation of the results shows that although the measures of change in log RER are negative for the three sectors, the response rate of the services sector is significant at 1%. This result also reflects the findings of Smith (2004) who reports that exports of the services sectors are much more sensitive to ER that those of other sectors.

However, a negative sign for RER suggests that these sectors lead to appreciation of the RER. It also suggests that the output of these sectors depends so much on imported inputs. When an economy is faced with such a situation, the implication is that the trade balance effect of the exchange rate dominates the possible negative supply-side effect thereby leading to an increase in aggregate output (see Rasaki and Malikane, 2015).

Guinea, Kenya, Lesotho, Liberia, Madagascar, Mali, Morocco, Mozambique, Namibia, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Tunisia, Uganda, and Zambia.

Table 4.2: Agricultural response to change in RER

Variable	I	II	III
Agric(-1)	-0.303*(0.069)	-0.302*(0.069)	-0.296*(0.072)
Log Real GDP(-1)	0.026**(0.011)	0.0187(0.016)	0.073**(0.036)
Change, Log RER	-0.000(0.030)		-0.129**(0.050)
RER, Log		-0.078(0.077)	
Openness			0.047(5.827)
Inflation			0.047(0.000)
CPIA			-0.020***(0.012)
Observations	370	370	370
Number of countries	36	36	37
Instrument rank	4	4	7
J-Statistics	2.978	2.946	3.107

Note: *1%; **5%; ***10% indicates that coefficients are significant at these levels. Standard errors are in parenthesis. Dependent variables and RER are lagged by one. Change in RER and log RER are average values over the 14 years period

Although this increase in output may be beneficial to the domestic economy in the short to medium term, in the long run, when the economy has generated much more resources, consumption pattern may shift to demand for foreign goods, which will in turn be detrimental to domestic production.

Table 4.3: Industry response to change in RER

Variable	I	II	III
Industry(-1)	-0.484*(0.037)	-0.484*(0.035)	-0.479*(0.036)
Log Real GDP(-1)	0.005***(0.003)	0.007***(0.004)	-0.001(0.011)
Change, Log RER	-0.001(0.008)		0.010(0.011)
RER, Log		0.016(0.013)	
Openness			-0.587(2.276)
Inflation			-0.000(0.000)
CPIA			0.002(0.003)
Observations	370	370	370
Number of countries	37	36	37
Instrument rank	4	4	7
J-Statistics	3.236	3.190	3.443

Note: *1%; ***10% indicate that coefficients are significant at these levels. Standard errors are in parenthesis. Dependent variables and RER are lagged by one. Change in RER and log RER are average values over the 14 years period

The interaction of the control variables with change in log RER shows slight impact in the model. Although rightly signed, the control variables affect the signs and magnitude of coefficients differently from other estimations. Income per capita (i.e. real GDP) is observed to be appropriately signed in agriculture and industry with high coefficient impact in the agricultural sector. This result is in line with the findings of Rodrik (2008). It follows therefore that a 10% increase in real GDP improves agricultural growth by 2.6% over the industrial sector. However, though most of the subsectors show positive signs, they were not significant at any level. This result is similar to the findings by Eichengreen and Gupta (2013).

Table 4.4: Services response to change in RER

Variable	I	II	III
Services(-1)	-0.323*(0.051)	-0.315*(0.056)	-0.323*(0.048)
Log Real GDP(-1)	-0.003(0.005)	-0.006 (0.007)	-0.028 (0.020)
Change, Log RER	-0.032*(0.012)		-0.037**(0.016)
RER, Log		-0.011 (0.027)	
Openness			-5.704***(3.270)
Inflation			0.000**(0.000)
CPIA			-0.003 (0.004)
Observations	370	370	370
Number of countries	37	37	37
Instrument rank	4	4	7
J-Statistics	2.048	2.100	2.058

Note: *1%; **5%; ***10% indicate that coefficients are significant at these levels. Standard errors are in parenthesis. Dependent variables and RER are lagged by one. Change in RER and log RER are average values over the 14 years period

The results in Tables 4.4- 4.9 show clearly how a change in log RER responds to the sectors when the three key sectors are disaggregated. Though the results differ across subsectors in terms of sign and magnitude of coefficients, the services subsectors ("others" and 'WRH') show positive and significant impacts. This implies therefore, that 10% depreciation will accelerate the growth of "others" by 1.4% and "WRH", by 5.6%.

