EFFECT OF THE SIZE OF THE INFORMAL SECTOR ON ECONOMIC GROWTH, TOTAL FACTOR PRODUCTIVITY AND POVERTY ALLEVIATION IN KENYA

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University or for any other award.

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DEDICATION

I dedicate this work to my husband Ayub,and children Josephine, Juliet and Jonathan.

Thank you for your support and patience.

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TABLE OF CONTENTS

DECLARATION ..... **II**

DEDICATION ..... **III**

ACKNOWLEDGMENT ..... **IV**

TABLE OF CONTENTS ..... **V**

LIST OF FIGURES ..... **IX**

ABBREVIATIONS AND ACRONYMS ..... **X**

OPERATIONAL DEFINITION OF TERMS ..... **XIII**

ABSTRACT ..... **XIV**

CHAPTER ONE **1**

INTRODUCTION **1**

1.1 BACKGROUND 1

1.1.1 The Evolution of the Informal Sector in Kenya *8*

1.1.2 Informal Sector Policy Measures in Kenya *14*

1.1.3 Employment Composition in Kenya (1973 to 2016) *20*

1.1.4 The Informal Sector, Economic Growth and Poverty in Kenya *22*

1.2 STATEMENT OF THE PROBLEM 26

1.3 THE RESEARCH QUESTIONS 27

1.4 OBJECTIVES OF THE STUDY 28

1.5 SIGNIFICANCE OF THE STUDY 28

1.6 SCOPE OF THE STUDY 29

1.7 ORGANIZATION OF THE STUDY 29

CHAPTER TWO **31**

LITERATURE REVIEW **31**

2.1 INTRODUCTION 31

2.2 THEORETICAL LITERATURE 31

2.2.1 Theories on the Informal Sector *31*

2.2.2 Economic Growth Theories *34*

2.2.3 Poverty Theories *45*

2.3 EMPIRICAL LITERATURE 50

2.3.1 Firm Size and Productivity *51*

2.3.2 The relationship between Informality, Output and Poverty *55*

2.4 OVERVIEW OF LITERATURE REVIEW 71

CHAPTER THREE 75

METHODOLOGY 75

3.1 INTRODUCTION 75

3.2 RESEARCH DESIGN 75

3.3 THEORETICAL FRAMEWORK 75

3.3.1 Production with a Dual Labour Market *75*

3.3.2 Poverty and Dual Labour Markets *81*

3.4 EMPIRICAL MODELS 82

3.4.1: Growth Accounting Model *82*

3.4.2 Total Factor Productivity (TFP) Model *83*

3.4.3: Poverty Model *89*

3.5 DEFINITION AND MEASUREMENT OF VARIABLES 93

3.6 DATA TYPES AND SOURCES 98

3.7 ESTIMATION PROCEDURE 99

3.8 DIAGNOSTIC TESTS 99

3.8.1 Stationarity tests *99*

3.8.2 Correlation Analysis *100*

3.8.3 Residual Diagnostic tests *101*

CHAPTER FOUR 102

EMPIRICAL FINDINGS 102

4.1 INTRODUCTION 102

4.2 DESCRIPTIVE STATISTICS 102

4.2.1 Line Graphs / Variable Plots *102*

4.2.2 Summary Statistics *104*
4.2.3 Stationarity Test Results *106*
4.2.4 Pairwise Correlation Analysis *108*
4.2.5 Residual Diagnostic Tests *110*
4.3 THE CONTRIBUTION OF THE INFORMAL SECTOR TO OUTPUT GROWTH IN KENYA ... 110
4.4 THE EFFECT OF THE INFORMAL SECTOR ON TOTAL FACTOR PRODUCTIVITY IN KENYA ... 125
4.5 THE EFFECT OF THE INFORMALITY ON POVERTY ALLEVIATION IN KENYA ... 134
CHAPTER FIVE ... 143
SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS ... 143
5.1 INTRODUCTION ... 143
5.2 SUMMARY OF THE STUDY ... 143
5.3 CONCLUSIONS OF THE STUDY ... 145
5.4 POLICY IMPLICATIONS ... 147
5.5 CONTRIBUTION TO KNOWLEDGE ... 148
5.6 AREAS FOR FURTHER STUDY ... 148
REFERENCES ... 149
APPENDICES ... 164
APPENDIX A: DERIVATION OF CAPITAL STOCK ... 164
APPENDIX B: DATA USED ... 169
APPENDIX C: PAIRWISE CORRELATION ... 176
APPENDIX D: MODEL ESTIMATION RESULTS ... 179
APPENDIX E: MODEL STABILITY TEST RESULTS ... 188

LIST OF TABLES

Table 1.1 Part of the Budgetary Allocation to the SME Sector from 2010 to 2016 12
Table 1.2 Composition of the Informal Sector in Kenya (percentage) 14
Table 4.1: Summary Statistics for Variables used in the Study 105
Table 4.2: Stationarity Test Results (Kwiatkowski, Phillips, Schmidt and Shin)..... 107
Table 4.3: Results of Diagnostic Tests for the Production Model 112
Table 4.4: Regression Data Estimates for the Growth Equation (Model 1c)..... 114
Table 4.5: Growth Accounting Results (Average)..... 117
Table 4.6: Results of Residual Diagnostic Tests for TFP (Model 2a) 127
Table 4.7: Results for the Effect of the Informal Sector on TFP (Model 2b - RLS) 128
Table 4.8: Results of Residual Diagnostic Tests for Poverty Alleviation 136
Table 4.9 Results for the Effect of Informality on Poverty Alleviation..... 137
Table A1: OLS Regression Results for Log of Investments against Time 168
Table A2: Factor inputs (Objective One)..... 169
Table A3: TFP Analysis Data 171
Table A4: Poverty Analysis Data..... 173
Table A5: Results of Pair-wise Correlation Analysis (Objective One) 176
Table A6: Results of Pair-wise Correlation Analysis (Objective Two)..... 177
Table A7: Results of Pair-wise Correlation Analysis (Objective Three)..... 178
Table A8: Growth Accounting Results (Model 1)..... 179
Table A9: Growth Accounting Results (Model 1a)..... 180
Table A10: Growth Accounting Results (Model 1b)..... 181
Table A11: Total Factor Productivity Analysis Results (Model 2 - OLS) 182
Table A12: Total Factor Productivity Analysis Results (Model 2a - OLS)..... 183
Table A13: Results of the Ordinary Least Squares for Poverty Alleviation (Model 3a) 184
Table A14: Results of the Ordinary Least Squares for Poverty Alleviation (Model 3b) 185
Table A15: Growth Accounting Results..... 186

LIST OF FIGURES

Figure 1.1: Sectoral Employment Composition in Kenya (1973 to 2016) 21

Figure 1.2: Economic Performance in Kenya (1974 to 2016) 22

Figure 4.1: Capital, Gross Domestic Product, Formal labour and Informal labour..... 103

Figure A1: CUSUM test for the Growth Accounting (Model 1c) 188

Figure A2: CUSUM of Squares test for the Growth Accounting (Model 1c) 188

Figure A3: CUSUM test for TFP Analysis (Model 2b)..... 189

Figure A4: CUSUM of Squares test for TFP Analysis (Model 2b)..... 189

Figure A5: CUSUM test for Poverty Alleviation Analysis (Model 3) 190

Figure A6: CUSUM of Squares test for Poverty Alleviation Analysis (Model 3) 190

ABBREVIATIONS AND ACRONYMS

ASMEP	Assistance to Micro and Small Enterprises Programmes
BDS	Business Development Services
CBN	Cost of Basic Needs
CDF	Constituency Development Fund
CDTF	Community Development Trust Fund
CMA	Capital Markets Authority
CUSUM	Cumulative Sum
CUSUMSQ	Cumulative Sum of Recursive Squared Residuals
DMSED	Department of Micro and Small Enterprise Development
DANIDA	Danish Development Agency
EPC	Export Promotion Centre
ERS	Economic Recovery Strategy
FDI	Foreign Direct Investment
FEI	Food Energy Intake
GDP	Gross Domestic Product
GTZ	German Agency for Technical Co-orperation
ICEG	International Centre for Economic Growth
IMF	International Monetary Fund
ILCS	International Conference of Labour Statisticians
ILO	International Labour Organisation
ISIC	International Standard Industrial Classification
KIBT	Kenya Institute of Business Training
KIPI	Kenya Industrial Property Institute
KIPPRA	Kenya Institute for Public Policy Analysis and Research
KIRDI	Kenya Institute of Research and Development
KNBS	Kenya National Bureau of Statistics
KRA	Kenya Revenue Authority
KREP	Kenya Rural Enterprise Programme
LATF	Local Authority Transfer Fund

MDGs	Millennium Development Goals
MFIs	Micro Finance Institutions
MIMIC	Multiple-Indicators-Multiple-Causes
MLHRD	Ministry of Labour and Human Resource Development
MSEs	Micro and Small Enterprises
MSEA	Micro and Small Enterprise Authority
MSMEs	Micro, Small and Medium Enterprises
MTP	Medium Term Plan
NHIF	National Hospital Insurance Fund
NICs	Newly Industrialized Countries
NIDC	National Industrial Development Council
NMK	*Njaa Marufuku* Kenya
NSSF	National Social Security Fund
OLS	Ordinary Least Squares
OECD	Organisation of Economic Co-operation and Development
PAYE	Pay- As-You-Earn
PEC	Poverty Eradication Commission
PEV	Post-Election Violence
PIN	Personal Identification Number
PSDS	Private Sector Development Strategy
PIM	Perpetual Inventory Method
REER	Real Effective Exchange Rate
RLS	Robust Least Squares
RPED	Regional Programme for Enterprise Development
SACCO	Savings and Credit Cooperative Society
SAPs	Structural Adjustment Programmes
SSJKEs	Small Scale and *Jua Kali* Enterprises
UNDP	United Nations Development Programme
USA	United States of America
R & D	Research and Development
RPED	Regional Programme for Enterprise Development

RGDP	Real Gross Domestic Product
RoK	Republic of Kenya
SDD	Social Dimensions of Development
SDGs	Sustainable Development Goals
SMEs	Small and Micro Enterprises
TFP	Total Factor Productivity
UNESC	United Nations Economic and Social Consortium
VAR	Vector - auto regression
WDI	World Development Indicator

OPERATIONAL DEFINITION OF TERMS

Informal Sector: Economic activities that have no clear distinction between the owner and the enterprise characterized by any one or more of the following criteria (small scale of operation, family ownership, no separate accounts, low levels of organization, low entry requirements, labour intensive, use of adapted technology and locally available resources, competitive and unregulated markets, apprentice skill acquisition, non-registration with the government registration bodies under the Companies Act or with tax collection bodies though they may be registered with the local authorities to obtain operation permits, and casual employment with no legal or social benefits and protection). The sector is popularly referred to as the „*Jua Kali"* sector in Kenya.

Informal employment: Work that has no legal or social protection in the formal and informal sectors.

Informal economy: Economic activities in the informal sector plus formal employment with no legal or social protection.

Micro enterprises: Firms with less than 10 workers and an annual turnover of less than Kshs 500,000.

Small enterprises: Firms employing 10 to 49 employees with an annual turnover of between Shillings 500,000 and Shillings 5 million per year.

Medium enterprises: Firms employing 50 to 99 employees.

Poverty: A situation where a household, person or community is not able to meet the food and non-food basic needs and is living below $ 1.90 per-day (2011 PPP).

Labour effectiveness: A measure of the quality and performance of a worker that affects worker productivity.

ABSTRACT

The Kenyan economy is predominantly informal. The informal sector employed 132,100 workers in 1974; and 13,442,200 workers in 2016, which translate to 19 percent and 84 percent of the total work force in the respective time periods. The government has from 1986 put in place policy measures to develop the sector for employment creation, economic growth, and poverty alleviation. Among the country‟s Big Four Agenda as contained in the Medium Term Plan (2018-2022), is the development of the manufacturing sector for economic growth and improved welfare. The manufacturing sector in the country is largely informal with 80 percent of firms and 84.3 percent of the total workforce being informal. The development of the sector is therefore central in the achievement of the country‟s macroeconomic targets of 10 percent annual economic growth rate and a reduction in poverty rates to 28 percent of the total population by the year 2030. However, theoretical and empirical literature point at a sector that has low productivity with some studies attributing poor economic performance to the existence of a large informal sector. This study aimed at establishing the effect of the size of the informal sector on economic performance in Kenya. The study objectives were; to analyze the contribution of the informal sector to output growth in Kenya, to determine the effect of the informal sector on total factor productivity in Kenya; and to examine the effect of the informal sector on poverty alleviation in Kenya. The study used secondary time series data for the period 1974 to 2016 and employed Ordinary Least Squares in analysis. Data was sourced from the country economic surveys and statistical abstracts, the Central Bank of Kenya website, the World Development Indicators and the Global Financial Development database. A growth accounting exercise was conducted using the standard Cobb-Douglas production function to address the first objective. The study used the residual from the growth accounting exercise, commonly referred to as total factor productivity as the dependent variable to address the second objective based on endogenous growth models with the growth in the average annual wage in the informal sector as an indicator of the size of the sector following *efficiency-wage* theories. The third objective was based on the Marxist and Liberal theories of poverty. The poverty headcount index was used as the dependent variable with the depth of informality as an indicator of the size of the informal sector. From the study findings, the informal sector is the lowest contributor to output growth in the country; the sector has a negative and statistically significant effect on total factor productivity; and significantly increases poverty in the country. Based on the findings, and given the size of the informal sector, the study concludes that there is a need to target increased productivity in the sector for increased output growth, increased total factor productivity and poverty alleviation in the country.

CHAPTER ONE

INTRODUCTION

1.1 Background

The informal sector was officially recognized by Keith Hart in his study of the labour market in Ghana in 1971 and the International Labour Organization (ILO) study in Kenya in 1972 (Chen, 2012). The sector traditionally consisted of productive activities in unregistered firms characterized by any one or more of the following features: family ownership, no separate accounts, small scale of operation, low entry requirements, low levels of organization, labour intensive, use of locally available resources and adapted technology, apprentice skill acquisition, competitive and unregulated markets, and non-registration with the government registration bodies under the Companies Act. This definition of the sector follows the International Conference of Labour Statisticians (ILCS) definitions in 2003 and 1993 (Chen, 2012). However, structural changes in the labour market in many countries have resulted in increased informalization of previously formal employment opportunities creating work that has no social or legal protection commonly referred to as casual or informal employment. The informal economy consists of both the informal sector and informal employment in the formal sector (Chen, 2012). The informal sector as used in this study refers to the informal economy, therefore captures both the traditional informal sector and informal activities in the formal sector popularly referred to as the *„Jua Kali"* sector in Kenya following Hope (2014).

The sector was in the past associated with low-income countries with the expectation that the size of the sector would reduce with economic growth as adequate employment

opportunities were created in the formal sector, also referred to as the "Lewis Turning Point" (Lewis, 1954). This has however not been the case. Globally, the size of the sector has been on the increase. Informal employment is presently a reality even in high-income and middle-income countries despite increasing economic growth. The sector provides employment opportunities, generates income and increases production hence plays a key role in the development of many developing and transition economies. The contribution of the sector to total output in the developing and developed countries is one third and between 10 to 20 percent, respectively (Benjamin, Beegle, Recanatini, & Santini, 2014). Additionally, the sector provides employment to 72 percent of non-agricultural workforce in Sub-Saharan Africa; 65 percent in Asia; 51 percent in Latin America, and 48 percent in North Africa (Benjamin *et al,* 2014). In Africa, the sector provides 90 percent of new employment opportunities and 20 percent to 80 percent of gross domestic product (Steel & Snodgrass, 2008). According to Todaro and Smith (2015), the informal sector accounts for about 50 percent of urban employment in developing countries.

The sector contributes to total output, total productivity and income in an economy as it facilitates increased use of resources, and encourages entrepreneurship, research and investment with no formal costs. However, the sector is characterized by tax avoidance which undermines government revenue (Loayza, Serven, & Sugawara, 2009; Chen, 2012; ILO, 2014; Joshi, Prichard, & Heady, 2014;) therefore limits state ability to provide public services which are essential support structures for increased productivity and economic growth. Additionally, the firms in the sector are largely small-scale which limits firm productivity and hinders the output potential of the sector (Cimoli, Primi &

Pugno, 2006; Kimenyi, Mwega & Ndungu, 2016). A large informal sector may compromise economic growth in an economy. Earnings in the sector are low, employment is largely high-risk and unstable and the workers have no social and legal protection so that the sector may also perpetuate poverty (Omolo, 2010).

The informal sector accounts for 84 percent of total employment in Kenya (Republic of Kenya, 2016). The Kenya Institute of Public Policy Analysis and Research (KIPPRA, 2010) acknowledged the important role played by the sector in economic growth, wealth creation and poverty alleviation in the country. The sector is composed of firms with low levels of organization found in the manufacturing, agricultural, transport and service sectors operating outside the formal legal and regulatory framework. Since 1986, there has been increased government effort directed towards the development of the sector in the country in recognition of the sector‟s employment generation and income creation potential (Republic of Kenya, 1992; 2005; 2012a; 2012b).

The *Micro, Medium and Small Enterprises (MSME) Basic Report (2016)* acknowledged that most of the MSMEs in Kenya are informal. However, accurate measurement of the sector‟s contribution to national output in the country has been elusive (KIPPRA, 2010; Republic of Kenya, 2016). The baseline survey on Micro and Small Enterprises (MSEs) conducted in 1999 found that the sector contributed 14.3 percent of the country‟s GDP in 1993 and 18.4 percent in 1999 (KNBS, ICEG & K-Rep, 1999). However, ILO (2002) estimated the sector‟s contribution to non-agricultural GDP at 25 percent in 1999 while Charmes (2006) put the sector‟s contribution to GDP in the same year at 18.5 percent

(Hope, 2014), which is consistent with the 1999 baseline survey by the Kenya National Bureau of Statistics and its partners. According to Ouma, Njeru, Khainga, Kirima and Kamau (2007), the sector contributed 12 percent of GDP in the period 1975 to 1980, 19 percent between 1980 and 1990; 26 percent in the period 1990 to 2000; and 20 percent from 2000 to 2005. The *Medium Term Plan (MTP) 2008-2012,* and the *Labour, Youth and Human Resource Development Sector Plan* - 2008, put the contribution of the sector at 18 percent of the country‟s GDP over the period 2003 to 2006 (Republic of Kenya, 2008a; 2008b). The sector‟s contribution to national output in 2015 was estimated at 33.8 percent (Republic of Kenya, 2016) while World Bank (2016) estimated the sector‟s contribution as 35.5 percent in the period 1999 to 2007.

Informal enterprises in Kenya are predominantly small in size. Firm productivity is limited due to the use of poor and outdated technology, lack of adequate finance, poor access to markets and social infrastructure, limited technological progress and the small scale of operation thus inability to enjoy economies of scale (Bigsten, Kimuyu, & Söderbom, 2010; Kimenyi *et al*, 2016). Theoretical and empirical literature shows a positive relationship between firm size and productivity (Schivardi, 2000; Naude & Krugell, 2003; Pagano & Taymaz, 2009). The *Micro, Small and Medium Enterprises Basic Report of 2016* stated that 92.2 percent of the firms in the sector employ between 1 to 9 workers with most being own account firms, but the 1999 baseline survey found that 70 percent of the firms in the sector employed only one person (Republic of Kenya, 1999). A World Bank (2016) study of the informal sector in Kenya found that the

productivity in informal firms measured by the value added per worker was 8.4 times less than that of formal firms.

Most firms in the sector remain informal to avoid state detection and adherence to necessary legal requirements which include the costs of formalization in business registration and license acquisition, tax payments and labour regulations. Avoidance of these requirements reduces operation costs encouraging inefficient firms to operate in the sector which leads to resource misallocation (Elbadawi & Loayza, 2008; Loayza, Serven & Sugawara, 2009). Tax avoidance limits government revenue used in the provision of public infrastructure leading to overcrowding of the available public facilities. A large informal sector could therefore compromise total productivity which is an important determinant of economic performance, international competitiveness and living standards in the economy. According to Haughton (2012), total factor productivity contributed between 1 and 3 percent of GDP growth in the Group of 7 industrialized countries (G7) and 6 percent for other nations in the Organisation of Economic Co-operation and Development (OECD) between 1985 and 2006.

Poverty remains a key macroeconomic concern in developing countries. According to the Keynesian or Liberal Theory of Poverty, increased employment may deepen poverty if the work is part-time, temporary, precarious and insecure (Davies & Sanchez-Martinez, 2015). The poverty incidence measured by the percentage of the population living on less than US Dollars 1.08 per day in Sub-Saharan Africa stood at 45 percent in 2004 (Agenor, 2004). There are 550 million workers worldwide who can be categorized as the working

poor, most of whom are engaged in the informal sector (Chen, Vanek, & Carr, 2004). Though the sector cushions workers unable to find formal employment, average wages are lower than earnings in the formal sector (ILO, 2002: 2007; Tokman, 2007; World Bank, 2016). Acknowledging that not all informal sector workers are poor, the United Nations Economic and Social Consortium (UNESC) 2006 paper on *Poverty and the Informal Sector* links poverty to informality, a finding shared by Sethuraman (1997) and Blunch, Canagarajah and Raju, (2001). The majority of the poor derive their income from employment (Agenor, 2004) so that employment creation is seen as a means of poverty reduction in many developing countries. However, Agenor (2004) states that increased employment may result in an increase in the number of the "*working-poor"* and not reduce poverty if it results in depressed wages.

The percentage of the total population classified as poor in Kenya was 44.8 percent in 1992, 52.3 percent in 1997, 56 percent in 2000, 46.6 percent in 2006 and 36.1 percent in 2016 (Republic of Kenya, 2009: 2018). The government has over time used various policy measures targeting poverty reduction. The Sessional Paper No. 10 of 1965, the 1983 District Focus for Rural Development, and the Sessional Paper No. 1 of 1986 focused on increased economic growth with the hope that the resultant increase in employment would help reduce poverty in the country. The Sessional Paper No. 1 of 1986 was based on contractionary fiscal policy that resulted in massive retrenchment and a freeze in public sector employment which deepened poverty in the country. Consequently, the government sought to cushion the poor by subsidizing education and healthcare, and supporting local government needs for more equitable growth using the

1994 Social Dimensions of Development (SDD) Programme, the National Poverty Eradication Programme of 1999 which established the Poverty Eradication Commission (PEC), and the Poverty Reduction Strategy Paper of 2002-2003 (Republic of Kenya, 2009). The PEC targeted poverty eradication in Kenya by the year 2015 (Republic of Kenya, 2009) following the 1995 United Nations Social Summit where it was resolved that the absolute poverty levels should be reduced by half in all member states by 2015.

Key programs targeting poverty reduction in the country that have been implemented over time include: the District Focus for Rural Development introduced in 1983 which moved the planning and implementation of development projects from the central government to the district level; the 1999 Local Authority Transfer Fund (LATF) which sought to financially empower the local administration for better financial management and improved delivery of services; and the Constituency Development Fund (CDF) introduced in 2003 to reduce regional inequality by supporting local projects at the constituency-level through equitable sharing of resources. Others include the Youth Enterprise Development Fund introduced in 2006, the 1996 Community Development Trust Fund (CDTF), the 2005 Njaa Marufuku Kenya (NMK), and the Women Enterprise Development Fund introduced in 2007.

Among the objectives of the *Kenya Vision 2030* is the reduction of poverty levels in Kenya from 46 percent of the total population in 2008 to 28 percent and increased economic growth to 10 percent per annum by the year 2030 through an export-led industrialization strategy. The key sectors in the country targeted for the achievement of

the stated macroeconomic goals include agriculture, fishing and livestock; manufacturing; tourism; financial services, Business Process Outsourcing, international trade, wholesale and retail (Republic of Kenya, 2008a). The informal sector employed 84.3 percent of the total work force in the manufacturing sector between 2003 and 2007 and constitutes more than 80 percent of industries in the country (Republic of Kenya, 2005; 20012a). The sector is therefore important in Kenya‟s industrialization process through investment, development of skills and technology, promotion of entrepreneurship and innovation, and in increasing exports (Republic of Kenya, 2016). According to economic growth theories, labour is one of the determinants of economic growth, and the theories of poverty state that the nature of employment is a key determinant of poverty in an economy. The size of the informal sector is therefore a key determinant of economic growth and poverty in Kenya.

1.1.1 The Evolution of the Informal Sector in Kenya

Consistent monitoring of the informal sector in Kenya started after the 1972 ILO recognition of the sector. Employment in the country was predominantly formal in the 1970‟s. The 1980‟s saw an increase in informal employment following a reduction in the rate of growth of formal employment in both the private and public sectors with the implementation of Structural Adjustment Programmes (SAPs) by the government in the 1980s and economic liberalization measures in the 1990s (Were, Ngugi, Wambua, & Oyugi, 2005; Omolo, 2010). The SAPs targeted the reduction of fiscal and external balances through retrenchment, employment freezing and restructuring in state run corporations and institutions. This was accompanied by privatization of state enterprises to improve productivity.

The 1980s period was also characterized by poor implementation of agricultural support policies and falling agricultural prices in the international market resulting in increased rural-urban migration as workers moved from farms in search of formal employment opportunities in urban centers (Were *et al,* 2005). Additionally, the movement towards free trade under a more liberalized economy in the 1990s led to increased competition in the private sector, sometimes from highly subsidized imports that stifled the local industries (Were *et al,* 2005). As a result, private sector firms retrenched workers and restructured to reduce costs and remain competitive. These measures included subcontracting and outsourcing resulting in increasingly informal employment.

These changes were accompanied by increased effort by the government to promote the informal sector in recognition of the slow rate of growth in formal employment opportunities. An average of 80,000 new jobs were created annually in the formal sector over the period 1999 to 2005 (Were *et al,* 2005). With the population growing at an average rate of 2.5 percent per annum between 1997 and 2002, and a need for 500,000 new jobs per year, most job seekers found refuge in the informal sector either as new entrants or those retrenched from formal employment (Were *et al,* 2005). A marked increase in the number of employees engaged in the informal sector in the country was experienced in the early 1990s following the structural changes in the economy and more consistent ways of capturing employment data on the sector.

According to Agenor (2004), most of the poor get their income from employment. This makes the informal sector an important consideration in the poverty reduction efforts in

Kenya. In 1995 incomes in two-thirds of informal sector enterprises in the country were below the required minimum wage of Kshs 2,712 per month (Omolo & Omiti, 2005). By 1999 earnings had increased to Kshs 6,008 which was low compared to formal sector earnings of Kshs 12,489 (KNBS, K-Rep & ICEG, 1999; Omolo & Omiti, 2005). Nyaga (2010) found that 80 percent of the workers in the informal sector in Kenya earn Kshs 5,400 or less per month compared to an average monthly wage of Kshs 7,915. World Bank (2016) found that worker productivity in the informal sector in the country is significantly lower than that of workers engaged in the formal sector. Moreover, informal sector workers have no contracts and where they exist are usually not binding, and labour laws are not observed. Hull (2009) classified informal sector jobs as low-productivity jobs and stated that poverty reduction can only be attained if growth is productivity enhancing or is concentrated in the more productive (formal) sectors of the economy.

Various institutions and programs have been initiated to oversee the development of the informal sector in Kenya. These include the Assistance to Micro and Small Enterprises Programme (ASMEP) set up in 2007 under the Ministry of Trade and financed by the European Commission to improve private sector development, economic growth and poverty reduction in the country; and the Micro and Small Enterprises (MSE) competitiveness project of 2004 facilitated by the World Bank which targeted improved private-public sector partnership to increase MSME productivity, to develop the private sector, increase output and reduce poverty. The World Bank project targeted the improvement of skills, increased access to finance, and better business environment and market linkages. The Department of Micro and Small Enterprise Development (DMSED) was established in 1992 following the merger of the Directorate of Applied Technology

and the Division of Small Scale and Jua Kali Enterprises. The objective of DSMED was to consolidate MSE policy formulation, coordination and implementation to facilitate the development of the sector in the country.

The identification of the informal sector as a key driver in Kenya‟s development process has seen massive resources channeled towards its development over time with different activities and projects initiated. Table 1.1 shows part of the financial resources allocated to the sector over the period 2010 to 2016 reflecting the importance that the government places on the development of the sector.

Table 1.1 Part of the Budgetary Allocation to the SME Sector from 2010 to 2016

Financial Year	Activity	Allocation (Kshs)
2010/11	Development of Micro and Small Enterprises	91 M
	Development of Industrial and Vocational Training centers	83.4 M
2011/12	Development of Micro and Small Enterprises	133.7 M
	Development of Industrial and Vocational Training centers	83.4 M
2012/13	Directorate of MSE Development	106.5 M
	Kariobangi Enterprise Development Center of Excellence	70 M
	Technology Development Centre (Athi River)	63 M
	National Industrial Training Centers (Nairobi, Kisumu and Mombasa)	96 M
	National Industrial Training Authority	100 M
2013/14	Directorate of MSE Development	7.29 M
	Micro and Small Enterprise Authority	100 M
	Kariobangi Enterprise Development Center	44.3 M
	Technology Development Centre (Athi River)	379.4 M
	National Industrial Training Centers (Nairobi, Kisumu and Mombasa)	38.5 M
2014/15	Directorate of MSE Development	12.5 M
	Micro and Small Enterprise Authority	200 M
	Kariobangi Enterprise Development Center	100 M
	Technology Development Centre (Athi River)	190 M
	National Industrial Training Centers (Nairobi, Kisumu and Mombasa)	105 M
2015/16	Directorate of MSE Development	15 M
	Micro and Small Enterprise Authority	300 M
	Kariobangi Enterprise Development Center	102 M
	Technology Development Centre (Athi River)	210 M
	National Industrial Training Centers (Nairobi, Kisumu and Mombasa)	130 M

Source: Republic of Kenya, Estimates of Development Expenditure, Various Issues

The sector was allocated Kshs 91 M for the development of Micro and Small Enterprises, and Kshs 83.4 M for the development of Industrial and Vocational Training centers in the budgetary period 2010/11; and Kshs 133.7 M and Kshs 83.4 M for the same in 2011/12. Of a budgetary allocation of Kshs 637.5 M to the Ministry of Labour and Human Resource Development in the period 2012/13, a total of Kshs 435.5 M (68.3 percent) was allocated to informal sector related activities. Of the amount, Kshs 106.5 M was allocated to the Directorate of MSE Development; Kshs 70 M to Kariobangi Enterprise

Development Center of Excellence; Kshs 63 M to the Technology Development Centre (Athi River); a total of Kshs 96 M to the Nairobi, Kisumu and Mombasa National Industrial Training Centers and Kshs 100 M to the National Industrial Training Authority. Total allocations for the development of the informal sector and related activities were 174.4 M in 2010/11; 217.1 M in 2011/12; 435.5 M in 2012/13; 569.5 M in 2013/14; 607.5 M in 2014/15; and 757 M in the period 2015/16 (Republic of Kenya, 2010 to 2016). This shows an upward trend in budgetary allocation to the sector.

Other government initiatives that target the development of the informal sector include the Kshs 3.8 billion MSE fund launched in 2011 to provide cheap credit and mentorship to the micro and small enterprises; and the Kshs 6 billion Uwezo fund launched in 2014 which targeted the development of firms managed by the youth, women and persons with disability. The broad objectives of the Uwezo fund were to promote innovation, incubate firms, create employment, improve economic growth and reduce the levels of poverty in the country. Other financiers of informal sector activities in the country include the Asian Foundation, various development partners like the Belgian government, the German Agency for Technical Co-operation (GTZ), Danish Development Agency (DANIDA) and the United Nations Development Programme (UNDP) (Omolo & Omiti, 2005).

The informal sector in Kenya is largely heterogeneous as presented in Table 1.2

Table 1.2 Composition of the Informal Sector in Kenya (percentage)

Activity	Employment	
	2015	**2016**
Manufacturing	20.3	20.4
Construction	2.6	2.5
Wholesale, retail trade, hotels and restaurants	59.8	59.7
Transport and communication	3.1	3.1
Community, social, and personal services	9.7	9.7
Others	4.6	4.5
Total	**100**	**100**

Source: Republic of Kenya Economic Survey, 2017

Wholesale, retail trade, hotels and restaurants are the lead employers with 59.7 percent of the total employees in 2016 and 59.8 percent in 2015, followed by manufacturing with 20.4 percent and 20.3 percent in the specific time periods. Community, social, and personal services accounted for 9.7 percent of total the employees in 2015 and 2016; while construction, transport and communication each employed 2.5 percent and 2.6 percent, with other lines of employment covering 4.5 percent and 4.6 percent of the total employees in the respective time periods.

1.1.2 Informal Sector Policy Measures in Kenya

Following the International Labour Organization (1972) report on *Employment, Income and Equality: A Strategy for Increasing Productive Employment in Kenya* which recognized the employment, output and income creating potential of the informal sector, various policy documents have put forward ways by which the sector can be developed to

increase productivity, employment and income by addressing the constraints faced by firms in the sector. Challenges faced by informal firms in the country include limited access to external markets, technology and information; an unfavourable regulatory environment and incoherent policies; and poor project planning and implementation (Republic of Kenya, 1986; 1992; 1996; 2003; 2005; 2008a). The 1972 ILO report advocated for the formalization of the informal sector through the simplification of trade licensing systems, increased ties between the informal and the formal sector through subcontracting, and increased security of tenure in place of constant harassment by local authorities and police and worksite demolitions (King, 1996).

Government effort to develop the informal sector was first mentioned in the 1986 Sessional Paper on *Economic Management for Renewed Growth* and the Sixth National Development Plan (1989-1993). The Sessional Paper proposed increased domestic market for manufactured goods through import substitution and an increase in the export potential of the manufacturing sector by increasing efficiency and competitiveness, improved entrepreneurial skills and increased access to credit, development of an entrepreneurial culture and the formation of co-operatives to assist in dissemination of information and technology and in the purchase of inputs (Republic of Kenya, 1986: 1992).

The National Development Plan (1989-1993) recognized the gains made by the Sessional Paper of 1986 in non-formal training of women groups in handicraft production and the establishment of Harambee Institutes of Technology and Village polytechnics. Based on

the potential of the informal sector to generate employment and income, promote indigenous participation in the economy, train entrepreneurs and improve income distribution, the paper proposed various ways of providing direct assistance to the sector. These included the review of building codes; easier land allocation; reduction of hindrances posed by large firms to small firms by facilitating more fair trade practices and easier marketing, distributive and financial infrastructure; and review of administrative procedures towards easier obtaining of trading licenses. The paper further proposed the facilitation of increased capital base for informal firms through the Capital Markets Authority (CMA) and the Co-operative Bank of Kenya.

The Sessional Paper No.2 of 1992 on *Small Enterprise and Jua Kali Development in Kenya* addressed the lack of graduation of small firms into formal enterprises. The paper recommended technology improvement through established research centers under the Ministry of Technical Training and Applied Technology, better marketing channels through the Export Promotion Division of the Ministry of Commerce and improved information dissemination through the formation of *Jua Kali* associations (Republic of Kenya, 1992). The Sessional Paper No. 2 of 1996 on *Industrial Transformation to the Year 2020* stated that the Small Scale and Jua Kali Enterprises (SSJKEs) have the potential to be key drivers in Kenya‟s industrialization process. The paper targeted increased market capacity, strengthening of the institutional framework in the informal sector and tightening policy development and implementation through relevant government ministries. The paper also advocated for the development of sector specific policies to create programmes and projects to facilitate full policy implementation under

the National Industrial Development Council (NIDC), increased Private-Public sector partnership and increased allocation of resources to technology development and management (Republic of Kenya, 1996).

The *Economic Recovery Strategy (ERS) for Wealth and Employment Creation 2003-2007* targeted the growth of MSEs to medium sized enterprises to improve product quality and create quality employment. The paper advocated for the identification of suitable worksites and provision of infrastructure through local authorities to serve as incubators for the MSE‟s (Republic of Kenya, 2003). Successes of the ERS period include securing of land parcels for informal sector operators in various parts of the country, worksite rehabilitation, increased marketing and knowledge sharing through regional exhibitions and training of informal sector workers resulting in the upgrading of skills and productivity. Others include the formation of Savings and Credit Cooperative Societies (SACCOs) which have facilitated improved savings and eased access to credit, and the facilitation of capitalization through the formation of Micro Finance Institutions (MFIs) (Republic of Kenya, 2008).

The Sessional Paper No. 2 of 2005 on *Development of Micro and Small Enterprises for Employment Creation and Poverty Reduction* aimed at the development of Micro and Small Enterprises through enhanced effectiveness of MSE institutions by strengthening MSE associations, “establishing a National Council for Small Enterprises and legislating a Micro and Small Enterprise Act” (Republic of Kenya, 2005:2) to improve coordination and implementation, monitoring and evaluation of informal sector policies in recognition

of the potential of the firms to graduate to medium and large industries. The paper provided for the allocation of 25 percent of public sector procurement to MSEs; increased firm linkages; and improved partnership between the informal sector, civil society and the private sector to achieve better resource use and develop the sector. The *Private Sector Development Strategy* (PSDS) acknowledged the important link played by the sector between the private sector and poverty alleviation in the country as the sector is labor-intensive. The PSDS advocated for the facilitation and support of the growth of MSME‟s into large enterprises through promotion of inter-firm linkages, encouragement of new enterprise growth, improved access to capital and increased MSME representation in business associations.

The *Kenya Vision 2030: First Medium Term Plan (MTP) 2008-2012* addressed lack of property rights, high entry costs and cumbersome regulations as hindrances to increased productivity and growth of firms in the informal sector. It advocated for the development of industrial and manufacturing zones and Small and Medium Enterprise (SME) industrial parks in key urban centers (Nairobi, Kisumu, Nakuru, Mombasa, and Eldoret). The paper also proposed the creation of a Micro and Small and Medium Enterprise (MSME) research and development, risk and venture capital fund; and a funded Business and Technology Incubation Programme (Republic of Kenya, 2008).

The Micro and Small Enterprises (MSE) Act No. 55 of 2012 envisaged in the Sessional Paper No. 2 of 2005 sought to provide cheap credit, guidelines for the registration of MSEs and a dispute resolution mechanism for informal sector firms. The Act also

established the Micro and Small Enterprise Authority (MSEA) under the Ministry of Industrialization and Enterprise Development. The vision statement of MSEA is "To promote the development of competitive and sustainable micro and small enterprises" (Republic of Kenya, 2012b: viii). The mandate of MSEA is the formulation and coordination of policies to enable the inclusion and harmonization of private and public sector initiatives towards the development, promotion and regulation of micro and small enterprises with a view of making them the leading industries of the future. Apart from policy formulation and implementation MSEA also targets market development, research and innovation, technology development and capacity building in the sector.