Table 4.5: "Others" response to change in RER

Variable	I	II	III
Others (-1)	-0.317*(0.031)	-0.312*(0.032)	-0.318*(0.031)
Log Real GDP (-1)	0.000(0.003)	0.002(0.005)	0.009(0.011)
Change, Log RER	0.014***(0.008)		0.015***(0.010)
RER, Log		0.005(0.017)	
Openness			1.914(2.024)
Inflation			-0.000(0.000)
CPIA			0.002(0.002)
Observations	370	370	370
Number of countries	36	36	37
Instrument rank	4	4	7
J-Statistics	1.896	1.927	1.902

Note: *1%; ***10% indicate that coefficients are significant at these levels. Standard errors are in parenthesis. Dependent variables and RER are lagged by one. Change in RER and log RER are average values over the 14 years period
"Others" is comprised of other community, social and personal services; private households with employed persons and extra-territorial organizations and bodies.

Table 4.6: "WRH" response to change in RER

Variable	I	II	III
WRH (-1)	-0.376*(0.017)	-0.378*(0.018)	-0.376*(0.017)
Log Real GDP(-1)	0.007(0.011)	0.015(0.014)	0.019(0.040)
Change, Log RER	0.056**(0.022)		0.072*(0.027)
RER, Log		0.050(0.040)	
Openness			4.009(6.429)
Inflation			-0.003(0.004)
CPIA			0.012***(0.007)
Observations	370	370	370
Number of countries	37	37	37
Instrument rank	4	4	7
J-Statistics	1.172	1.173	1.229

Note: *1%; **5%; ***10% indicate that coefficients are significant at these levels. Standard errors are in parenthesis. Dependent variables and RER are lagged by one. Change in RER and log RER are average values over the 14 years period
"WRH" is comprised of wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods; Hotel and restaurants; financial intermediation; Real estate, renting and business activities; Public administration and defence and compulsory social securities.

The huge impact of RER on WRH growth could be because the subsector uses fewer imported inputs. It could also be that the sector has lower fixed cost of entry. As noted by Eichengreen and Gupta (2013:6), "lower fixed cost result to elastic supply response".

Although there was no significant change in the coefficient of RER in "others", when controlled for, significant change was noticed in "WRH".

Table 4.7: Mining and Utility response to change in RER

Variable	I	II	III
Mining & Utility(-1)	-0.525*(0.035)	-0.525*(0.033)	-0.521*(0.034)
Log Real GDP(-1)	-0.003(0.002)	-0.005 (0.004)	0.006(0.011)
Change, Log RER	-0.000 (0.007)		-0.012 (0.013)
RER, Log		-0.018 (0.013)	
Openness			1.045 (2.285)
Inflation			-0.000(0.000)
CPIA			-0.002 (0.003)
Observations	370	370	370
Number of countries	37	37	37
Instrument rank	4	4	7
J-Statistics	2.758	2.727	2.929

Note: *1% indicates that coefficients are significant at these levels. Standard errors are in parenthesis. Dependent variables and RER are lagged by one. Change in RER and log RER are average values over the 14 years period.

However, while RER response to construction is negative and positively signed, mining and utility is negative and non-significant. However, the coefficients of manufacturing and transport and communication are positive but not significant. The implication of these results therefore is that while the activities of the construction and mining and utility sectors lead to RER appreciation, the manufacturing, and transport and communication sectors' activities lead to RER depreciation.