Following the various policy measures, the size of the sector in the country measured by the number of persons employed has increased. Other gains made include the facilitation of MSE participation in the\Nairobi Stock Exchange and the development of Micro Finance Institutions to facilitate easy access to finance by the firms. Commercial banks are also embracing small firms with many introducing financial facilities suitable for MSEs. However, informal firms continue to suffer harassment by police and local authorities and worksite demolitions despite the allocation of land to informal sector activities. The local authorities who are the custodians of the land have over time sold the parcels to private developers. Firm productivity in the sector remains low (KIPPRA, 2010). This has been attributed to poor policy design and weak policy implementation lacking an effective coordination, monitoring and evaluation mechanism (Republic of Kenya, 2005).

1.1.3 Employment Composition in Kenya (1973 to 2016)

Employment numbers in Kenya are reported under two categories: modern and informal sector employment. The modern sector has wage employees, self-employed and unpaid family workers. Unpaid labour is one of the distinguishing features of informal employment. Huitfeldt and Jutting (2009) and Chen, Vanek and Carr (2005) categorized informal employment into own-account/self-employed workers, employer-owners, casual workers, unpaid family members and sub-contracted workers. As already mentioned, 70 percent of all informal firms in Kenya were own account firms in 1999 (KNBS, K-Rep and ICEG, 1999). This study used the sum of workers employed in the informal sector, in self-employment and unpaid family workers as the total number of persons informally employed in the country.

The number of workers engaged in the informal sector in the country has increased over time as shown in Figure 1.1.

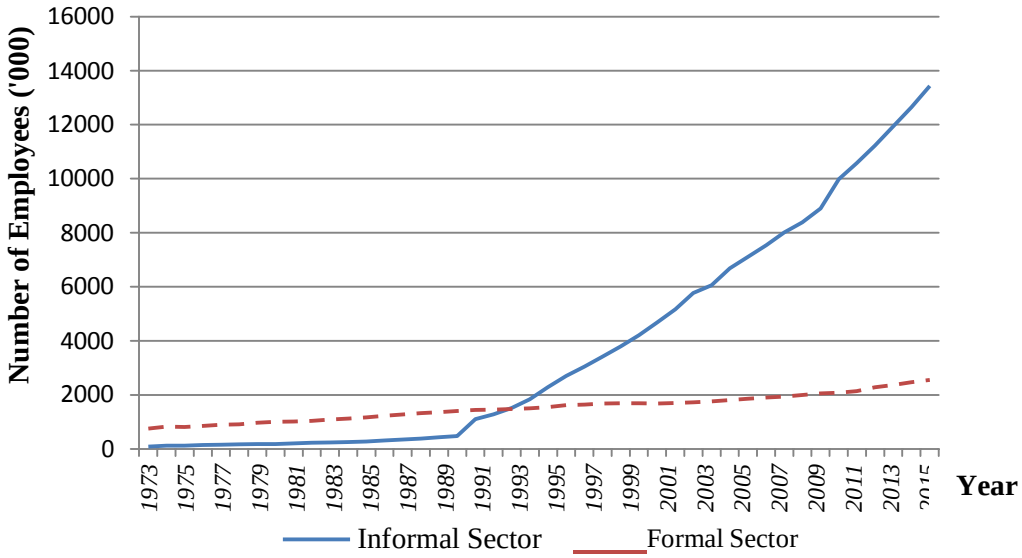

Figure 1.1: Sectoral Employment Composition in Kenya (1973 to 2016)

Data Source: Republic of Kenya Economic Surveys, Various Issues

In 1973 the sector employed 95,400 persons, increasing to 13,442,200 in 2016, while employment in the formal sector over the same period increased in absolute terms from 761,400 employees in 1973 to 2,554,300 in 2016 (Republic of Kenya Economic Survey, Various). This shows a reduction in formal sector employment from about 81 percent of the total employment in 1973 to 16 percent in 2016.

The decline in the rate of growth in formal employment from the 1980s is attributed to structural changes in the economy which forced workers to seek alternative employment opportunities in the informal sector. The rapid increase in the reported number of workers engaged in the sector from 1990 to 1991 is not wholly a reflection of growth of the sector but has also been attributed to better data monitoring (Omolo, 2010; Bigsten *et al*, 2016).

1.1.4 The Informal Sector, Economic Growth and Poverty in Kenya

The key policy objectives for the development of the informal sector in Kenya are employment creation, economic growth and income generation / poverty alleviation. Graphic analysis of the annual rate of growth in the size of the informal sector, economic growth and household final consumption expenditure (a proxy of poverty) from 1974 to 2016 is shown in Figure 1.2.

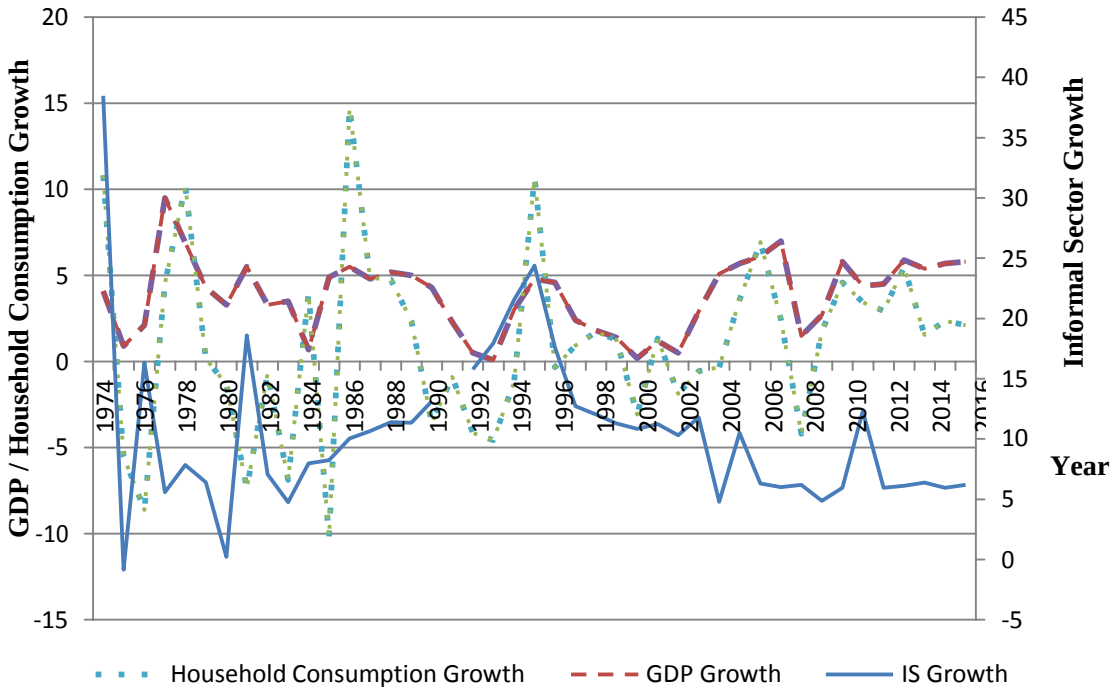

Figure 1.2: Economic Performance in Kenya (1974 to 2016)

Data Source: Republic of Kenya Economic Surveys, Various Issues
World Bank Database, 2017

The official recognition of the informal sector in Kenya followed the 1972 ILO report on the sector in the country. The study used 1974 as the start period as there was a steep increase in the reported number of workers employed in the sector from 1973. This can be attributed to underestimation of the size of the sector in the previous time periods which was difficult to quantify. A marked increase in the size of the sector was again

experienced from 1990 to 1991 (127 percent) due to better methods of data collection (Omolo, 2010). The growth in the informal sector for the periods 1973 and 1991 were therefore excluded from the graphic analysis as the growth rate in the size of the sector remained fairly stable from 1974 to 1990 and from 1992 to 2016. The analysis covered the period 1974 to 2016 to avoid loss of information and a dummy for the size of the sector introduced to capture the 1990 to 1991 structural breaks.

There was a reduction in the average rate of growth of the informal sector in Kenya from 1974 to 1980. This period was characterized by increasing formal employment opportunities in the public sector as government adopted a Kenyanization employment policy which was accompanied by increasing wages to promote worker productivity (Omolo, 2013). The country also experienced an increase in parastatals accompanied by an import substitution policy that encouraged the growth of local industries (Were *et al*, 2005). The period between 1983 and 1995 saw an increase in the growth rate of the informal sector supported by government efforts to develop the sector (Republic of Kenya, 1992; 2005; 2012a; 2012b). The government in a bid to reduce spending enforced wage restraint (Omolo, 2013) and reduced employment pushing workers from formal to informal employment following the implementation of the SAPs that were recommended by the World Bank and the International Monetary Fund (Were *et al*, 2005). The country experienced a reduction in growth rate of the informal sector between 1995 and 2004, which has remained largely stable from 2005 to 2016.

Economic growth theories state that the level of output is determined by the amount of labour and capital employed and the productivity of the factor inputs (Romer, 2012). However, the same theories state that the use of outdated technology; low levels of capital per worker; low investment; and low levels of education and skill, thus low human capital compromise factor productivity and are retrogressive to economic growth (Romer, 2012). These are the characteristics of the production processes in the informal sector in Kenya.

The increasing rate of growth of the informal sector from 1980 to 1992 was accompanied by increasing GDP growth; the period 1982 to 1992 experienced reducing GDP growth rates and an increase in the growth rate of the informal sector; and the period 2013 to 2016 experienced fairly stable growth rates in both the GDP and in the size of the informal sector. Empirical studies show mixed results on the relationship between the size of the informal sector and economic growth. In a study of the causes and consequences of informality in Latin America, Loayza *et al* (2009:2) stated that "informality is not only a reflection of under-development, but may also be a source of further economic retardation" as it reduces firm productivity and overburdens public resources thus limits total productivity in the economy. High levels of informality have been linked to low productivity hence low economic growth (Cimoli *et al*, 2006; Taymaz, 2009; Pablo, 2014; Abou-Ali & Rizk, 2015). The studies found that the informal sector had a negative effect on economic growth in Latin America, Egypt, Spain and Turkey, respectively; while Macias (2008) found a positive relationship for Mexico which was the case in a cross-country analysis in Beck, Demirguc-Kunt and Levine (2004). Biau (2011)

in a cross-country analysis found a non-monotonic relationship which was positive for low income countries but reversed as the level of income increased, while Tabunan (2006) found no conclusive relationship between the two.

The graphic analysis shows no clear relationship between the growth of the informal sector and household final consumption spending which was used as a proxy for poverty. There was a reduction in the rate of growth in the informal sector between 1976 to 1981 followed by increasing growth in 1982 to 1995, and a reduction after 1995 to the period 2010 remaining fairly stable to 2016 with a spike in 2012. This period saw wide fluctuations in the growth in household final consumption spending with peaks experienced in 1986, 1995, 2006 and 2013 while reduced growth rates were experienced in 1976, 1985 and 2008. According to Organization of Economic Co-operation and Development - OECD (2009), most of the poor are informally employed and depend entirely on their earnings for day-to-day survival emphasizing the role of the nature of work in income determination. The report states that working in the informal sector makes the poor vulnerable to continued poverty as labour laws are disregarded and the sector offers low wages with no social security, a finding that is shared by Blank (2005), Omolo & Omiti (2005) and Nyaga (2010). The United Nations Economic and Social Consortium - UNESC (2006) states that the informal sector provides relief from poverty, but also links informal employment to poverty. Agenor (2004) acknowledging that most of the poor get their earnings from employment observes that employment may cause poverty if it results in depressed wages.

Empirical studies show mixed results on the relationship between the size of the informal sector and poverty. Bigsten *et al* (2004) found no conclusive relationship for Kenya while Oiro *et al* (2004) found that poverty was high among informal sector workers in the country. In cross country analyses Beck *et al* (2004) found no conclusive relationship between the size of the informal sector and poverty, while Biau (2011) found a non-monotonic relationship. Cimoli *et al* (2006), Elbadawi and Loayza (2008) and Nazier and Ramadan (2014) found a positive relationship between the size of the sector and poverty in Egypt, the Arab world and in Latin America respectively.

1.2 Statement of the Problem

The Kenyan government targets economic growth rates averaging 10 percent per year, and a reduction in poverty rates from 46 percent in 2008 to 28 percent by the year 2030 to "attain high quality lives" (Republic of Kenya, 2008:1). The number of persons employed in the informal sector in Kenya has increased from 95,400 persons in 1973 and 132,100 persons in 1974 to about 13.4 million in 2016. This is equivalent to 19 percent and 84 percent share in total employment in 1974 and 2016 respectively. Ninety-one (91) percent of new employment opportunities in 2016 were created in the informal sector (Republic of Kenya, 2017). The government has from 1986 continued to dedicate resources to the development of the sector. The key policy objectives of the sector have been the creation of employment opportunities, income generation and economic growth making the sector pivotal in the achievement of the country‟s macroeconomic goals.

The informal sector contributes to total productivity, output and income in an economy as it facilitates increased use of resources and encourages entrepreneurship, research and

investment with no formal costs. Economic growth and poverty theories do not support the development of the sector for improved economic performance. This is based on the constraining effect of the sector on the ability of the government to provide public infrastructure, the retrogressive characteristics of production processes used by informal sector firms which compromise productivity and output, and the low wages and poor working conditions faced by employees in the sector. Though the sector has substantially increased the levels of employment in Kenya, the contribution of the informal sector to national output in Kenya remains questionable. Empirical literature for other countries give mixed findings on the relationship between the size of the informal sector and economic growth; and the size of the sector and poverty.

There is a need to establish the relationship between the size of the informal sector and economic performance in Kenya. Most studies done on the informal sector in Kenya have been at firm-level, seeking to understand constraints to firm growth and the implications of firm size on productivity. However, there are no econometric studies on the contribution of the sector to output growth; the relationship between the size of the informal sector and productivity; and the relationship between the size of the sector and poverty in the country at the macro-level which is important for policy making.

1.3 The Research Questions

This study sought to answer the following questions:

a) What is the contribution of the informal sector to output growth in Kenya?

b) What is the effect of the informal sector on total factor productivity in Kenya?

c) What is the effect of the informal sector on poverty alleviation in Kenya?

1.4 Objectives of the study

The main purpose of the study was to determine the contribution of the informal sector to economic growth, the effect of the sector on total factor productivity, as well as investigate how the sector impacts on poverty alleviation in Kenya. The specific objectives were:

a) To analyze the contribution of the informal sector to output growth in Kenya.
b) To determine the effect of the informal sector on total factor productivity in Kenya.
c) To examine the effect of the informal sector on poverty alleviation in Kenya.

1.5 Significance of the study

The informal sector in Kenya and has been targeted as a key driver towards the attainment of the country‟s macroeconomic goals which include a sustainable increase in economic growth averaging 10 percent per year and a reduction in poverty levels from 46 percent in 2008 to 28 percent by the year 2030. The policy objectives for the sector in the country include income and output generation in addition to employment creation. The findings of this study will help the national and county governments, and the concerned stakeholders to strengthen and develop appropriate intervention measures for the sector towards the attainment of the stated objectives. This will be achieved by shedding light on the contribution of the sector to economic growth, the effect of the sector on TFP, and the effect of the sector on poverty alleviation in the country. The findings will add to the existing literature on the informal sector in the country by examining the macroeconomic effect of the sector on economic performance as measured by the contribution of the

sector to economic growth, the effect of the sector on TFP and on poverty alleviation in the country.

1.6 Scope of the study

The informal sector is the lead employer in Kenya. Labour as a key input in the production process, therefore an important determinant of economic performance. The understanding of the effect of the size of the sector on output growth, total factor productivity and poverty alleviation in the country necessitated the use of national data. The study was therefore macroeconomic in nature. The number of workers employed in the sector was used as an indicator of the size of the sector, while the average real annual wages in the sector was used to reflect worker productivity. Secondary data used in the analysis was collected from various government and non-governmental reports and publications covering the period 1973 to 2016.

1.7 Organization of the study

This thesis is organized as follows: Chapter one gives a background to the study, research objectives, significance of the study and the scope of the study. Chapter two presents the literature review, covering the mainstream theoretical literature which gives the basis for the existence of the informal sector and theories of economic growth and poverty. The Chapter also contains empirical literature on the relationship between firm size and productivity given the small size of informal firms in Kenya, and the relationship between the size of the informal sector and economic growth, productivity and poverty. Chapter Three contains the methodology used in the study. It describes the theoretical framework, research design, model specification, definition and measurement of

variables, data types and sources and the methods applied in data analysis. Chapter Four contains the study findings and discussions based on the results from the estimated models. Finally, Chapter Five gives the summary, conclusions and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the theoretical literature on the informal sector, economic growth and poverty; and the empirical studies on the relationship between the informal sector, total factor productivity and economic growth, and the informal sector and poverty. The first part examines the theoretical literature explaining the existence of the informal sector. The second part looks at theories explaining economic growth, total factor productivity, and poverty while the third part reviews empirical literature on the relationship between firm size and firm productivity as informal firms in Kenya are predominantly small. The other section reviews empirical literature on the relationship between the size of the informal sector and economic growth, the size of the informal sector and total factor productivity, and the size of the sector and poverty. The section closes with an overview of the literature, justifies the current study, and provides a theoretical basis for the study.

2.2 Theoretical Literature

2.2.1 Theories on the Informal Sector

The emergence of the informal sector in Kenya can be explained by four dominant theories which are applicable globally. The oldest is the dualists‟ theory popularized by the International Labour Organization (ILO) in the 1970s (Chen, 2012). According to the Harris and Todaro (1970) hypothesis, and Lewis (1954) and Kuznets (1955), the economy is dual consisting of the urban capitalist industrial sector and the rural

subsistence agricultural sector. The urban sector which produces industrial goods offers higher wages than the rural sector. Capital accumulation was found in the urban sector which was therefore viewed as the engine of economic growth (Harris & Todaro, 1970; Lewis - 1954 & Kuznets - 1955).

Todaro and Smith (2015) classified the dual sectors in urban areas as formal and informal, in line with Harris and Todaro (1970); and Lewis (1954) and Kuznets‟ (1955) classification of the whole economy. Driven by minimum wage policies, expected wages in the urban or formal sector are higher than rural or informal wages drawing workers from the rural to the urban areas, or from the informal to the formal sectors. In cases where the level of investment therefore economic growth is low or the population growth rate is higher than the rate at which the economy is growing, the available urban or formal employment opportunities cannot cater for all who are seeking employment. The unemployed resort to informal employment (Lewis - 1954 & Kuznets -1955; Harris & Todaro, 1970; Chen *et al,* 2004; Khan, 2007; Chen, 2012; Todaro & Smith, 2015). The informal sector is therefore a last refuge for persons unable to secure formal employment. According to the World Bank Development Indicators (2018), the unemployment rates in Kenya following ILO estimates were 11.59 percent in 2015, and 11.52 percent in 2016 with total labour force of 18.75 million and 19.4 million in the two time periods. This translates to 2.17 million unemployed workers in 2015, and 2.23 million workers in 2016. The formal sector is unable to cope with the rising number of job seekers who have therefore resorted to informal employment (Were *et al,* 2005).