Table 4.8: Construction response to change in RER

Variable	I	II	III
Construction(-1)	1.037*(0.033)	1.038*(0.034)	1.038*(0.033)
Log Real GDP(-1)	25.933 (74.439)	27.638 (75.386)	229.975**(119.473)
Change, Log RER	-251.470*(102.054)		-828.029*(293.316)
RER, Log		58.747(78.615)	
Openness			5144.420 (13389.61)
Inflation			2.429**(1.097)
CPIA			-33.085 (53.246)
Observations	370	370	370
Number of countries	36	36	37
Instrument rank	4	4	7
J-Statistics	6.162	6.327	6.017

Note: *1%, **5% indicates that coefficients are significant at these levels. Standard errors are in parenthesis. Dependent variables and RER are lagged by one. Change in RER and log RER are average values over the 14 years period

Table 4.9: Manufacturing response to change in RER

Variable	I	II	III
Manufacturing(-1)	-0.235*(0.087)	-0.236*(0.086)	-0.238*(0.087)
Log Real GDP(-1)	0.001(0.009)	0.005 (0.012)	-0.016 (0.024)
Change, Log RER	0.020 (0.017)		0.016 (0.024)
RER, Log		0.032 (0.030)	
Openness			-3.384 (4.859)
Inflation			0.000 (0.000)
CPIA			0.003 (0.006)
Observations	370	370	370
Number of countries	37	37	37
Instrument rank	4	4	7
J-Statistics	6.241	6.266	6.527

Note: *1% indicates that coefficients are significant at these levels. Standard errors are in parenthesis. Dependent variables and RER are lagged by one. Change in RER and log RER are average values over the 14 years period.

Table 4.10: Transport and Communication response to change in RER

Variable	I	II	III
Transport & Comm(-1)	-0.326*(0.019)	-0.325*(0.020)	-0.318*(0.019)
Log Real GDP(-1)	-0.001(0.003)	-0.001(0.004)	0.005(0.006)
Change, Log RER	0.000(0.005)		-0.005(0.006)
RER, Log		0.000(0.015)	
Openness			0.968(0.994)
Inflation			-0.000(0.000)
CPIA			-0.001(0.002)
Observations	370	370	370
Number of countries	37	37	37
Instrument rank	4	4	7
J-Statistics	4.127	4.215	4.331

Note: *1% indicates that coefficients are significant at these levels. Standard errors are in parenthesis. Dependent variables and RER are lagged by one. Change in RER and log RER are average values over the 14 years period

4.5 Conclusion

Many developed and emerging economies have adopted the path of appropriate economic policy framework to achieve the twin objectives of economic and social prosperity. They developed frameworks that enabled them strategically move from the production of agricultural products to the production of manufactured goods through the adoption of appropriate ER policy frameworks. Specifically, these countries adopted the policy of

undervaluation of the RER, which many policymakers and scholars have identified as beneficial to export and economic growth (see Sachs and Warner, 1997 and Rodrik, 2008). However, the case of Africa is quite different as the region is still fixated on the production of agricultural products with an underdeveloped industrial sector.

This study has therefore examined the effectiveness of real exchange rate as a policy tool for industrial development. Specifically, the response rate of different sectors were examined to find out if real exchange rate affects the growth composition of these sectors. The conceptual framework by Rodrik (2008) was adopted in conducting the analysis. Setting aggregate growth as the dependent variable, the study shows how under- or overvaluation of RER can affect the output of a country. The study finds that RER is a significant factor to economic growth. Similar studies by Bleaney and Greenaway (2001); Hua (2007); and Max Corden (2009) also show comparable results.

Specifically, the findings show that while the response of sectors such as agriculture, construction, mining and utility to RER suggests appreciation of RER, the response of manufacturing, transport and communication, "WRH" and "Others" suggests depreciation of RER. However, out of the sectors that suggest depreciation of RER, only "WRH" and "Others" are significant at 5 and 10 per cent. The non-significance of the manufacturing, and transport and communication sectors may be as a result of two factors. First is the underdevelopment of the sectors which many studies have noted as a serious challenge to the continent (see AU, 2008 and Pedersen, 2001). According to Pendersen (2001), although the transport and communication sectors are growing and contributing to lower the unit cost of exports and imports, this did not apply to all forms of consignments, communications, origins and destinations. Second, this may be due to high dependency of manufacturing on agricultural inputs (Breisinger et al., 2009). Therefore, a policy framework towards the development of the industrial sectors, especially, manufacturing, transport and communication, will act as a springboard that could lunch Africa into an era of industrial revolution.

Chapter Five

Conclusion and Policy Implications

5.1 Introduction

This thesis has 3 objectives. Firstly, it examines the impact of the composition of growth on poverty and inequality in selected African countries. Secondly, it investigates the impact of the composition of growth on the level of external debt (ED) in the selected countries. Thirdly, it examines the effectiveness of real exchange rate (RER) as a policy tool for industrial diversification.

5.2 The Impact of Growth Composition on Poverty and Inequality in Selected African Countries

Chapter 2 examines the impact of the composition of growth on poverty and inequality in 36 African countries. Specifically, the study investigates the three main productive sectors to identify which of them has more capacity to improve welfare among African countries. Adopting a dynamic generalized method of moments (GMM) estimation technique, the findings of the study are summarized as follows:

One, although the agricultural sector at time *t* reduces the poverty level, the impact is very low when compared with those of the services and industrial sectors whose impact on poverty is greater. This finding reinforces the earlier position of the study on the misconception of the agricultural sector as the main driver of poverty reduction in Africa. Two, the disaggregation of the three sectors into subsectors shows clearly the impact of each of these sectors on poverty reduction. The findings show that the subsectors with the greatest impact on poverty are construction, manufacturing, "others," and mining, with very little contribution from the agricultural sector. Three, this trend was also observed when the subsectors were examined on the inequality index Gini coefficient. Even though the coefficient of the agricultural sector was observed to be rightly signed, the study finds it challenging to accept the result, especially going by the views expressed in Adams (2002) and Ravallion and Datt (2002). These studies argue that agricultural productivity growth increases the rate of inequality among farm owners when land is appropriated by wealthy individuals, when technology is improved, and when agricultural exports are concentrated in the hands of large farm owners.

5.3 The Impact of Growth Composition on External Debt: Evidence from African Countries

Chapter 3 investigates the impact of the composition of growth on the level of external debt in the selected African countries. This study observed that previous studies, which mainly centred on the impact of ED on aggregate growth, provide evidence that a high level of ED affects investments and growth negatively. Iyoha (1999) investigates the impact of external debt on economic growth in sub-Saharan African countries and finds that a high debt burden affects investments negatively in the region. Similarly, Presbitero (2012) shows that a high stock of external debt creates uncertainty and distorts future inflow of external funds which are needed to boost investments and economic growth. In order to investigate which of the sectors that has the capacity to provide greater resources to drive the level of ED in African countries, this study combined two theoretic frameworks by Loayza and Raddatz (2010) and Pattillo et al. (2011). The approach of targeting specific sectors for the purpose of improving domestic sources of revenue will provide additional resources to cater for the effect of high debt stock per aggregate national income on economic growth.

Applying a dynamic generalized method of moments (GMM) estimation technique, the results show that rather than the much-touted agricultural sector being the main driver of economic growth in Africa, the industry and services sectors are responsible for driving the levels of ED in African countries. A closer examination of the sectors shows that industry (construction and manufacturing) and services (wholesale, retail and hotels) are the subsectors with the higher capacities for driving the levels of ED. When institutional and macroeconomic factors are controlled for, there was no significant variation in the outcome. This result suggests that one of the reasons why the African continent is constantly faced with fiscal imbalances is weak policy choice in investing into the productive base. Therefore, the fiscal challenges facing many African countries can be reduced through the application of appropriate policy instruments.

5.4 Real Exchange Rate (RER) as a Policy Tool for Industrial Diversification and Growth in Africa

In chapter four, the effectiveness of the real exchange rate as a policy tool for industrial diversificationisexamined. Specifically, the response rates of the three key sectors and their

subsectors to change in the exchange rate policy are investigated. Even though the impact of change in ER on growth is ambiguous, many studies note that undervaluation of RER improves the quality of exports and growth, while overvaluation reduces exports and growth. However, despite the plethora of studies on RER and growth in both developing and developed economies, this study notes that studies that investigate the effectiveness of RER on sectoral growth in Africa are scarce.Similar to Rodrik (2008) and Eichengreen and Gupta (2013), this study adopted a framework that was able to examine the response rate of each of the sectors through dynamic generalized methods of moments (GMM) estimating techniques.