The structuralists school of thought led by Alexandro Portes and Caroline Moser was developed in the 1970‟s and 1980‟s (Chen, 2012). The theory views the informal sector as being largely composed of micro-enterprises serving large firms in the formal sector to reduce labour and input costs, and improve competitiveness in the formal sector in the face of increased globalization. The informal sector is therefore seen to co-exist with the formal sector, driven by the profit maximization motive of the capitalist formal sector. Recent developments in the Kenyan labour market including subcontracting and outsourcing of non-core activities to reduce operating costs have resulted in increasingly informal employment. Both the private and public formal sectors sub-contract to the informal sector. The *Sessional Paper No. 2 of 2005* provided for the allocation of 25 percent of public sector procurement to MSEs (Republic of Kenya, 2005), while the Kenyan Public Procurement and Asset Disposal Act (2015) provides that 30 percent of all government procurement should be sourced from persons with disabilities, youth and women (Republic of Kenya, 2015) most of whom are employed in the informal sector.

The third school of thought are the legalists pioneered by Hernando de Soto in the 1980s and 1990s. They view the sector as being comprised of micro-entrepreneurs who operate informally to avoid the costs of formal registration (Chen *et al,* 2004; Chen, 2012). The costs of formalization in Kenya involve adherence to labour laws and government registration requirements which include registration of employees with Kenya Revenue Authority (KRA) and submission of monthly contributions (Pay-As-You- Earn, National Social Security Fund and the National Hospital Insurance Fund); the company name should be registered with the Registrar of Companies; the owner should acquire a

Personal Identification Number (PIN); and the firm should get licenses to trade from the local authorities and the Ministry of Trade among others. The processes are bureaucratic and time consuming which encourages corruption and increases the cost of business formalization leading to informality.

The last theory views the sector as largely voluntary, composed of persons who are not constrained by the legalities of formalization as with the legalist theory but deliberately opt to avoid the legal costs and procedures by being informal (Chen, 2012).

2.2.2 Economic Growth Theories

Economic growth refers to a long-run increase in the national output of a country. If the rate at which the economy grows is higher than the rate of population growth, the members of the economy enjoy higher standards of living. The Kenyan government targets increased economic growth and a reduction in poverty to guarantee improved living standards for the general population.

Economic growth is measured by the annual rate of change in the real value of all final goods and services produced within the borders of a given country over a given time period (usually a year). It is facilitated by an increase in factor supply and/or increased factor productivity. Increased factor productivity may be due to improvement in the quality of labour engaged in production, improvement in institutions, or innovation and technological progress (Romer, 2012). Various models attempt to explain the key determinants of the level of output in an economy among which are the Harrod-Domar model, the Solow Growth Model, the Ramsey-Cass-Koopmans Growth Model, the

Diamond Model and the New Growth theories founded on the Solow Growth Model (Romer, 2012; 2001). The theories are discussed in the following section.

The Harrod-Domar Growth Model

The model which was developed after the 1933 Great Depression by Harrod (1939) and Domar (1946) is a classical model based on the Keynesian *General Theory of Employment and Income Determination.* It emphasizes the important role played by savings, and capital productivity on economic growth. It is based on the assumption that the level of output in an economy depends on the level of savings through which resources for investment in the economy are mobilized. The level of savings depends on the level of income in the economy as presented in equation (2.1)

$$S = sY \qquad (2.1)$$

Where S is the level of savings, s is the marginal propensity to save and Y is the level of national income

Investment increases the economy‟s potential for future production by increasing the economy‟s capital stock, and the capital-output ratio which affects the degree of efficiency of investment or the productivity of capital. The amount of capital needed to produce a given output level is as presented in equation (2.2),

$$K = \mu Y \qquad (2.2)$$

Where μ is the capital-output ratio, Y is the level of output or national income, and K is the capital stock

Investment ( ) will increase the economy‟s capital stock as shown in equation (2.3)

$$I = \Delta K = \mu \Delta Y \qquad (2.3)$$

This was used as a guide in the derivation of the capital stock for Kenya based on the Perpetual Inventory method following Berlemann and Jan-Erik (2012).

At equilibrium the level of investment is equal to the level of savings so that:

$$I = S \tag{2.4}$$

and $$\mu \Delta Y = sY \tag{2.5}$$

The equilibrium economic growth rate, *g* is presented in equation (2.6),

$$\frac{\Delta Y}{Y} = \frac{s}{\mu} \tag{2.6}$$

All factors constant, the rate of output growth in the economy depends on the marginal propensity to save ( ), the capital stock ( ) and the capital-output ratio ( ). Increased economic growth can therefore be realized through increased savings which facilitates increased capital stock, and consequent increase in the scale of production, productivity and efficiency. An economy with a low marginal propensity to save will have low levels of economic growth. The financial sector acts as an intermediary between savers and the borrowers who invest the funds. The lending rate which is the cost of borrowed funds was used as one of the determinants of total factor productivity to address objective two which was to determine the effect of the informal sector on total factor productivity in Kenya.

Rostow (1960) classified economic growth into four stages, each with a specific desired rate of savings, hence like the Harrod-Domar model, links economic growth to savings. The first stage - pre-conditions for take-off marks the transition from a traditional economy which is characterized by subsistence farming. The stage is characterized by

increased mechanization of agriculture and international trade. This requires a savings rate of up to 5 percent of GDP. The second stage - the take-off stage characterized by rapid industrialization and an increase in the modern sector requires high rates of investment and capital formation which can be attained with a savings rate of between 5 percent and 10 percent or more of GDP. The drive-to maturity is characterized by modernization of the whole economy with savings rate of between 10 percent and 20 percent of GDP. The last stage, the stage of high mass-consumption is characterized by increased production of consumption goods and services where the rate of savings may be declining. The model is applicable to developing countries like Kenya where the level of gross savings is low, standing at 10.7 per cent of GDP in 2016 (WDI). The country targets an increase in the savings rate to 30 percent of GDP (Republic of Kenya, 2008a) to attain rapid economic growth which characterizes the take-off stage as has been experienced in the newly industrialized countries (NICs) in East Asia which include China, Taiwan, South Korea, Singapore and Hong Kong, with average savings rate of 30 percent of GDP (WDI).

The Kenyan economy is dual. Firms in the informal sector in the country have limited capital that basically consists of personal savings and borrowing from friends and family. The level of savings and investment is low which hinders research that may lead to inventions and innovations to improve productive efficiency and mechanization of the production processes. Production is therefore labour-intensive (McCormick, 1992; Akoten, 2006; World Bank, 2016) as opposed to being capital-intensive as proposed in the model. Productivity in the sector is also constrained by the small size of firms, poor

infrastructure, lack of property rights and difficulties in marketing of products which negatively affect the total productivity in the country (McCormick, 1992; Republic of Kenya, 1992; Akoten, 2006). An economy where production is mainly informal may have low factor productivity and low economic growth.

The Harrod-Domar growth model addresses the role played by savings and investment in determination of the capital stock and output in an economy, but does not consider the direct effect of the quantities of capital and labour employed. Additionally, output is not only dependent of the quantities of factors employed, but is also highly affected by the productivity of the inputs which the model fails to address. The factors that determine total productivity are outlined in the endogenous growth models. These include infrastructure, technology, the level of education and skill of labour, nutrition, life expectancy, the development of institutions, business expectations, macroeconomic stability and value systems which include corruption (Romer, 2012).

The Solow Growth Model

The model is one of the neo-classical models explaining economic growth and is commonly used in growth accounting studies (Romer, 2012). Assuming constant returns to scale, it states that the level of output in the economy at any time, $Y(t)$ is determined by the amount of capital employed *K(t)*, the amount of labour employed *L(t)*, and the effectiveness of labour in the specific time period presented as *A(t)*. Labour effectiveness is determined by the level of technology or technological progress so that technology is

labour-augmenting or Harrod-Neutral. The production function can therefore be modeled as:

$$Y(t) = F(K(t), A(t)L(t)) \qquad (2.7)$$

where *t* represents the time period (Romer, 2012).

Technological progress may also be *capital-augmenting,* where it affects production through capital as presented in equation (2.8) (Romer, 2012).

$$Y(t) = F\left[A(t)K(t), L(t)\right] \qquad (2.8)$$

The production function can also be presented as equation (2.9) where technological progress is *Hicks-Neutral,* affecting output through both capital and labour:

$$Y(t) = F\left[A(t)\left[K(t), L(t)\right]\right] \qquad (2.9)$$

A(t) in equation (2.9) is a measure of total factor productivity as opposed to equation (2.7) where it is assumed that technology enters the production function through labour and equation (2.8) where it affects production through capital. The Solow model as presented in equation (2.9) by assuming *Hicks-Neutral* technological progress allows the decomposition of total output into three components, the portion attributed to the amount of capital employed, that explained by the amount of labour employed, and a residual, the total factor productivity that is affected by technological progress among other factors. This informed the choice of models used to address both objectives one and two in this study.

The model improves on the Harrod-Domar model as it explains the level of output in an economy by the amounts of the traditional factor inputs employed which are capital and

labour, while the Harrod-Domar model omits labour and emphasizes savings, investment, capital stock, and the capital-output ratio as determinants of output growth. Additionally, the Solow model introduces a third element, the total factor productivity as the level of output in many developed countries cannot be fully explained by the quantities of inputs employed (Romer, 2012). However, like the Harrod-Domar model, the Solow model fails to explain the determinants of total factor productivity in an economy.

Ramsey-Cass-Koopman's Model

This is another neo-classical model which combines the works of Ramsey (1928); and Cass (1965) and Koopman (1965). Like the Harrod-Domar model, it emphasizes the importance of savings, investment, capital accumulation and technological progress on economic growth (Romer, 2012); and assumes constant returns to scale as in the Solow model, but introduces consumer choice to economic growth. The model assumes that the economy consists of many households which aim at utility maximization and several firms targeting profit maximization. The firms employ capital and labour to produce output which is sold to the households. Assuming constant returns to scale, the model takes the form of a Cobb-Douglas production function as presented in equation (2.10)

$$Y = f(K, AL) = K^{\alpha} AL^{(1-\alpha)} \qquad (2.10)$$

Where Y is output, K is capital, L is labour and A is technology or labour productivity

As in the Solow growth model, technology is *labour-augmenting* so that improved technology results in increased worker productivity with the same amount of capital. Firms aim at maximizing profits while households aim at utility maximization. At any

time, households divide their income between consumption and savings depending on their utility expectations. A high return on savings will cause household‟s expectations of future utility to increase, thus reduce consumption and increase savings. The savings are directed towards investment which results in technological improvement and increased capital stock hence an increase in output. Economic growth is therefore largely determined by the level of savings and the rate of growth in technology (Romer, 2012). The model, however, like the Harrod-Domar and Solow growth models does not consider other factors that affect productivity apart from technological progress. This study used the theory of production and the Cobb-Douglas production function to conduct growth accounting. The lending rate which inversely affects borrowing, investment and capital accumulation was used as one of the determinants of total factor productivity in Kenya.

The savings rate in Kenya is low and the informal firms in the country have limited access to credit which is important for increased investment in the absence of private finance. Firm financing in the sector is limited to individual and family savings (McCormick, 1992). The level of investment in the country and in the informal sector is therefore low resulting in limited technological advancement. These characteristics point at a sector that has limited potential to drive economic growth. This study therefore assumed a dual economy with labour decomposed into formal and informal labour. The contribution of the two sectors was then estimated together with that of capital and total factor productivity.

The Diamond / Overlapping Generations Model

The model states that the rate of economic growth is determined by the level of savings and accumulation of private capital over time. However, unlike the Harrod-Domar and Ramsey-Cass-Koopman‟s models it looks at the effect of savings and capital accumulation on economic growth across different generations (Romer, 2012). The model assumes two generations that exist at any time period, the young and the old where every person lives for two time periods. The young work and use part of their income for consumption while the rest is saved in the first period. The old being retirees, consume from savings and interest earned from the first time period. Firms maximize profits, and households maximize utility but have a high degree of risk aversion so that preference is given to consumption. Savings can only be induced by high returns. The model assumes a Cobb Douglas production function of the form:

$$f(k) = k^{\alpha} \qquad (2.11)$$

Where: *f(k)* is output per unit of effective labour and

k is capital per unit of effective labour,

An increase in output over time can be achieved by increased savings resulting in increased investment and a higher capital stock thus higher capital/labour ratio, k^{α}. The *Kenya Vision 2030* targets an increase in savings to 30 percent of GDP by the year 2030 to finance investment (Republic of Kenya, 2008) as a strategy towards increased economic growth. Savings levels in the Kenya remain low hampering investment and capital accumulation. Gross savings in the country was 10.7 percent of GDP, and gross domestic savings 7.9 percent of GDP in 2016 (WDI). The informal sector in Kenya is

labour-intensive. Finance is limited to individual and family savings which constrains investment, capital accumulation and output.

Endogenous Growth Models

The models which include the Romer and the Lucas (1988) growth models improve on the classical and neo-classical models by addressing the factors that determine labour effectiveness and total productivity (Romer, 2012). These include the level of education and skill of the worker, finance, technological progress, the degree of openness, cultural attitude towards work and entrepreneurship, the quality of infrastructure, institutional development, strength of property rights, geography and climate (Romer, 2012). The theories also examine how knowledge accumulation or technological progress is produced, the factors that determine resource allocation for knowledge production, and the effect on economic performance, (Romer, 2012).

According to Lucas (1988), knowledge may be generated through technical and scientific discoveries therefore Research and Development (R & D), while human capital development can be achieved through studying as measured by the number of schooling years. The endogenous theories assume that capital, labour and technology in the economy is used either in the production of conventional goods or in research and development to produce knowledge and new technology. Both the knowledge and technology production functions are Cobb-Douglas and may exhibit increasing, decreasing or constant returns to scale. Increasing returns to knowledge which results in an increase in knowledge that is proportionately larger than the existing capital stock or

knowledge will result in increasing economic growth through improved worker productivity (Romer, 2012). According to the Romer model, positive returns to R & D realized through increased output spurs further R & D, resulting in economic growth (Romer, 2012). This explains the emphasis placed by the Ministry of Industrialization in Kenya on technological improvements as reflected in the Ministry‟s Strategic objective No.5: "the promotion of Research and Development and adoption of technology" (Republic of Kenya, 2008) and the Kenya Industrial Research and Development Institute (KIRDI) Strategic Plan 2010-2015 which laid out strategies for advanced Research and Development towards the industrialization of the Kenyan economy (Republic of Kenya, 2011).

The endogenous theories further analyze the implication of the quality of human capital, social infrastructure and rent seeking behavior on economic growth (Romer, 2012). Human capital refers to the acquired skills, abilities, education and knowledge of the specific worker. Social infrastructure refers to the policies and institutions that encourage investment e.g. taxation, security, contract enforcement mechanisms, property rights and corruption. An increase in social and institutional requirements breeds rent-seeking behavior. The higher the number of rent-seekers, the more time producers devote to protection of their investments reducing productivity. An increase in human capital, improvement of social infrastructure and reduction of rent-seeking behavior will all have positive effects on production leading to increased economic growth (Romer, 2012). The large informal sector in Kenya has been attributed to the retrogressive nature of all the three factors in the country (Republic of Kenya, 1986: 1992: 1997: 2003: 2005: 2008b).

The endogenous growth models by emphasizing the factors that influence total productivity in an economy informed the inclusion of human capital, infrastructure, and the degree of openness as control variables to address objective two which was to determine the effect of the informal sector on total factor productivity in Kenya.

2.2.3 Poverty Theories

Poverty can be defined either in relative or in absolute terms. Absolute poverty refers to a situation where an individual lacks sufficient resources to lead a dignified life thus is unable to meet the basic needs of food, shelter, clothing, education, proper sanitation and health; while relative poverty is a situation where due to resource limitation an individual is unable to meet the socially expected living standards (Davies & Sanchez-Martinez, 2015). Quantitative measures commonly used as indicators of poverty are income and consumption levels, which may fall below a given minimum level so that the individual is not able to meet the basic needs. Qualitative measures include education, health and nutrition. According to Davies and Sanchez-Martinez (2015), the macroeconomic fundamentals that may cause poverty include rate of inflation which by acting as a retrogressive tax reduces the purchasing power of earnings; the real exchange rate which influences a country‟s international competitiveness and potential for growth; and variations in interest rates which affect output through consumption and investment. Poverty has been explained by several economic theories which include the Classical, Neo-classical, Keynesian and the Marxian theories (Davies & Sanchez-Martinez, 2015) which are discussed in the following section.

The Classical Theory

The theory is attributed to Adam Smith and David Ricardo. Assuming that the workers are paid in line with their marginal productivity, the theory attributes poverty to poor choices which compromise individual productivity and income, though it acknowledges that genetic and cultural factors may also limit an individual‟s productivity (Davis & Sanchez-Martinez, 2015). Influencing factors include low levels of education, poor work ethics and lack of competitive skills, while some genetic and cultural practices predispose individuals to make choices with low pay-offs resulting in inter-generational poverty in families. Inter-generational poverty is manifested in a subculture of poverty as witnessed in slum dwellers, families reliant on welfare support systems, and social hierarchy systems like the caste system in India (Bradshaw, 2006). Workers in the informal sector in Kenya on average have low levels of education and skill, with family enterprises spanning across generations common in the sector. The poverty level in the country is high among informal sector workers (Oiro *et al,* 2004). This study therefore analyzed the effect of informality on total factor productivity and on poverty in the country with human capital measured by the level of educational attainment as one of the control variables in answering objectives two and three which were: to determine the effect of the informal sector on total factor productivity in Kenya, and to examine the effect of the informal sector on poverty alleviation in Kenya. The average real annual wage in the informal sector was used as a measure of labour productivity in objective two in line with the theoretical assumption that workers are paid according to their marginal productivity.

The Neo-Classical Theory

Authored by Alfred Marshall in 1890, the theory builds on the Classical theory. It states that differences in initial endowment in capital, skills and talent determine the probability that an individual will be poor in a competitive market environment. The theory adds incomplete information, moral hazards and negative externalities as determinants of poverty beyond an individual‟s control. Like the Classical theory, this theory assumes that persons are paid in line with their marginal productivity so that poverty can be alleviated through increased income. However, the theory does not consider price fluctuations as increased prices may erode any increase in monetary income so that an individual still remains poor despite increased income. The theory further states that the inability of families and individuals to acquire private assets such as houses and money; and social assets like education and health make them susceptible to poverty especially where the employment is not stable (Davis & Sanchez-Martinez, 2015). Informal sector employment in Kenya is largely unstable with poor working conditions, the workers have low levels of education with limited skills, and firm and labour productivity is low which pre-disposes the workers to poverty. Kenya has a large informal sector. This study therefore analyzed the effect of the size of the sector on poverty in the country.

The human capital theory attributed to Becker (1964) under the Neo-Classical theories states that the skill of a worker determines their income level (Davis & Sanchez-Martinez, 2015). The informal sector in Kenya is composed of workers with low levels of education and skill. Earnings in the sector are low when compared to the formal sector explained by the low productivity in the sector (Omolo & Omiti, 2005; World Bank,

2016). This study therefore used the size of the informal sector as the key variable explaining poverty in the country. Training, education and worker mobility are key determinants of poverty. Poverty can therefore be reduced by providing training and education facilities to poor families as is the case in Kenya where the government provides free public primary education, subsidizes secondary education and in 2019 enforced a policy targeting 100 percent transition from primary to secondary level. However, the theory does not acknowledge the important role played by institutions and value systems.