The result shows clearly that the ER policy of undervaluation is not effective for both the agricultural and industrial sectors. However, the policy of undervaluation is very effective for the services subsectors (that is, "Others" and "WRH"). The result shows that a 10% depreciation will accelerate the growth of "Others" and "WRH" by 1.4% and 5.6% respectively. The weak response rate of the manufacturing sector is a testament that the sector is still underdeveloped in the African region. This finding is a significant departure from previous studies that assume that the manufacturing sector is a strong beneficiary of the recent undervaluation of ER policy in Africa.

5.5 Policy Implications and Recommendations of the Study

The results of this study have important policy implications for African economies. In view of the low level of social welfare, high external debt, and underdeveloped industrial sector, it is highly imperative that African policymakers adopt a policy framework that targets specific sectors for improvement of domestic revenue and industrial growth. The approach of targeting specific sectors for economic growth and development, in order to reduce poverty and inequality has been used by Asian and some Latin American countries to improve welfare conditions in their various countries. Therefore, a policy framework that continues to transfer resources into the agricultural sector rather than the industrial and services sectors makes growth and development an uphill task.

Likewise, a policy thrust in favour of improving domestic sources of revenue through the approach of targeting the industrial or services sectors will provide additional resources to cater for the high debt stock per aggregate national income which is a challenge in Africa. The idea of applying the 'traditional' debt relief packages for financing domestic economic

activities, by many developing countries' policymakers has been proven to be inadequate. It is therefore imperative that policymakers retool their policy frameworks to engender improvement of domestic sources of revenue which can complement borrowed funds for the purposes of economic growth and development.

Lastly, appropriate exchange rate (ER) policies in some Asian and Latin American countries have led to improvement in industrial diversification and growth. The growth 'miracle' of the Asian countries centres on the effective use of ER and trade policies, specifically the adoption of depreciation of ER. However, the case of Africa is different, as the continent is yet to take advantage of the benefits of the policy of undervalued ER to improve trade and industrial growth. In addition, since the industrial (manufacturing) sector is underdeveloped, revising this trend therefore requires that African policymakers adopt a framework that will develop the industrial sector before the ER policy of undervaluation can be applied to stimulate export and aggregate growth. The current practice of tailoring resources towards the 'traditional' sectors is counterproductive and unsustainable. Thus, retooling measurement criteria to understand the growth-poverty-inequality dynamics is critical for African researchers if the knowledge gap is to be filled.

5.6 Suggested Areas for Further Research

This study investigated the impact of sectoral growth on social welfare; the impact of sectoral growth on ED; and the role of the RER in industrial diversification. This study noted that with the appropriate policy mix, the worsening socio-economic conditions in the African continent can be improved. However, it was observed that examining the impact of foreign direct investment (FDI) on sectoral growth composition in Africa will further provide additional knowledge to policymakers on how FDI can be used as a veritable tool to channel scarce resources to productive sectors with high growth and welfare improving capacity. Borensztein and Lee (1998), Markusen and Venables (1999), and Ayanwale (2007) posit that FDI is an important vehicle that transfers technology and contributes to both industrial and aggregate economic growth through higher productivity. Conversely, this study observes that while literature that investigates the impact of FDI is in abundance, studies that examine the impact of FDI on the composition of growth in Africa are relatively scarce. Therefore, conducting research on the impact of FDI on sectoral growth composition will contribute significantly to the development literature.

Appendices

Appendix 1A: Descriptive statistics (Poverty and Sectors)

Variable[17]	Mean	Median	Max	Min	SD	Obs
Poverty growth	0.154	0.000	25.214	-0.963	1.517	443
Industry growth	0.155	0.110	10.173	-0.359	0.536	444
Agriculture growth	0.108	0.108	0.942	-0.296	0.147	444
Services growth	0.113	0.103	1.025	-0.346	0.138	444
Mining growth	0.153	0.100	9.667	-0.419	0.531	444
Others growth[18]	0.112	0.108	0.840	-0.398	0.143	444
WRH growth[19]	0.130	0.107	8.714	-0.755	0.436	444
Construction growth	0.177	0.124	12.043	-0.514	0.607	444
Manufacture growth	0.145	0.094	14.500	-0.426	0.702	444
T&C[20]	0.126	0.109	1.190	-0.509	0.436	444

Appendix 1B: Descriptive statistics (Inequality and Sectors)

	Mean	Median	Max	Min	Std Dev.	Obs
Gini growth	0.007	0.000	0.948	-0.476	0.133	430
Agriculture growth	0.108	0.108	0.942	-0.296	0.147	444
Industry growth	0.155	0.110	10.173	-0.359	0.536	444
Services growth	0.113	0.103	1.025	-0.346	0.138	444
Construction growth	0.177	0.124	12.043	-0.514	0.607	444
Manufacture growth	0.145	0.094	14.500	-0.426	0.702	444
Mining growth	0.153	0.100	9.667	-0.419	0.531	444
Others growth	0.112	0.108	0.840	-0.398	0.143	444
T&C growth	0.126	0.109	1.910	-0.509	0.178	444
WRH growth	0.130	0.107	8.714	-0.755	0.436	444

[17] International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4) classified the industrial sector into manufacturing, mining, and construction. While the services sector is comprised of 'Others', transport and communication (T&C), and wholesale, retail and hotels (WRH).

[18] "Others growth" is comprised of other community, social and personal services; private households with employed persons and extra-territorial organizations and bodies.

[19] "WRH growth" is comprised of Wholesale and retail trade; Repair of motor vehicles, motorcycles and personal and household goods; Hotel and restaurants; Financial intermediation; Real estate, renting and business activities; Public administration and defense and compulsory social securities.

[20] "T&C growth" is comprised of Transport, Information and Communications.

Appendix 1C: Correlation analysis (Gini coefficient and disaggregated Sectors)

	Gini	GDP	Agric	Con	Mining	Others	T&C	WRH	Manuf
Gini	1.000								
GDP	0.004	1.000							
Agric	0.053	0.671*	1.000						
Con	0.000	0.148*	0.135*	1.000					
Mining	0.018	0.266*	0.152*	0.839*	1.000				
Others	0.032	0.629*	0.514*	0.225*	0.182*	1.000			
T&C	0.090**	0.512*	0.413*	0.180*	0.150*	0.605*	1.000		
WRH	-0.022	0.324*	0.352*	-0.006	0.065	0.124*	0.196*	1.000	
Manuf	0.027	0.093**	0.116*	0.945*	0.885*	0.166*	0.137*	0.022	1.000

All variables are in growth rates. *1% significant; **5% significant

Appendix 1D: Correlation analysis (Poverty and Sectoral disaggregation)

	Poverty	GDP	Agric	Con	Man	Mining	Others	WRH	T&C
Poverty	1.0000								
GDP	0.0226	1.0000							
Agric	0.0534	0.6820*	1.0000						
Con[21]	0.0119	0.1526*	0.1375*	1.0000					
Man[22]	-0.0048	0.0968**	0.1173*	0.9440*	1.0000				
Mining	-0.0189	0.2679*	0.1583*	0.8396*	0.8851*	1.0000			
Others	0.0494	0.6428*	0.5128*	0.2273*	0.1679*	0.1891*	1.0000		
WRH	0.0046	0.3280*	0.3566*	-0.0036	0.0238	0.0670	0.1307*	1.0000	
T&C	-0.0014	0.5171*	0.4219*	0.1833*	0.1390*	0.1519*	0.6127*	0.1994*	1.0000

All variables are in growth rates. *1% significant; **5% significant

Appendix 1E: Gini index values by region, 1990-2008 (based on net income)

Region	1990	2000	2008	2008-2000 Change	2008-2000 Change
Asia	36.4	40.0	40.4	4.0	0.6
Eastern Europe and Central Asia	26.7	33.2	35.4	8.7	2.2
Latin America and the Caribbean	46.9	49.2	48.3	1.5	-1.3
Middle East and North Africa	39.2	39.2	39.2	0.0	0.0
Sub-Saharan Africa	49.1	46.1	44.2	-4.8	-1.8
High-income Countries	27.4	30.8	30.9	3.5	0.0
Number of Observations	137	140	141	132	132

Source: Ortiz and Cummins (2011). * Unweighted average values.