The Keynesian / Liberal Theory

The Liberal theory adds that macroeconomic factors that determine productivity and income also affect poverty. Poor health, low skills and education thus low human capital; poor state capacity in form of security provision and law enforcement; cultural barriers; corruption; poor technology; high levels of unemployment which compromise wages and geographical isolation are structural factors sighted as causes of poverty. The theory states that though employment facilitates earnings, the nature of employment may cause poverty if the work is temporary, low-paying or part-time (Davies & Sanchez-Martinez, 2015). Additionally, globalization resulting in increased competition and technological improvements to improve efficiency has also reduced the need for unskilled labour resulting in reduced wages for the workers as the numbers seeking employment increase. This is the case with reforms in the labour market in Kenya where competition has resulted in increased out-sourcing of non-core activities, thus an increase in contract and casual (informal) employment. Over time there has been a reversal in the employment

composition in the country with 84 percent of the total labour force employed in the informal sector in 2016 compared to 19 percent in 1974.

Other factors observed as contributing to poverty include increased government debt which may divert resources from programs targeting poverty reduction and inflation which erodes real incomes (Davis & Sanchez-Martinez, 2015). Keynes argues that poverty reduction can be attained through economic growth by creating employment opportunities via government investment in infrastructure and human capital through the provision of education (Davis & Sanchez-Martinez, 2015). However, this is based on the assumption that economic growth will have a "trickle-down effect" so that all members of the economy will enjoy increased income which has not been the case in many economies characterized by wide income disparities. Apart from the key explanatory variable, informality, the study used government debt, infrastructure and human capital as additional determinants of poverty in the country.

The Marxian / Radical Theories

The theories attribute poverty to: capitalism where persistent unemployment explained by dysfunctional labour markets keeps earnings low; the existence of a dual labour market where workers in the secondary labour market earn low wages and employment is unstable; poor access to resources due to geographical location, age, gender, ethnicity, class and social factors such as occupation, education, health and crime which all lead to both social and economic discrimination; and the negative effects of economic growth such as environmental pollution and global warming (Davis & Sanchez-Martinez, 2015).

The Kenyan labour market is dual. Economic changes arising from globalization and increased competition have resulted in a reduction in the rate of growth of formal employment resulting in increasingly casual employment (Were *et al*, 2005). This is worsened by the existence of a labour force that is largely composed of low skilled and poorly educated workers who are not able to secure high paying formal employment (Omolo, 2010). The increase in unemployment has not only eroded incomes but also seen a rapid increase in the number of employees engaged in informal activities which in Kenya as in other developing countries are low productivity, low income and hazardous jobs with no health or social benefits (Were *et al*, 2005). Considering the dominance of the informal sector in Kenya, the study sought to estimate the effect of informality on poverty in the country.

2.3 Empirical Literature

Informal sector firms in Kenya are predominantly small. According to the Micro, Small and Medium Enterprises (MSME) Survey Basic Report of 2016 (Republic of Kenya, 2016) and the World Bank (2016) report on *Informal Enterprises in Kenya*, 90 percent and 92.2 percent of the MSEs in the country employ between 1 to 9 workers with most being own account firms. The Sessional Paper No. 2 of 2005 and the 1999 MSE baseline reports, found that 70 percent of the firms in the sector employ between 1-2 employees (Republic of Kenya, 1999: 2005) and have minimal rates of graduation to medium and large enterprises (Republic of Kenya, 2005; Kimenyi, Mwega, & Ndungu, 2016). Various studies have been conducted to establish the relationship between firm size and productivity and the effects of informality on firm productivity and by extension economic output and poverty.

2.3.1 Firm Size and Productivity

Biesebroeke (2005) studied the effect of firm size on productivity in nine Sub-Saharan African countries which included Kenya, Zambia, Tanzania, Ethiopia, Burundi, Zimbabwe, Ghana, Cameroon and Cote d‟Ivoire using descriptive analysis of firm characteristics. The study sample was composed of both formal and informal firms with firm size measured by the number of employees and productivity measured by labour productivity and total factor productivity. The study used firm level data for manufacturing firms with three interviews conducted between 1992 and 1996. 200 firms engaged in the production of textiles and clothing, food, machinery and metal, and wood and furniture were selected from each country using stratified sampling based on firm size and then geographic location. From the study findings, many firms in developing countries are either micro or small sized which have high employment creation potential. However, the firms were found to be less productive than large firms employing 100 or more workers and that large firms have higher growth potential with significantly higher total factor productivity attributed to access to external markets and finance.

Leung, Meh and Terajima (2008) using descriptive analysis studied the relationship between firm size, labour productivity, and total firm productivity in Canada using firm-level data from 1983 to 1997. The study also compared the productivity differentials between firms in Canada and in the United States of America (USA) with a hypothesis that the high productivity gap between the two countries in favour of the USA was caused by differences in firm size. The study sample consisted of all non-manufacturing and manufacturing firms in Canada with a registered payroll account with the country‟s revenue authority which gave an accurate measure of the number of employees, hence the

size of the firm. Labour productivity was measured by the value of sales per employee with firm age, the nature of the sector and the capital/labour ratio as independent variables. The study found that labour productivity in firms employing more than 500 workers was 30 percent more than in firms with 0 to 100 employees. This was attributed to the tendency for small firms to engage in activities which by nature have low productivity and the low capital-labour ratio. Labour productivity of firms in the USA was found to be higher than in Canada largely attributed to productivity differentials between the two countries than to firm size.

This study used the number of employees in the informal sector in Kenya as reported in national statistics to estimate size of the sector and decomposed total national employment into formal and informal in order to assess the contribution of the informal sector to output growth in addressing objective one. The relative size of the sector in total employment was used to estimate effect of the sector on poverty alleviation in the country to address objective three. While Leung *et al* (2008) used the value of sales per employee as a measure of labour productivity, this study used the average annual real wage in the informal sector as an indicator of labour productivity in the sector in addressing objective two following the classical assumption that workers are paid in line with their marginal productivity.

Taymaz (2009) studied the causes of productivity differentials between formal and informal firms in Turkey using firm-level and individual-level analysis. Firm-level analysis was done using switching regression models based on a Cobb Douglas

production function, and matching propensity scores, while individual-level analysis was done by using a multinomial selection model to compare wage differentials between the formal and informal employees. Among the causes of low productivity in informal firms sighted include the size of the firms which are usually small hindering the exploitation of economies of scale, use of poor and outdated technology, lack of credit, and poor access to markets and social infrastructure. The study advocated for a reduction in the size of the informal sector and an increase in the formal sector for increased productivity and economic growth. Unlike the study which was micro, this study was macro in nature. Macro studies give a good representation of the economy therefore good for policy making as opposed to micro studies which could be firm, regional or sectoral. As in Taymaz (2009), the study used the Cobb-Douglas production function to assess the contribution of the informal sector to output growth.

Bigsten *et al* (2010) acknowledged the importance of the informal sector in Kenya but observed that due to low private and public investment and technological limitation, the firms remain small and are unable to enjoy economies of scale which limits their contribution to output and income. The failure to grow was also attributed to their inability to produce competitive products and penetrate the export market, indivisibility of capital goods, financial constraints, lack of adequate skilled manpower, poor physical and information infrastructure that hinders information flow and successful innovation, and low unsophisticated demand.

Lee *et al* (2010) conducted a study of the impact of big firms on economic performance based on global data on the largest companies in the world from 1994 to 2005 using annual sales and market capitalization as benchmarks. Using dynamic panel data and regression residuals, the study regressed the number of large firms against GDP, and per capita GDP while controlling for the rate of investment, human capital formation and population growth. The study found that large firms have a positive effect on economic growth. This was attributed to economies of scale in production, increased market sizes, and the ability of large firms to compete in an increasingly global business environment and to engage in Research and Development (R & D). Additionally, through linkages with small firms, large firms improve efficiency in small firm production.

Bento and Restuccia (2017) using registry, census and survey data for manufacturing firms in 134 countries between 2000 and 2012 found a strong positive correlation between the average firm size and the total productivity and output. The firm size was measured by the number of employees. The study found that institutional and policy distortions discourage highly productive establishments by limiting firm size, hence negatively affect firm and aggregate productivity. Using the American manufacturing data as a benchmark, the study investigated the link between the correlated distortions, firm size and firm productivity. The differences in distortions were found to account for different firm sizes, thus impacting productivity. Aggregate productivity in America was found to be 1.6 times that in India. The study attributed this to misallocation and distortions that discourage large and higher productivity firms and encourage the establishment of small firms.

Informal sector firms in Kenya as already observed are small in size (Republic of Kenya, 1999: 2005: 2016; Kimenyi *et al,* 2016). The low productivity of small firms sighted in the studies above has been explained by the use of outdated technology, low levels of skill among the workers, lack of credit facilities and low investment, poor social infrastructure and inability to enjoy economies of scale which are constraints faced by firms in the informal sector in Kenya. Given the large size of the sector in Kenya, this study sought to understand the effect of the size of the sector on total productivity and on poverty in Kenya, in addition to the contribution of the sector to output growth in the country.

2.3.2 The relationship between Informality, Output and Poverty

Bigsten *et al* (2004) investigated the effect of increasing informality of the Kenyan productive sector on economic growth. Using OLS and stochastic production frontier models the study compared the total productivity of firms in the informal sector with the firms‟ potential output. The study used a random sample of 266 firms in Kenya‟s manufacturing sector over the period 1993 to 1995 drawn from the 1990 World Bank Regional Programme for Enterprise Development (RPED) where 96 were informal and 170 formal. The study found that informality on its own may not lead to firm growth and increased productivity hindering economic growth. Though the findings of the study agree with theories of firm size and productivity, the maximum productivity of a firm is not easy to estimate given a set of inputs using stochastic production frontier models as this needs a functional production function which is difficult to estimate. The study found no conclusive relationship between informality and poverty.

Additionally, macroeconomic analysis of the relationship between the size of the informal sector and economic growth in the country would have been useful for policy guidance. This study analyzed the contribution of the informal sector to output growth using the total number of workers engaged in the sector to reflect the size of the sector. This gives a better indication of the actual size compared to the percentage of the total workforce employed in the sector. Using a macroeconomic approach, the study used time series data (1974 to 2016) to analyze the contribution of capital, labour, and total factor productivity to economic growth. Based on the dual economy model, the study decomposed labour into formal and informal labour. This facilitated the estimation of the contribution of the informal sector to national output. The study further analyzed the effect of the informal sector on total factor productivity and on poverty in Kenya.

Orlando (2001) studied the relationship between the informal sector, output and poverty in Venezuela where 83 percent of new employment opportunities in the country between 1990 and 1993 was in the informal sector, a situation that characterizes the labour market in Kenya. A descriptive analysis of the percentage of total employees engaged in the informal sector, incomes and GDP contribution using time series data from 1990 to 1997 showed that the percentage of workers engaged in the sector in Venezuela increased while the percentage of total GDP contributed by the sector and total labour income earned in the sector decreased. Using Ordinary Least Squares (OLS), the study analyzed the relationship between labour earnings per hour; and worker experience and education (human capital), gender, civil status while including economic activity and urban-regional differences as dummy variables in the country in 1997. Though informal sector

earnings varied depending on age, education, gender and geographic location, the study found that hourly earnings in the formal sector were on average three times higher than earnings in the informal sector. A small percentage of workers in the informal sector earned incomes higher than they would have earned in the formal sector, however poverty was found to be high among the informal sector employees. The study advocated for a reduction in informality and an increase in labour productivity in the informal sector through provision of credit and increased education.

The study did a good analysis of the informal and formal sectors by considering the productivity differentials in the two sectors and the key determinants, giving results that are useful for sector specific policy development. However, the time period used was short so that the study findings could have been easily influenced by cyclical changes and external shocks example the 1992 and 1997 financial crises. Additionally, many persons under declare income to evade tax and may be more willing to declare expenditure as opposed to earnings (Aigbokhan 2000; Naralli & Griffith, 2011). Consumption-based measures are better indicators of living standards and poverty than income based measures as consumption among the poor is more stable than income (Aigbokhan 2000; Naralli & Griffith, 2011). This study used the poverty headcount index as a measure of poverty following Elbadawi and Loayza (2008), and Loayza *et al* (2009) and assuming a dual economy estimated the contribution of the informal sector to output growth. Additionally, using the average real annual wage in the informal sector, the study estimated the effect of the sector on total factor productivity in Kenya. The data set used was also larger, covering the period 1974 to 2016.

Beck *et al* (2004) analyzed the rate of growth of the informal sector in developed and developing countries and its relationship with economic growth and poverty. Using cross-country regression analysis, the study applied OLS to analyze the relationship between the size of the small and medium enterprises (SMEs) / informal sector, and economic growth, income inequality and poverty in the 1990s while controlling for country-specific factors. The study used two measures of SME size i.e. the share of SME workforce in total workforce in manufacturing where SMEs refer to firms with 250 or less workers to standardize the definition of SMEs; and the share of SME workforce in the total workforce in manufacturing in 62 countries following country specific definitions of SMEs i.e. 100 to 500 workers. Further analysis to control for simultaneity bias was done using two stage instrumental variable regressions (2SIVR). Economic growth was measured by the average growth rate in the per capita GDP while poverty and income inequality were measured using the Gini coefficient growth rate, the rate of growth of the income of the poorest quintile of the population, the rate of growth of the poverty gap and the percentage growth rate in the population living below the national poverty line. The study found a positive relationship between the size of the SME sector and economic growth and concluded that fast growing economies have a large SME/informal sector.

However, cross-country studies may fail to capture country specific experiences which include the policy environment and challenges faced by firms. Additionally, the definition of SMEs as used in the study only includes formal enterprises employing 250 or less workers; and 100 to 500 workers. These wide variations make the generalization of the findings difficult. The data used was restricted to the 1990s so that the findings

may be easily influenced by transitional factors, business cycles or crises. Lastly, the short time period cannot be used for the analyses of long-term relationships which is desirable for more reliable findings. The findings do not apply to the Kenyan economy where about 90 percent of MSEs employ less than 9 workers (Republic of Kenya, 2016; World Bank, 2016). This study used the annual growth rate in GDP as a measure of economic growth; however, in the absence of consistent Gini coefficients for Kenya, the study used the poverty headcount index which is consistent with the proportion of the population living below the poverty line as used in Beck *et al* (2004).

Oiro, Mwabu, and Manda (2004) studied the relationship between poverty and the nature of employment in Kenya. The study investigated the patterns of poverty among the employed by constructing poverty profiles using a sample of 1,048 urban and 329 rural clusters from the 1994 Welfare Monitoring Survey household data and the 1989 census. The informal sector was described as being largely composed of self-employment survivalist activities with returns below the minimum wage. Poverty was measured using the Cost of Basic Needs (CBN) and Food Energy Intake (FEI) absolute poverty lines. Variables used included health, education, crop production, child nutrition, food, income, social amenities and non-food expenditure. The research found that 50 percent of the working population in Kenya in 1994 was poor with the informal and agricultural sectors leading in poverty rates and that an increase in the size of the informal sector does not reduce poverty. The sector is defined as one that helps the poor cope with poverty and not one that helps them get out of poverty. However, the study findings were purely based on descriptive analysis. Descriptive analysis assists in visualizing the characteristics of the

data and is useful when the study is based on the whole population. As the study used a sample of the population, the use of inferential statistics would have given more credible results.

Cimoli, Primi, and Pugno (2006) researched on the causes of low economic growth in Latin America by investigating the link between the growth of the formal sector, the structural changes in the informal sector and the effect of the latter on overall economic performance against a background of increasing poverty and low economic growth. Using the structuralist‟s approach, the study assumed that the economy is composed of two sectors, the formal and informal sectors which jointly determine total output in the economy. Descriptive analysis of productivity differentials in the region between 1990 and 2000 showed that productivity in the informal sector was about one third of that in the formal sector. Informal sector firms were found to be small, producing for the domestic market with low skilled employees, using obsolete technology and inputs when compared to firms in the formal sector. Firms in the formal sector were medium or large and produced for export, using fairly modern production techniques and high skilled labour. Using the efficiency wage approach, the formal sector pays a premium above the informal sector wage which is solely determined by worker productivity. Workers seek work in the higher paying formal sector depending on the level of demand for exports and the residual workers are absorbed in the informal sector.

The rate of growth of demand for exports and productivity determine the growth rate of output and employment in the formal sector. Workers who fail to secure employment in

the formal sector are absorbed into the informal sector. An increase in formal sector productivity and low export growth cause a reduction in formal sector employment pushing workers to the informal sector. As the informal sector has lower productivity, total productivity and economic growth reduces. The study viewed the informal sector as a structural barrier to economic growth in Latin America and attributed stagnating economic growth in the region to increased informality advocating for increased formality through an export-led growth policy. As income in the informal sector is lower than in the formal sector, the persistent poverty in the region was also attributed to the sector.

Firms in the formal sector in Kenya have aggressively used restructuring measures from the 1990s to increase firm productivity and reduce operation costs. The realized increase in productivity has been accompanied by low and fluctuating export levels partly reflected by a largely unfavourable Balance of Payments position (BoP) over time. The result has been a reduction in the formal sector employment pushing job seekers to the less productive informal sector. This study used the dualist approach thus assumed two sectors, the formal and informal sectors as used in Cimoli *et al* (2006). The study applied OLS in the estimation of the contribution of the informal sector to output growth in Kenya using a Cobb Douglas production function based on the Solow growth model. The impact of the informal sector on poverty was also independently analyzed by estimating the effect of informality on the poverty headcount index while controlling for other determinants of poverty.

Tabunan (2006) hypothesized a positive relationship between the growth of the informal sector and economic growth in Asia. According to the study, apart from the direct contribution to output, Micro and Small Enterprises (MSEs) also indirectly contribute to income and output through their linkage with large enterprises so that a growing MSE sector is associated with increased productivity, high economic growth and a reduction in poverty rates. Economic growth in the study was measured by the annual growth rate in RGDP per capita. The study used cross-sectional data from 1990 to 2000 for seventeen Asian-Pacific countries. Using OLS, the study investigated the relationship between economic growth measured by the annual percentage growth rate in RGDP per capita; and the percentage annual growth rate in output attributed to MSE‟s, and the percentage annual growth rate in output attributed to large enterprises while controlling for a set of economic growth determinants. The study found no conclusive relationship between the size of the MSE sector and economic growth. This may be attributed to the use of cross country data covering both high and low growth countries which may have differing characteristics (social, economic and institutional). Additionally, the use of cross-country data from one particular time period instead of time series data cannot show how economic growth responds to the size of the informal sector which is a dynamic process that can only be observed over time. The study did well by bringing in other determinants of economic growth but failed to specify them. Time series data over the period 1974 to 2016 was used in this study as it facilitated the analysis of the behavior of variables over time.

The study used the percentage annual growth in output attributed to MSEs and the percentage growth in output attributed to large enterprises as measures of the size of the two sectors and as determinants of economic growth. Output in Kenya is recorded per activity following the International Standard Industrial Classification (ISIC) of economic activities so that it is difficult to allocate a specific amount of output to the formal or informal sectors. The total number of employees engaged in the informal sector was used as a measure of the size of the sector. As 70 percent of informal sector firms in Kenya are own account firms (KNBS, K-Rep & ICEG, 1999), the number of persons in self-employment and unpaid family workers was also included.

Obayelu and Uffort (2007) investigated the existence of a causal relationship between poverty and the size of the informal sector in developed and developing countries. The study found that poverty rates and the size of the informal sector is higher in developing countries. The possibility of there being a link between the size of the informal sector and poverty in Nigeria was investigated using primary data collected from persons engaged in the sector in 2006. The study found that the large informal sector in the country was caused by high poverty rates. However, the deductions were based on descriptive analysis and the data collected pointed at reasons for individuals operating in the informal sector such as high tax burden, corruption, lack of education, lassitude, among others which are possible indicators of the size of the informal sector. The analysis may therefore not suggest a causal link between the size of the sector and poverty as deduced by the study. The size of the sample is also not clear and the mode of sample selection unspecified casting doubt on the reliability of the findings. This study investigated the impact of the

overall size of the informal sector (measured by employment numbers as reported in government statistics) on poverty in Kenya.

Elbadawi and Loayza (2008) using OLS investigated the causes and effects of a rapidly growing informal sector on economic growth in the Arab World. The study used time series data from 1985 to 2005. The independent variables used were the Schneider index of the shadow economy, the Heritage Foundation index of informal markets, absence of pension coverage and prelevance of self-employment as measures of the of the level of informal activity, with the average growth of GDP per capita as the dependent variable. The study found that an increase in informal activities leads to a reduction in economic growth. Using the poverty headcount index as the dependent variable against the four informal activity indicators, the study found a positive relationship between the size of the informal sector and the level of poverty. The growth of the informal sector was found to be as a result of low economic growth following a slump in oil prices in the 1980s. The economic slowdown, accompanied by a growing labour force and a poorly developed public-sector driven economy pushed workers to increasingly resort to informal activities. The study also found that informality results in resource misallocation as firms operate sub-optimally to escape state detection and associated costs, losing on the advantages of operating legally such as formal credit, state protection and access to markets which negatively affect productivity. This study also used the poverty headcount index as a measure of poverty in assessing the effect of informality on poverty in Kenya.

Macias (2008) researching on the size of the informal sector and its effect on economic growth in Mexico used the excess currency demand approach as a measure of the size of the sector. The study used time series data from 1970 to 2006. Using regression analysis, the study investigated the relationship between economic growth measured by the GDP per capita; and trade, government consumption spending as a percentage of GDP, population, the informal sector size and foreign direct investment as a percentage of GDP. Government consumption was found to have a positive effect on economic performance followed by trade and the size of the informal sector. The study recommended the channeling of returns from the informal sector into the official economy using easier regulatory requirements.

Argentina faces high levels of informality and poverty. Devincienti, Groisman, and Poggi (2009) used panel data from the country‟s household survey covering eight years from 1996 to 2003 to study the relationship between household poverty and informality in the country using a bivariate random effect probit model. The study used household heads‟ income noting that it made up a significant portion of household income. The study found the existence of a two-way causality between informality and poverty and advocated for the formalization of informal jobs, increased firm productivity, improved human capital and labour productivity to enable workers join the formal sector. However as already observed, many persons under-declare earnings to evade tax so that consumption-based measures are better indicators of living standards and poverty than income based measures (Aigbokhan 2000; Naralli & Griffith, 2011). This makes the use of the per capita household final consumption expenditure as a proxy for poverty ideal. However,

this measure assumes equal distribution of income which is not true. Another commonly used measure of poverty is RGDP per capita which also assumes equal distribution of income among the population. Naralli and Griffith (2011) stated that RGDP per capita would be a better indicator of poverty if reported per quintile therefore for the lowest quintile in the distribution of income. It is also a wide measure hiding the use of earnings thus may not be a good indicator of poverty as per the definition of poverty in this study (the inability to meet food and non-food basic needs). The poverty headcount index was used in this study as a measure of poverty following Elbadawi and Loayza (2008), and Loayza *et al* (2009). The index shows the proportion of the population that is classified as poor.

Loayza, Serven, and Sugawara (2009) using OLS and instrumental variable regression investigated the causes and consequences of informality in Latin America and the Caribbean where 70 percent of the labour force was informally employed, and 40 percent of the GDP in the region was produced in the informal sector. The study analyzed the impact of the size of the informal sector on economic growth and on the incidence of poverty in the region using cross-country analysis for the period 1985 to 2005. The rate of growth in per capita GDP and the poverty headcount index were the dependent variables and indicators of economic growth and poverty. The independent variables and indicators of the size of the informal sector were; the Schneider index of the shadow economy, which combines the physical input (electricity) method, the excess currency-demand approach, and the dynamic multiple-indicators-multiple-cause (MIMIC) method; the Heritage Foundation index based on the role of corruption on general law

compliance; the levels of self-employment; and absence of pension. The study used the ratio of government expenditure to GDP and GDP per capita as proxies of state capacity which affect the depth of informality in an economy. As the level of informality affects and may be affected by economic growth and poverty, the study used the instrumental-variable approach. Secondary schooling, law and order levels, and business regulatory freedom were used as instrumental variables to account for the possibility of endogeneity between the size of the informal sector and economic growth, and size of the sector and poverty.

The study found a negative relationship between the size of the informal sector and economic growth and a positive relationship between the size of the sector and the incidence of poverty in the region. The study observed that informality is a sign of underdevelopment and may cause economic stagnation. As it leads to resource misallocation and limits state ability to provide public services. This negatively affects economic growth and poverty. Unlike the reviewed study, this study used the annual growth rate in GDP and the number of persons employed in the informal sector as indicators of economic growth and the size of the informal sector, but borrows from the study by using the poverty headcount index as a measure of poverty.

Taymaz (2009) studied the sources of productivity differentials between formal and informal firms in Turkey based on a sample of 7,335 firms which were selected nationally using stratified and multi-stage sampling technique. The study conducted individual-level and firm-level analysis. Individual level analysis was achieved by

comparing wage differentials between workers in the two sectors using a multinomial selection model, while firm level analysis was done using switching regression methods and matching propensity scores to compare the productivity levels of firms in the two sectors. Additionally, the study investigated the implication of formalization on total productivity by assessing the productivity of informal firms assuming that they were formal.

Individual-level analysis found that labour productivity in informal firms in both the manufacturing and service sectors was 107 percent and 60 percent lower than that in the formal sector; and that wages in the formal firms in both sectors was 35 percent and 55 percent higher than those in the informal sector. The analysis of firm productivity differentials found that the productivity of firms which were formal was 150 percent more than that of informal firms. The study concludes that productivity in the country could be increased by enforcing the formalization of informal firms. This will allow the firms to enjoy facilities mainly accessible to formal firms such as contract and property rights enforcement, access to credit and increased access to public facilities like training and technology transfer which may improve firm and total productivity. The study found productivity gains of 5 percent in manufacturing sector and 25 percent in the service sector in the country if all the informal firms were formalized. However, the gains in productivity may be limited as some informal firms may close if they are not able to meet the costs of formalization. Additionally, workers in the informal sector are usually less educated with lower skills than their formal sector counterparts so that formalization should be accompanied by improvements in the quality of human capital for increased

productivity. This study used the average real annual wage in the informal sector as an indicator of worker productivity as one of the explanatory variables following the *efficiency-wage* theories (Romer, 2012) to estimate the effect of the informal sector on total factor productivity.

Biau (2011) used a fixed-effect model to study the effect of the size of the informal sector on poverty, and investment in 22 developing countries from 1995 to 2006 based on the World Bank (2011) income classification. The study found that at low levels of income, growth in the size of the informal sector increases investment leading to an increase in the per capita GDP to a peak after which due to limited firm productivity, further growth in the informal sector has a negative effect on per capita GDP. This suggests a non-monotonic relationship between the size of the informal sector and per capita GDP. The study used investment and poverty as the dependent variables. The gross fixed capital formation was used as a measure of domestic investment while poverty was estimated using the poverty headcount ratio. The size of the informal sector was measured by data on employment numbers in the sector sourced from ILO reports. Other independent variables used were the real interest rate, the inflation rate, credit availability, government regulation and the rule of law. The study findings indicate that there exists an optimal size for the informal sector beyond which the informal sector results in a higher poverty headcount index, thus intensifies poverty. Following the study, this study used both the number of persons employed in the informal sector as reported in government statistics, and the poverty headcount index as measures of the size of the informal sector and of poverty, respectively.

Nazier and Ramadan (2014) investigated the causal relationship between the size of the informal sector and poverty in Egypt. The study found that 26.3 percent of the population lived below the national poverty line and 30 percent of the poor were informally employed in 2012. The study used the instrumental-variable technique and compared the per capita household head‟s monthly expenditure with the national poverty line. The study used the household size and various characteristics of the household head such as age, level of education, level of parent‟s education, and the size of the firm where they work as additional explanatory variables. From the study findings, being poor does not predispose a worker to be employed in the informal sector. However, working in the informal sector increases the probability of one being poor. This study investigated the effect of informality on poverty in Kenya with the informal sector measured by the depth of informality.

Pablo (2014) using a vector auto-regression (VAR) framework studied the relationship between the size of the informal sector and economic growth (measured by real GDP) in Spain using time series data from 1980 to 2008. The study used a common factor to measure the size of the informal sector based on four estimates of the size of the sector (the MIMIC approach, the excess currency demand, excess energy consumption approach and a model based approach). The study found a one-way causality where GDP Granger-causes informality. The study further analyzed the effect of GDP shocks on the size of the informal sector using impulse response. The findings show that a positive GDP growth induces a positive growth in the size of the informal sector indicating complementarity

between the formal and informal sectors, while a growth in the size of the informal sector did not have a significant effect on GDP.

According to Abou-Ali and Rizk (2015) the informal sector employs 58.3 percent of the total labour force in Egypt. The study analyzed the effect of informality on output and productivity of firms in the country. The study used a sample of 37,140 enterprises which consisted of both formal and informal firms. A linear regression model was estimated using OLS with the levels of output and firm productivity as the dependent variables. Explanatory variables included infrastructure, asset ownership, labour and raw materials employed, the location of the firm, the education level of the workers, access to finance, the firm‟s age, and nature of economic activity. The study found that firm output and productivity are negatively affected by informality and advocated for increased formality through government support for increased firm productivity. Borrowing from the study, this study used infrastructure, and human capital as a measure of the education level of the worker to estimate the effect of the informal sector on total factor productivity in Kenya.

2.4 Overview of Literature Review

The existence of the informal sector in Kenya is explained by three theories. According to the dualist theory, the informal sector exists along-side the formal sector, each serving different market segments. However, wages and firm productivity is higher in the formal sector. The structuralists view the informal sector as one that is composed of micro-enterprises that serve the formal sector, thus keeping formal firms competitive by minimizing operation costs. The legalists view the sector as one that is composed of firms

that remain small to avoid state detection and the associated costs. Kenya has a dual labour market composed of formal and informal labour with wide differences in firm and labour productivity (Republic of Kenya, 2016; World Bank, 2016). Growth accounting studies for Kenya use labour as one component therefore do not consider the dual nature of the economy to isolate the contribution of the informal sector to output growth and TFP. This study adds to the literature on growth accounting in the country by investigating the contribution of the informal sector to output growth in the country.

The theories on economic growth reviewed attribute economic growth to the quantities of labour and capital employed and to exogenous factor that affect the productivity of the factor inputs, commonly referred to as total factor productivity (TFP). These include technological progress, the education and skill of the workers, quality of infrastructure and institutional development, availability of finance, technological progress, strength of property rights, degree of openness and geographical location. Savings was identified as a key determinant of investment and technological progress. From the empirical literature, firms in the informal sector have low productivity thus low output when compared to firms in the formal sector. This is explained by the small scale of operation of most firms in the sector which hinders exploitation of economies of scale, and constraints that include lack of credit, the use of outdated technology, use of labour with low skill and education, and poor access to markets and social infrastructure. The firms by avoiding tax payment crowd public infrastructure therefore compromise total productivity and output in the economy. Empirical studies reviewed give mixed results on the effect of the informal sector on total productivity. Studies on the determinants of TFP in Kenya which

include Hammouda *et al* (2010), Oduor and Khainga (2010), and Kalio *et al* (2012) did not consider the effect of the informal sector. However, the studies guided the choice of control variables in the analysis of the effect of informality on TFP.

The choice of control variables addressing the effect of informality of poverty in Kenya was guided by theoretical literature. Poverty has been explained by the Classical, neo-classical, Liberal and Marxian theories. Factors identified as determining the level of poverty include the rate of inflation which affects the purchasing power of individuals; the real exchange rate which affects international competitiveness; interest rate which affects the level of investment; health, ethics, education and skill of the labour; access of information; state capacity; culture, technology, and the level of unemployment which determines wages. The Liberal and Marxian theories state that employment that is temporary, low paying or part time may cause poverty if it results in depressed wages. From the empirical studies, though informal employment cushions workers from increased poverty, the lack of adherence to labour laws, low wages and poor working conditions make the workers highly vulnerable to poverty giving mixed results on the effect of the sector on poverty. Oiro *et al* (2004) found that poverty was high among workers in the informal sector in Kenya though no studies have examined the effect of the sector on poverty in the country at the macro-level.

This study conducted a macroeconomic analysis of the effect of the size of the informal sector on economic performance as measured by the contribution of the sector to output

growth, the effect of the sector on total factor productivity, and the effect of the sector on poverty in the country, all of which have not been done in the reviewed country studies.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methodology used in the study. It discusses the research design, the theoretical framework and models, and the empirical models on which the study is based. The chapter also covers the definition and measurement of variables, the types and sources of data used and the model estimation techniques employed.

3.2 Research Design

The study was non-experimental and utilized a longitudinal research design using macro-level data which is available in data banks and in various publications thus limiting the possibility of data manipulation. This facilitated the analysis of the behavior of variables over time which was important in understanding the effect of the informal sector on economic performance. Time series data covering 43 years was used in the study.

3.3 Theoretical Framework

3.3.1 Production with a Dual Labour Market

The production theory which shows the relationship between inputs and output and is frequently used in growth accounting was adapted in this study. The study was based on the dualist theory of the economy (Harris & Todaro, 1970; Todaro & Smith, 2015) and the Solow growth model (Solow, 1956). The dualist theory led by Harris and Todaro (1970) and formulated by Arthur Lewis in the 1950‟s, viewed the economy as consisting of two sectors: the rural and urban sectors (Todaro & Smith, 2015). Drawn by the higher

wages offered in the urban sector, workers migrate from the rural to the urban sectors. Urban unemployment is attributed to an influx of rural immigrants in excess of the employment opportunities available.

The analysis is also commonly applied to urban economies with two sectors, the formal ( ) and the informal ( ) sectors (Fields, 2007; Khan, 2007; Todaro & Smith, 2015). The formal sector is capital-intensive with large-scale production, while the informal sector is labour-intensive and production is small-scale (Todaro & Smith, 2015). Worker productivity in the informal sector is lower than in the formal sector as the workers have low levels of education, are unskilled, with no financial capital (Todaro & Smith, 2015). Informal employment offers no social security, and is insecure with poor working conditions (Todaro & Smith, 2015). Generally, workers prefer the higher paying formal jobs and those who are unable to secure formal employment seek refuge in the informal sector. Lewis (1954) and Kuznets (1955) categorized the informal sector as a low productivity sector with low wages compared to the formal sector so that the formal sector is viewed as the engine of economic growth (Fields, 2007).

According to the Solow growth model, economic growth ( ) in any given time period is determined by the amount of capital employed ( ), the amount of labour employed ( ), and labour effectiveness ( ) (Solow, 1956; Romer, 2012) given as:

( ) , ( ) ( ) ( )- (3.1)

Labour effectiveness is determined by technological advancement. Technological progress enters the production function through labour and is therefore *labour-*

augmenting or Harrod-neutral (Romer, 2012). Technological progress may also enter the production function through capital, thus be *capital-augmenting* as presented in equation (3.2) (Romer, 2012).

$$Y(t) = F\left[A(t)K(t), L(t)\right] \qquad (3.2)$$

Increased output may also be attributed to technological progress that increases the productivity of both capital and labour. In this case the production function may be presented as equation (3.3) where technological progress is *Hicks-neutral* (Romer, 2012).

$$Y(t) = F\left\{A(t)\left[K(t), L(t)\right]\right\} \qquad (3.3)$$

In this study, growth was analyzed under the assumption that technological progress is *Hicks-neutral* as it affects the productivity of both labour and capital (Romer, 2012). The presentation of equation (3.3) allows the decomposition of the sources of economic growth as arising from growth in labour, growth in capital and technological progress. Isolation of the independent contributions of each factor was critical in the study which was specifically interested in decomposing the contribution of labour from the two sectors of the economy (the formal and informal sectors).

Based on the dualist theory of the economy, the labour component of the production function presented in equation (3.3) can be decomposed into formal and informal labour following Cimoli *et al* (2006) so that:

(3.4)

Where is the total employment, is labour employed in the formal sector, and is labour employed in the informal sector. Incorporating (3.4) into (3.3) gives an extended form of the production function as presented in equation (3.5):

( ) * ( ), ( ) ( ) ( ) -+ (3.5)

Following the Solow growth model in which the Cobb-Douglas functional representation is adopted, the specific production function can therefore be given as:

( ) ( ) ( ) ( ) ( ) (3.6)

Where the parameters: α , β , and ρ are the elasticities of output with respect to capital, to labour in the formal sector and to labour in the informal sector, respectively, when the function is transformed into log-linear form. Equation (3.6) can be empirically analyzed to enable the estimation of the contributions of capital in general, but labour by sector to output growth of a country.

The Cobb-Douglas production function was used to answer objective one based on the *Hicks-neutral* production function presented in equation (3.3). This form of production function was favoured as it facilitated simplified analysis of the sources of output growth, and has been used in many empirical studies for Kenya, e.g. Njuguna *et al* (2005), Hammouda *et al* (2010), Oduor and Khainga, (2010), and Kalio *et al* (2012). The Kenyan economy is characterized by a dual labour market, i.e. formal and informal labour. Based on this, the study modelled total employment as presented in equation (3.4) following Cimoli *et al* (2006).