[21] "con" represents construction
[22] "man" stands for manufacturing

Appendix 1F: Proportion of people living on less than $1.25 a day (Percentage)

Region	1990	2010	1990-2010* Change	2011**
Sub-Saharan Africa	56.0	48.0	8.0	46.9
Southern Asia	51.0	30.0	21.0	24.5
Southern Asia (excluding India)	52.0	22.0	30.0	N/A
South-Eastern Asia	45.0	14.0	31.0	7.9
Eastern Asia (China only)	60.0	12.0	48.0	N/A
Latin America and the Caribbean	12.0	6.0	6.0	4.6
Caucasus and Central Asia	10.0	4.0	6.0	0.5
Western Asia	5.0	4.0	1.0	N/A
Northern Africa	5.0	1.0	4.0	1.7
Developing regions (excluding China)	41.0	26.0	15.0	N/A
Developing regions	47.0	22.0	25.0	17.0
World	36.0	18.0	18.0	14.5

Source: *Millennium Development Goals (MDG) Report, 2014; **World Bank *PovcalNet*, 2014.

Appendix 1G: Income and multi-dimensional poverty, by region*

Region	Income poverty headcount (%)	Near income poverty (%)	Number of countries in sample	Multi-dimensional poverty headcount (%)	Intensity of deprivation (%)	Near multi-dimensional poverty (%)
Arab States	6.5	36.4	9	15.5	48.4	8.7
East Asia and the Pacific	12.7	25.1	10	6.4	44.7	16.2
Europe and Central Asia	1.4	6.0	15	1.8	37.3	4.5
Latin America and the Caribbean	5.7	7.0	14	6.7	42.8	9.5
South Asia	30.6	44.4	7	53.4	50.8	17.9
Sub-Saharan Africa	50.9	27.8	36	59.6	55.0	16.2

Source: UNDP Report, 2014. *Multidimensional poverty headcount includes those that are deprived of education, health, and quality standard of living.

Appendix 2 (a-c): Regional output share in GDP by sectors: US Dollars at current prices and current exchange rates (in millions)*

a. Agricultural share

Region	1970-1980	1980-1990	1990-2000	2000-2010	2010-2013
Western Africa	22073.835	35494.392	26944.254	78002.309	138596.525
Eastern Africa	10916.215	18708.043	20784.110	34064.616	67354.241
Northern Africa	9414.563	18808.411	30089.875	52922.318	94702.537
Southern Africa	2882.424	4666.540	5921.073	7654.349	10330.811
Summary - Africa	**45287.036**	**77677.387**	**83739.312**	**172643.592**	**310984.114**
Caribbean	2831.091	5275.000	5397.000	6429.000	8964.750
Central America	12391.727	21421.900	30311.000	39218.727	52533.500
South America	26905.545	53648.273	77813.364	112774.909	220686.250
Summary - Latin America	**42128.364**	**80345.173**	**113521.364**	**158422.636**	**282184.500**
Eastern Asia	63817.000	118506.000	177686.000	359538.000	810326.000
Southern Asia	56616.000	112004.000	177686.000	236555.000	442579.000
South-East Asia	26158.000	48544.000	73547.000	125150.000	274475.000
Western Asia	2882.424	4666.540	5921.073	7654.349	10330.811
Summary - Asia	**149473.424**	**283720.540**	**434840.073**	**728897.349**	**1537710.811**