Theoretical literature states that the formal sector is capital-intensive, hence technology based while the informal sector is labor-intensive (Todaro & Smith, 2015). However, in a study on the adoption of adapted technology in Kenya‟s informal sector, Kuuya (2003) found that the informal sector in the country also uses technology. Therefore, incorporating equation (3.4) into (3.3) gives the following *Hicks-Neutral* Cobb-Douglas production function for the Kenyan economy:

= (3.7)

Where: is the elasticity of output with respect to capital

is the elasticity of output with respect to formal labour

is the elasticity of output with respect to informal labour

and = 1

These factor shares are based on the assumption of Euler‟s theorem, that the production function is homogenous of degree one (Greene, 2012) therefore exhibits constant returns to scale. The factors are paid according to their marginal productivity so that the total payment to the factors equals total output (Greene, 2012). As apparent in the above equation, the contributions of capital, formal labour and informal labour to output are captured by the parameters , which are output elasticities with respect to the specific variables. Equation (3.7) was first linearized by taking the natural logarithm which yields:

= (3.8)

The growth in output is given by differentiating equation (3.8) with respect to time leading to equation (3.9).

$$\frac{\partial \log Y}{\partial t} = \frac{\partial \log A}{\partial t} + \alpha \frac{\partial \log K}{\partial t} + \beta_1 \frac{\partial \log L_F}{\partial t} + \beta_2 \frac{\partial \log L_I}{\partial t} \quad (3.9)$$

or $$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha \frac{\dot{K}}{K} + \beta_1 \frac{\dot{L}_F}{L_F} + \beta_2 \frac{\dot{L}_I}{L_I} \quad (3.10)$$

Where:

$$\frac{\dot{Y}}{Y} = \frac{Y_t - Y_{(t-1)}}{Y_{(t-1)}}; \quad \frac{\dot{K}}{K} = \frac{K_t - K_{(t-1)}}{K_{(t-1)}}; \quad \frac{\dot{L}_F}{L_F} = \frac{L_{Ft} - L_{F(t-1)}}{L_{F(t-1)}}; \text{ and } \frac{\dot{L}_I}{L_I} = \frac{L_{It} - L_{I(t-1)}}{L_{I(t-1)}}$$

are the rates of growth of the different factor inputs.

Equation (3.9) states that the growth in output is a weighted summation of the effect of growth in the different factor inputs and growth in total factor productivity. The factor contributions were estimated using the output elasticities obtained from equation (3.8) which were multiplied by the annual growth rate in the respective factor input as expressed in equation (3.10).

The portion of output growth that is not explained by the quantities of capital and labour employed is attributed to total factor productivity (TFP). This was the independent variable in objective two which was to determine the effect of the informal sector on total factor productivity in Kenya. According to the endogenous growth models, TFP can be explained by technological progress, employee skills and educational attainment, social and institutional infrastructure, the strength of property rights, the quality of infrastructure, and cultural attitude towards work and entrepreneurship (Romer, 2012). The large informal sector in Kenya has been attributed to the retrogressive nature of the first five factors.

3.3.2 Poverty and Dual Labour Markets

The third objective of the study was to examine the effect of the informal sector on poverty alleviation in Kenya based on the Classical, Liberal and Marxian theories of poverty. According to the Liberal and Marxian theories of poverty, though employment provides earnings, the work may cause poverty if it is temporary, low-paying or part-time (Davis & Sanchez-Martinez, 2015). These are the basic characteristics of informal employment in Kenya which like in other developing economies consists of precarious jobs with no legal or social protection (ILO, 2002: 2014).

The study assumed a dual labour market following Arthur and Lewis, and Harris and Todaro (1970), with the formal and informal sectors (Todaro & Smith, 2015). The informal sector is labour intensive and the workers have low levels of skill and education (Chen, 2012; Todaro & Smith, 2015) which according to the human capital theory determine their income levels. If the workers are paid in line with their marginal productivity as stated in the Classical theory of poverty (Davis & Sanchez-Martinez, 2015), wages in the sector will be low when compared to the formal sector which is capital-intensive with higher productivity (Todaro & Smith, 2015). Orlando (2001), Cimoli *et al* (2006), Elbadawi and Loayza (2008), and Todaro and Smith (2015) state that labour productivity therefore earnings in the informal sector is low. Agenor (2004) states that majority of the poor derive their income from employment so that increased employment may cause poverty if it results in depressed wages. Though the informal sector provides an escape from extreme poverty and unemployment for those unable to

secure formal employment (Davis & Sanchez-Martinez, 2015; Todaro & Smith, 2015), the sector may cause poverty.

The Classical, Neo-Classical, Liberal and Marxian theories give other determinants of poverty as inflation which erodes purchasing power; the real effective exchange rate which affects the country‟s international competitiveness and economic output; interest rate which affects output and income through investment and consumption; the state of health, skill and education of the worker which affects worker productivity; unemployment levels which affect wages; state capacity i.e. law enforcement and provision of support infrastructure; technology; corruption; cultural barriers; the nature of work especially in dual labour markets; and government debt which diverts resources that could be used to promote output and increase gainful employment (Davis & Sanchez-Martinez, 2015).

3.4 Empirical Models

3.4.1: Growth Accounting Model

To ensure that the growth equation reflected a robust estimate of the production function, several specifications of the model were estimated. The basic model, (model 1) used to obtain the elasticities was the general production function with total employment decomposed into formal ( ) and informal ( ) employment as presented in equation (3.8) which can also be expressed as equation (3.11).

= (3.11)

Various restrictions were then placed on the model coefficients for estimation of subsequent variants of model 1. The first restriction was for constant returns to scale (CRS) based on Euler‟s Theorem. The Theorem states that the production function is homogenous of degree one, implying that the sum of coefficients for all factor inputs is equal to one. This was the first variant of model 1 (model 1a) presented in equation (3.12).

= (3.12)

Where: to impose CRS restriction.

The study then added dummy variables to capture the structural breaks observed in GDP, capital and the size of the informal sector and equation (3.13) estimated. This is the second variant of model 1 (model 1b) which was estimated maintaining the restriction of constant returns to scale.

=

(3.13)

The third variant of model 1 incorporated dummies to smooth out the outliers representing cyclical changes in GDP (Romer, 2012) as presented in equation (3.14).

=

(3.14)

3.4.2 Total Factor Productivity (TFP) Model

The second objective was to analyze the effect of the informal sector on total factor productivity (TFP) in Kenya. This is the residual of output growth after accounting for

the contribution of capital and labour (Barro, 1996; Romer, 2012). According to Romer (2012), output growth cannot be adequately explained by the growth in capital and labour employed alone, giving unexplained growth attributed to TFP which largely explains output growth in many developed countries (Romer 2012).

Endogenous growth models link changes in TFP to labour effectiveness which is explained by the skills and education of the worker, thus human capital; and research and development, hence knowledge accumulation and technological advancement. Other theoretically recognized determinants of TFP include the degree of openness, access to financial capital, the quality on infrastructure, the strength of property rights, institutional development and rent seeking behavior, and cultural attitude towards work and entrepreneurship (Romer 2012).

The Solow residual which is an indicator of TFP was obtained using the difference between the output growth attributed to factor inputs and the rate of change in output. Re-arranging equation (3.10) gives the Solow residual expressed as:

$$\frac{\dot{A}}{A} = \frac{\dot{Y}}{Y} - \alpha\frac{\dot{K}}{K} - \beta_1\frac{\dot{L_F}}{L_F} - \beta_2\frac{\dot{L_I}}{L_I} \qquad (3.15)$$

Studies on the determinants of TFP in Kenya include Onjala (2002), Hammouda *et al* (2010), Oduor and Khainga (2010), and Kalio *et al* (2012). Human capital, openness, conflict, export diversification, financial deepening, foreign aid, foreign direct investment, monetary and fiscal policies, trade policy, government spending as a percentage of GDP, industrial and agricultural development policies, the science and technology policies, and private consumption as a percentage of GDP are some of the

variables used in the various studies as determinants of total factor productivity. However, none of the studies investigated the effect of the quality of labour on TFP. Labour in the formal sector is highly skilled and educated when compared to informal sector labour (Todaro & Smith, 2015), so that the labour productivity in the two sectors differs.

This study investigated the link between the informal sector and TFP in Kenya. The following econometric model was estimated.

= +

(3.16)

Where:

is the average annual real wage in the informal sector

is human capital

is the degree of openness

is passable roads

is the annual rate of inflation

is the lending rate

is financial deepening

is foreign direct investment

is digital technology (digital money)

is life expectancy

is conflict

‟s are the parameters and is the regression error term.

The average real annual earnings of labour in the sector was used as an indicator of the size of the sector as increased earnings attract workers (Romer, 2012). Assuming a perfectly competitive labour market, wages are determined by the forces of demand for and supply of labour, and the workers are paid according to their marginal productivity (Romer 2012; Davis & Sanchez-Martinez, 2015). The *efficiency-wage* theories link wages to worker productivity explaining that higher wages attract good quality of workers, facilitate good nutrition, improve worker effort, and win their loyalty resulting in improved worker productivity (Romer 2012). The average real annual wages in the informal sector was therefore used as an indicator of both the size of the sector and of labour productivity.

Additional variables used as determinants of total factor productivity were human capital which according to the endogenous growth theory determines worker effectiveness (Romer, 2012); and openness which affects the level of trade, specialization, skill and technology transfer (Romer, 2012) following Hammouda *et al* (2010) and Kalio *et al* (2012); financial deepening as an indicator of financial development which determines economic growth, economic stability and poverty alleviation (Cihak *et al*, 2012) following (Nachega & Fontaine, 2006; Hammouda *et al*, 2010; Oduor & Khainga, 2010), and conflict (Hammouda *et al*, (2010). This study used the secondary school enrollment as a measure of human capital following Kalio *et al* (2012) and Hammouda *et al* (2010) while Oduor and Khainga (2010) used the adult literacy rate. International trade which has been referred to as market orientation in Romer (2012) facilitates transfer of skills, knowledge and technology, economies of scale and improved competition thus impacts

TFP. This was measured by the extent of openness using the proportion of exports and imports, to GDP following Hammouda *et al* (2010), Oduor and Khainga, (2010), and Kalio *et al* (2012).

Financial development shows the depth, efficiency and stability of the financial sector. A well-developed financial sector facilitates savings and borrowing therefore investment and innovation, reduces transaction costs, and helps in the identification of profitable projects facilitating and influencing the profitability of investment, total productivity and economic growth (Nachega & Fontaine, 2006; Hammouda *et al,* 2010; Cihak *et al,* 2012; Bazhal, 2016). The size of the financial sector can be estimated using monetization ratios, and intermediation ratios. Total money supply (M3) as a percentage of GDP shows the velocity of circulation, therefore how monetized an economy is, while commercial banks and other financial institutions by facilitating credit provide intermediation services. Various measures used as indicators of financial deepening include private sector credit from commercial banks as a percentage of GDP, commercial bank deposits as a percentage of GDP, the assets of non-bank financial institutions as a percentage of GDP, credit to the private sector by commercial banks and other financial institutions as a percentage of GDP and total commercial bank deposits as a percentage of GDP (Global Financial Development Database, 2018; Cihak *et al,* 2012). According to Schumpeter (1911), (as cited in Bahzal, 2016), economic flows represented in the circular flow of income and spending model generate circular flows that determine the level of output and productivity in an economy. The value of output and productivity in the economy is

therefore determined by the degree of monetization or the amount of money in circulation.

The private sector credit is a commonly used measure of financial deepening (Okafor, 2016). However, the demand for credit may vary between countries and the credit may not necessarily be linked to productivity if the resources are directed to consumption (Hammouda *et al,* 2010), are misallocated or are used in low productivity investment which is common in the public sector in Kenya. Nachega and Fontaine (2006) used the ratio of credit to the private sector to GDP, and the ratio of bank deposits to GDP; while Hammouda *et al* (2010) used the credit to the private sector as a percentage of GDP, total credit in the economy as a percentage of GDP, and broad money supply as a percentage of GDP; and Oduor and Khainga (2010) used the interest rate spread. Guided by Bahzal (2016), this study investigated the monetization role of the financial sector in the determination of TFP in Kenya. The study used the broad money supply as a percentage of GDP sourced from the World Development Indicators (WDI) database. The monetary value of mobile money transactions per year which facilitates easy, quick and reliable money transfer, thus greatly improves the speed of transactions was used as an indicator of digital technology.

Kenya has experienced conflict from time to time based on tribal or political differences. Such conflicts in a country affect social infrastructure and negatively impacts political stability (Romer, 2012). Conflict that is politically instigated has widespread effect on economic activities in the country as opposed to tribal conflict which is regional with no

national effect. In Kenya, this has caused the destruction of both private and public property, displacement of persons (Hammouda *et al,* 2010) and discouraged private investment, undermining TFP and economic growth. Other control variables used include foreign direct investment (FDI) inflow as a percentage of GDP (Oduor & Khainga, 2010; Kalio *et al,* 2012), infrastructure and the annual rate of inflation (Oduor & Khainga, 2010). FDI injects capital, technology and skill into the economy improving its productive capacity while infrastructure has been sighted in the endogenous growth models as a determinant of TFP (Romer, 2012). The study used the kilometers of passable (bitumen) roads as an indicator of the quality of infrastructure as this facilitates a smooth production process (Oduor & Khainga, 2010).

The annual rate of inflation was used in the study as an indicator of macroeconomic stability. This assures the productive sectors of a stable business environment therefore encourages investment and increased total productivity (Romer, 2012). Finally, investment facilitates capital accumulation, technological progress and skill enhancement which are key determinant of total productivity (Romer, 2012). This was brought into the model using the annual commercial bank lending rate as funds used for investment come from savings, but is largely facilitated by borrowing. The general state of health of the population which according to endogenous growth models determines worker effort and productivity was captured using the life expectancy.

3.4.3: Poverty Model

The third objective was to examine the effect of the informal sector on poverty in Kenya. Economic theory links poverty reduction to growth in output, leading to employment

creation and income generation (Romer, 2012). However, for this to happen growth must not only result in increased employment but also be accompanied by increased worker productivity (Melamed *et al*, 2011). Employment levels in Kenya have increased overtime, however, most of this has been in the informal sector. According to the Marxian theory of poverty, the existence of a dual labour market creates a secondary market where work is low-paying, insecure and highly vulnerable to economic shocks (Davis and Sanchez-Martinez, 2015). The Liberal theory of poverty states that though employment may provide earnings, the work can cause poverty if it is temporary, low-paying or unstable (Davis and Sanchez-Martinez, 2015). These are basic characterize informal employment in Kenya.

Indicators of poverty can be broadly classified as monetary and non-monetary. Monetary indicators include income and consumption. Consumption spending is favoured as income does not guarantee improved welfare as the effect is subject to availability of goods and services. Additionally, earnings from the agricultural and informal sectors are erratic. Non-monetary indicators include the health and nutrition status, and the literacy level of the population. Both categories require a poverty line which acts as a guide in differentiating the poor and non-poor which makes the use of household consumption spending and income as indicators of poverty difficult in a macro study. At the macro level poverty can be measured using the poverty headcount index which shows the proportion of the population with income or consumption below a given poverty line; the poverty gap which shows how far households are from the poverty line, and the severity of poverty among the poor (Coudouel *et al*, 2018). This study used the poverty headcount

index as a measure of poverty in Kenya following Loayza *et al* (2009) and Elbadawi and Loayza (2008). The informal sector was measured by the number of workers engaged in the sector as a portion of total employment. The following econometric model was estimated.

Therefore, the following econometric model for poverty was estimated based on the above discussion and the theories presented in section (3.3):

= +

(3.17)

Where:

is a measure of poverty

is the depth of informality

is passable roads

SAV is savings

is the real effective exchange rate

is government debt

is human capital

is conflict

"s are the parameters and is the regression error term.

Following the classical, neo-classical, Liberal and Marxian theories of poverty, the other determinants of poverty used in the study apart from the depth of informality include savings, real effective exchange rate, government debt and human capital. Additional explanatory variables used were passable roads and conflict. Savings results in the

accumulation of capital which is borrowed by firms for investment resulting in economic growth, employment creation and income generation (Ames *et al,* 2001; Romer, 2012) while the real effective exchange rate (REER) influences the country‟s international competitiveness therefore economic growth, income and poverty (Ames *et al,* 2001). An increase in the REER means that the country is losing international competitiveness which restricts output and incomes. Increased government debt reduces the amount of resources that are available for the implementation of development projects and the provision of basic social infrastructure, thus has a negative effect on the productive sector of the economy, resulting in increased poverty (Ames *et al,* 2001). Human capital affects the nature of work an individual can secure, thus the income and poverty status of the person. Highly educated workers are generally more productive hence have better opportunities for employment in the higher paying formal sector while those with low levels of education settle for low-paying informal employment (Davis & Sanchez-Martinez, 2015; Todaro & Smith, 2015).

A key determinant of poverty is the rate of economic growth (Ames *et al,* 2001; Romer, 2012). Reducing poverty requires a stable macroeconomic environment that encourages economic growth (Oduor & Khainga, 2010; Kalio *et al,* 2012). The rate of inflation can be used as a measure of macroeconomic stability as it acts as a tax by eroding the purchasing power of money with the burden largely felt by the middle and low income earners (Ames *et al,* 2001), thus compounds poverty. However, this variable was not included in the analysis as the REER which captures variations in both the exchange rate and in inflation was used.

The availability of passable roads opens up regions to productive activities by facilitating easy access to markets and inputs, and enhances the movement of labour and the acquisition of employment or income earning opportunities. Roads in Kenya are classified as earth and bitumen where the rural road network mainly consists of earth roads. Poverty levels are high in the rural compared to the urban areas (Oiro *et al*, 2004). The analysis therefore investigated the effect of earth roads, bitumen roads and the total road network on poverty independently using three different variants of model three.

Conflict which is periodically experienced in Kenya negatively affects the productive sector (Hammouda *et al*, 2010) and has caused massive population displacement, loss and destruction of property in the country leading to impoverishment of the affected households.

3.5 Definition and Measurement of Variables

Economic Growth (log): Is the annual rate of change in the value of goods and services produced in the country (natural logs) in each year measured in constant 2010 Kenya shillings. Data was sourced from various Economic Surveys.

Capital ( ) Is the cumulative value of capital in the economy (natural logs) in each year measured in constant 2010 Kenya shillings. The data was generated from the annual gross fixed capital formation using the Perpetual Inventory Method (PIM).

Formal labour ( ): Is the size of the formal sector measured by the number of workers employed in the sector (natural logs) in the year as reported in the national Economic Surveys.

Informal labour ( ): Is the size of the informal sector measured by the number of workers employed in the sector (natural logs) in the year. This is a summation of the number of workers employed in the informal sector and in self-employment as most own-account firms in the country are in the informal sector. Both were sourced from the country Economic Surveys.

Depth of Informality ( ): Is the degree to which the economy is informal measured by the ratio of the number of workers in the informal sector to total employment in the country in the year.

Total Factor Productivity ( ) Is the part of output growth that is not explained by the amount of capital and labour employed, but arises due to technological progress, the quality of infrastructure, employee skills and educational attainment, and the strength of property rights among others. It was calculated as a residual in the growth accounting model and is the difference between the rate of output growth and the growth attributed to labour and to capital.

Wages in the informal sector ( ): Is the average annual real wage earned by workers in the sector in Kenya shillings. The data was generated by linear interpolation using

various observations on average annual wages in the sector from different sources including the World Bank (2016) report on *Informal Enterprises in Kenya*, the *Sessional Paper No. 2 of 2005 on Development of Micro and Small Scale Enterprises for Employment and Wealth Creation,* and the 1999 *National Micro and Small Enterprise Survey*.

Human capital ( ) Refers to the quality of labour therefore labour effectiveness which is affected by the acquired skill and education, habits and personality of labour. It affects worker productivity and is therefore independent of other types of capital. This was measured by the number of students enrolled in secondary schools in each time period. Data was sourced from the country Statistical Abstracts and Economic Surveys.

Openness ( ) Is the international trade orientation of a country measured by the volume of trade between a country and the rest of the world. This was measured by the value of exports plus imports as a percentage of GDP. Data was sourced from the World Development Indicators (WDI) and the national Economic Surveys.

Passable roads ( ) Is the total quantity of motorable roads and an indicator of the quality of infrastructure. This was measured by the kilometers of earth roads, or bitumen roads, or the total road network in the country in each year as was appropriate in the analysis of the different objectives. The data was sourced from various Statistical Abstracts.