*Author's compilation (Source of data: UNCTAD, 2014)

b. Industry

Region	1970-1980	1980-1990	1990-2000	2000-2010	2010-2013
Western Africa	25148.034	30749.813	21887.834	62082.352	97672.690
Eastern Africa	8362.092	12677.254	13235.225	24350.714	34788.184
Northern Africa	27592.381	58006.998	74059.810	178197.622	230077.933
Southern Africa	16415.001	35325.172	47612.664	73831.496	93503.563
Summary - Africa	**77517.508**	**136759.237**	**156795.533**	**338462.185**	**456042.370**
Caribbean	6971.612	13019.573	17464.461	34247.947	50614.776
Central America	44618.633	108167.793	180220.168	346256.736	478092.170
South America	105240.716	214754.727	351048.224	581685.041	1157136.156
Summary - Latin America	**156830.961**	**335942.093**	**548732.852**	**962189.724**	**1685843.101**
Eastern Asia	101886.648	253529.390	624589.561	1759879.849	4092457.004
Southern Asia	51812.526	103482.080	150858.626	389842.765	775118.835
South-East Asia	33129.839	93748.150	213021.413	430985.816	881308.934
Western Asia	90696.906	166660.834	233819.244	599410.484	1260651.740
Summary - Asia	**277525.919**	**617420.454**	**1222288.844**	**3180118.914**	**7009536.513**

*Author's compilation (Source of data: UNCTAD, 2014)

c. Services

Region	1970-1980	1980-1990	1990-2000	2000-2010	2010-2013
Western Africa	52591.116	804977.707	46692.605	145311.625	294209.642
Eastern Africa	14059.272	26118.767	31331.471	60298.099	115573.525
Northern Africa	26698.757	658276.222	104861.993	181404.576	332485.834
Southern Africa	19336.258	430307.860	84307.762	155984.066	258203.021
Summary - Africa	**112685.403**	**1919680.556**	**267193.831**	**542998.366**	**1000472.022**
Caribbean	14760.318	30473.064	43918.000	84114.000	124869.749
Central America	63699.127	128073.096	271802.000	540752.000	762790.530
South America	124693.759	284802.226	720662.516	1087491.717	2269049.261
Summary - Latin America	**203153.203**	**443348.387**	**1036382.516**	**1712357.717**	**3156709.541**
Eastern Asia	69447.529	231723.908	764545.887	2055784.435	4556780.549
Southern Asia	76159.277	184565.670	274013.504	700716.338	1450136.159
South-East Asia	39019.710	113627.268	278365.553	511465.870	1077214.166
Western Asia	62433.665	163811.908	269674.015	635682.460	1168777.437
Summary - Asia	**247060.182**	**693728.752**	**1586598.959**	**3903649.103**	**8252908.311**

*Author's compilation (Source of data: UNCTAD, 2014)

Table 4.11 Correlation matrix between real exchange rate (RER) and different sectors[23]

Variable	Real Exchange Rate	Agriculture	Industry	Services	Construction	Mining & Utility	Manufacture	"OTHERS"	Transport & Comm.	"WRH"
Real Exchange Rate	1.000									
Agriculture	-0.031	1.000								
Industry	0.031	-0.029	1.000							
Services	0.016	0.238*	-0.063	1.000						
Construction	-0.130*	-0.001	0.046	0.038	1.000					
Mining & Utility	-0.034	0.022	-0.978*	0.046	-0.034	1.000				
Manufacture	0.021	0.129*	-0.071	0.480*	-0.058	0.028	1.000			
Others[24]	-0.035	-0.317*	0.057	-0.898*	-0.0102	-0.038	-0.434*	1.000		
Transport & Communication	0.109**	-0.177*	0.053	-0.612*	-0.078***	-0.040	-0.287*	0.401	1.000	
WRH[25]	0.040	-0.240*	0.060	-0.724*	-0.031	-0.049	-0.241*	0.538*	0.368*	1.000

*1%; **5%; ***10% significant.

[23] Appendix 1 shows the correlation between the real exchange rate (RER) and the different sectors in the economy. Among the sectors, agriculture, construction, mining and utility and "others" are negatively correlated with RER suggesting that an appreciation in RER negatively affects these sectors. While manufacturing, transport and communication and "WRH" are positively correlated with RER, suggesting a depreciation in RER. This result corroborates our earlier findings.

[24] "Others" comprises other community, social and personal services; private households with employed persons and extra-territorial organizations and bodies.

[25] "WRH " comprises: Wholesale and retail trade; Repair of motor vehicles, motorcycles and personal and household goods; Hotel and restaurants; Financial intermediation; Real estate, renting and business activities; Public administration and defense and compulsory social securities

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