Inflation ( ) Is the rate of change in the average price level in each year. It is measured by the average annual rate of change in the price of a basket of commodities in each time period. Data was sourced from the country Economic Surveys.

Lending Rate (LR): This is the cost of borrowed funds. Funds used for investment come from savings, but is largely facilitated by borrowing. Investment results in the accumulation of **c**apital therefore technological progress and skill enhancement which are key determinants of total productivity. This was measured by the annual commercial bank lending rate.

Financial Deepening ( ) s a measure of the degree of monetization in the economy. This determines the number of transactions, therefore productivity and output in an economy. It was measured by the ratio of broad money to GDP in each year. Data was sourced from the Global Financial Development Database.

Foreign Direct Investment (FDI): Refers to the degree of non-local investment in the economy. It affects the productive capacity of the economy by injecting capital, skill and technology and skill, and facilitates increased resource use. It was measured as a percentage of FDI to GDP. Data was sourced from the WDI.

Digital technology ( ) Refers to electronic resources, devices, tools and systems which aid in the production process by increasing the speed of transactions in the economy. This positively affects productivity and output growth. It was measured by the

monetary value of mobile money transactions in each year sourced from the Central Bank of Kenya website.

Life Expectancy: This is the average number of years that a person is expected to live at birth. It measures the general state of health of the population which according to endogenous growth models determines worker effort and productivity. The data was sourced from the WDI.

Conflict ( ) Is widespread social and economic disruption that has its origin in political instability. This adversely affects total productivity, economic growth and poverty. It was measured using a dummy variable indicating the absence or presence of conflict. The years that the country faced political instability were 1982, 1983, 1992, 1993, 2007 and 2008. The stated years assumed the value 1 and 0 for other years.

Debt ( ) This the total value of money advanced to the Central government from various sources. A large debt reduces the resources available to government for both development and recurrent expenditure as priority is given to debt servicing. This was measured by the total central government debt as a percentage of GDP sourced from the country Statistical Abstracts.

Savings ( ) Is the amount of disposable income that is not consumed, but is put aside to facilitate future consumption. This is the source of funds for borrowing and investment. Investment increases the productive capacity of a country by influencing the

capital stock, the capital-labour ratio therefore the effectiveness of both capital and labour. It was measured by the monetary value of savings as a percentage of GDP as reported in the WDI.

Real effective exchange rate ( ) Is the measure of the value of the Kenya shilling compared to other major currencies adjusted for inflation. This was measured by the average nominal exchange rate between the Kenyan shilling and the dollar in 2017 adjusted for inflation. The average annual exchange rate and the Consumer Price index (2010) used in the calculation of the Real Effective Exchange Rate (REER) were sourced from the WDI.

Poverty ( ) This is a measure of welfare. A person who is unable to meet the basic food and non-food needs is described as poor. This was measured by the poverty headcount index generated from various observations using linear interpolation. The observations were sourced from the 1999 report of the National Poverty Eradication Programme, the Poverty Reduction Strategy Paper (2002-2003), Kabubo-Mariara and Kiriti-Nganga (2002); Geda *et al* (2005), the Poverty Eradication report of 2009, and the WDI among others.

3.6 Data types and Sources

The study used secondary data. Most of the observations were available for the period 1974 to 2016. Where there were gaps in the data, missing value were calculated using linear interpolation giving a 43-year time series. The data was collected from the Kenyan Economic Surveys, the national Statistical Abstracts, the Global Financial Development

Database and the World Development Indicators (WDI). Data for capital stock was calculated using the Perpetual Inventory Method (PIM) from the annual gross fixed capital formation sourced from the Economic Surveys. Informal sector wages and the poverty headcount index were both estimated using linear interpolation based on reported values from various sources.

3.7 Estimation Procedure

The empirical models were estimated using ordinary least squares (OLS). In the context of time series literature, OLS assumes that each variable is stationary or covariance stationary (Greene, 2012). The data was tested for stationarity and for auto-correlation.

3.8 Diagnostic Tests

3.8.1 Stationarity tests

Stationarity tests were conducted to establish the order of integration of the variables which guided the presentation of the series in model estimation. This is important to ensure that the results obtained from the estimated model are not spurious as regression of non-stationary time series may show significant statistical relationship even where it is absent (Enders, 2015; Greene, 2012). Though the estimated coefficients will be unbiased and consistent, the R-squared and t-statistics will be inflated and the variances underestimated. Tests commonly used include the Augmented Dickey-Fuller (ADF) test, the Phillips-Perron (PP) test and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test. The KPSS test which controls for size is based on the null hypothesis that the time series is stationary i.e. I (0), while the ADF and PP are based on the null hypothesis that

the time series is non-stationary and is stationary at first difference (Enders, 2015; Greene, 2012).

The KPSS test developed in 1992 which is widely used as an alternative to the ADF and PP tests as it resolves the low power of the two tests (Enders, 2015; Greene, 2012; Verbeek, 2004) was utilized. The test gives better estimates of the trend and intercept coefficients as the it first calculates the trend coefficient and utilizes it to de-trend the data used in the unit root test (Enders, 2015). Under the KPSS tests the null hypothesis is not rejected where the computed statistic is less than the critical value otherwise the series is non-stationary.

3.8.2 Correlation Analysis

Linear regression analysis assumes the absence of perfect collinearity among the regressors so that the explanatory variables should be independent of each other (Farrar & Glauber, 1967; Greene, 2012). The correlation coefficient checks the level of association among explanatory variables. By analyzing correlations between them, one can identify variables which are highly correlated of which some may be dropped from the model to avoid the multi-collinearity problem. Where the variables have a perfect linear dependence, estimation of the parameters will not be possible as regression analysis will encounter a "near singular matrix problem" (Farrar & Glauber, 1967). However, it is possible to estimate coefficients where there is near perfect collinearity among the explanatory variables. Though the presence of multi-collinearity may give parameter estimates which are consistent and unbiased, the standard errors will be large, leading to wide confidence intervals, low t-values and high R-squared. The explanatory

power of the model may be high, but the estimated parameters will not be reliable (Greene, 2012). Pair-wise correlation analysis among the explanatory variables for each objective was done to estimate the level of association between the variables using the Pearson Product Moment approach. Where necessary, each of the explanatory variables was regressed against the others and the variable with the highest R-Squared omitted from the analysis.

3.8.3 Residual Diagnostic tests

The estimated empirical models specified for each of the objectives were tested for robustness. Tests conducted were for model specification, residual diagnostics and model stability. Residual diagnostic tests were the Jarque-Bera test for normality of regression residuals, the Breusch-Godfrey test for serial correlation and the Breusch-Pagan-Godfrey test for heteroscedasticity. The estimated models were also checked for stability using the CUSUM test and the CUSUM sum of Squares test.

CHAPTER FOUR

EMPIRICAL FINDINGS

4.1 Introduction

This chapter presents a summary of the study findings and discussions. The chapter presents descriptive statistics for the data used in the study, the results of the estimated models and model diagnostic test results for the contribution of the informal sector to output growth in Kenya, the effect of the informal sector on Total Factor Productivity (TFP) in Kenya, and the effect of the informal sector on poverty alleviation in the country.

4.2 Descriptive Statistics

Capital stock was calculated using the annual gross fixed capital formation following the Perpetual Inventory Method (PIM) as outlined in Appendix A. The basic characteristic of the data was analyzed using descriptive statistics or summary statistics, namely the values of the mean and variance, and the minimum and maximum values of the variables. Line graphs were used to observe the movement of variables. This is an important first step in the analysis of time series data (Greene, 2012). Stationarity tests and correlation analysis were also conducted.

4.2.1 Line Graphs / Variable Plots

The time plots for GDP, capital, formal labour and informal labour showed they all exhibited fluctuations but followed an upward trend as presented in Figure 4.1. However, there was a visible fall in the GDP series from 1990 to 1995 and in the capital series from

1990 to 1999; and a big jump in the size of the informal sector in 1991. These structural changes correspond with the implementation period of the Structural Adjustment Programs (SAPs).

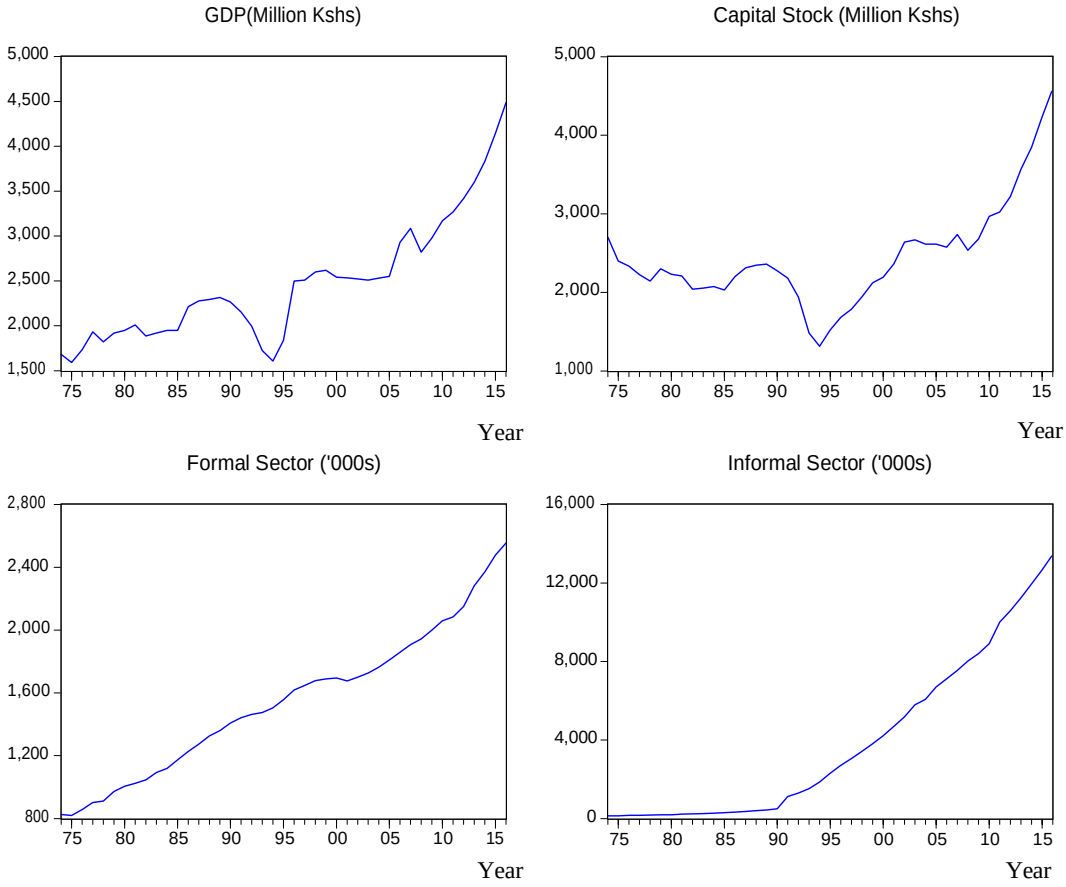

Figure 4.1: Capital, Gross Domestic Product, Formal labour and Informal labour

Source: Author‟s Computation

The rate of growth of Gross Domestic Product (GDP) increased from 1974 following increased government spending that resulted in nationalization in various sectors of the economy, the establishment of parastatals, and the active promotion of the agricultural sector (Were *et al*, 2005). However, increased involvement by government in production activities and a poor macroeconomic environment compromised productivity resulting in a decline in the rate of output growth in the early 1980s. This led to intervention by the

International Monetary Fund (IMF) and the World Bank through the SAPs which targeted reduced government spending, economic liberalization, export promotion and trade liberalization for continued financial support from the two institutions resulting in a return of the rate of increase in output to the historical trend from 1995. However, the SAPS resulted in reduced employment in the public sector. The period also saw restructuring measures implemented by firms in the private sector, hence a reduction in the rate of growth of formal employment and a rapid increase in informal employment. Investment expenditure which constitutes a large part of government spending was negatively affected resulting in a dip in the capital stock between 1990 and 1999 as most of the government spending was directed towards the financing of re-current expenditure.

Overall, the SAPs implemented had a stabilizing effect on the macro-economy resulting in increased output and investment after 1995 with the resumption of donor funding. The big increase in the number of persons employed in the informal sector from 1990 is also attributed to improved data collection mechanisms (Omolo & Omiti, 2005) and increased efforts by government to develop the sector to provide alternative employment faced with dwindling formal employment opportunities. The dips in the GDP and capital stock, and the jump in the size of the informal sector were captured in data analysis by using dummy variables.

4.2.2 Summary Statistics

This was calculated for all the variables used in the study to determine their basic characteristics and ascertain whether there was sufficient variation in each variable to

qualify the use of the data in regression analysis. The statistics included the mean, range and standard deviation. The findings are presented in Table 4.1.

Table 4.1: Summary Statistics for Variables used in the Study

Variable	Mean	Maximum	Minimum	Standard Deviation	No. of Obs.
Gross Domestic Product (GDP) (Kshs Billions - 2010)	2468.718	4484.048	1591.514	688.139	43
Capital (K) (Kshs Billions - 2010)	2448.303	4592.994	1314.362	663.040	43
Formal Employment ('000s)	1546.084	2554.300	819.100	467.776	43
Informal Employment('000s)	3903.909	13442.200	131.000	4162.100	43
Informal Wages	4844.975	22000	12.764	6011.005	43
Output growth attributed to TFP (%)	0.104	28.676	-8.464	6.225	43
Human capital / Secondary enrollment ('000s)	879.910	2,720.563	195.779	646.424	43
Openness (% of GDP)	57.269	74.573	37.929	7.702	43
Inflation (%)	12.613	45.979	1.554	8.221	43
Lending Rate (%)	17.328	36.240	9.500	6.692	43
Financial Deepening (M3/GDP)	34.638	42.606	25.710	4.882	43
Foreign Direct Investment (% of GDP)	0.608	2.532	0.004	0.551	43
Life expectancy (years)	57.698	67.032	57.271	4.232	43
Digital Technology (Kshs Billions)	33.002	316.773	0.000	77.881	43
Passable/Bitumen roads ('000s of kms)	59.724	64.480	50.092	5.059	43
Earth roads ('000s of kms)	52.002	65.581	45.930	4.008	43
Total roads ('000s of kms)	59.988	74.523	50.091	5.091	43
Depth of informality (Informal labour/Total employment)	0.509	0.840	0.137	0.283	43
Debt (% of GDP)	0.454	0.958	0.270	0.128	43
Savings (% of GDP)	17.115	37.322	10.227	5.308	42
Real Effective Exchange Rate	33.921	147.228	0.398	40.707	43
Poverty Headcount Index	47.160	56.80	36.10	4.450	43

Source: Author‟s Computation

From Table 4.1, it can be observed that the standard deviations for most of the variables used in the study were relatively large indicating that the variables were significantly dispersed from the mean hence suited for further statistical analysis. For example, the size of the informal sector grew from 131,000 workers in 1974 to 13,442.2 thousand

workers in 2016, while formal employment increased from 819,100 workers to 2,554.3 thousand workers over the same time period. The GDP over the time period increased from about Kshs 1,591.51 trillion to Kshs 4,484.05 trillion, while capital grew from Kshs 2,702.64 trillion in 1974 to Kshs 4,592.99 trillion in 2016 with a minimum of about Kshs 1,314.36 trillion in 1994.

4.2.3 Stationarity Test Results

Stationarity tests for all the variables used in the study were conducted using the more superior Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test. The results are presented in Table 4.2.

Table 4.2: Stationarity Test Results (Kwiatkowski, Phillips, Schmidt and Shin)

Variable (At levels)	Type of test		Conclusion
	Intercept and trend	Intercept only	
Log of GDP	0.151	0.769	Stationary at 1% (Intercept and trend)
Log of capital	0.188	0.418	Stationary at 1% (Intercept and trend)
Log of informal labour	0.127	0.802	Stationary at 1% & 5% (Intercept and trend)
Log of formal labour	0.160	0.821	Stationary at 1% (Intercept and trend)
TFP	0.048	0.048	Stationary at 1% & 5% (Intercept only)
Wages in informal sector (Growth rate)	0.104	0.339	Stationary at 1% & 5% (Intercept and trend)
Human capital / Secondary School Enrollment (growth rate)	0.083	0.080	Stationary at 1% & 5% (Intercept only)
Life expectancy	0.068	0.072	Stationary at 1% & 5% (Intercept only)
Openness	0.072	0.462	Stationary at 1% & 5% (Intercept and trend)
Passable / bitumen roads	0.145	0.777	Stationary at 1% & 5% (Intercept and trend)
Earth roads	0.172	0.414	Stationary at 1% (Intercept and trend)
Total road network	0.177	0.564	Stationary at 1% (Intercept and trend)
Inflation	0.061	0.213	Stationary at 1% & 5% (Intercept only)
Lending rate	0.151	0.198	Stationary at 1% & 5% (Intercept only)
Financial deepening	0.059	0.708	Stationary at 1%, 5% & 10% (Intercept and trend)
FDI	0.087	0.102	Stationary at 1% & 5% (Intercept only)
Poverty Headcount Index	0.172	0.178	Stationary at 1% & 5% (Intercept only)
Depth of Informality	0.116	0.775	Stationary at 1% & 5% (Intercept and trend)
Savings	0.178	0.372	Stationary at 1% (Intercept and trend)
Government debt	0.179	0.201	Stationary at 1% & 5% (Intercept only)

Note: Asymptotic Critical Values (KPSS)
(Intercept and trend): 1% Level of significance 0.216; at 5 % level of significance 0.146; 10 % level of significance 0.119
(Intercept only): 1% Level of significance 0.739; at 5 % level of significance0.463; 10 % level of significance 0.347

Source: Author‟s Computation

The KPSS test found all variables used in the study stationary at levels. The rate of growth in wages in the informal sector and in human capital / secondary school enrollment was used in the analysis.

4.2.4 Pairwise Correlation Analysis

Partial correlation coefficients were used to measure the level of association between the explanatory variables. The results are presented in in Table A5 Table A6 and Table A7 in Appendix C. Additionally, the Durbin-Watson (D-W) statistic and the Breusch-Godfrey tests for serial correlation were also utilized. The D-W statistics for the estimated models are presented with the results, while the Breusch-Godfrey test results are contained in the residual diagnostic test results as per objective.

The variables used to address objective one which was to analyze the contribution of the informal sector to output growth were GDP, capital, formal labour and informal labour. The correlation coefficients for the explanatory variables (capital, formal labour and informal labour) are presented in Table A5 in Appendix C. The coefficients for formal labour and capital; and for informal labour and capital were 0.663 and 0.804, respectively. Production in the formal sector in Kenya is capital-intensive, while the informal sector is relatively more labour-intensive. The correlation coefficient for informal labour and formal labour was 0.946 which implies complementarity between the two sectors or co-movement in the two variables with employment in the two sectors increasing given a growing labour force. However, the number of observations used in the model estimation was large enough to accommodate the problem of “near singular matrix”. The model was successfully estimated indicating that there was no near perfect

correlation between any of the explanatory variables, the model satisfied all residual diagnostic tests and was found to be stable.

The second set of explanatory variables used to estimate the effect of the informal sector on TFP in model 2 were the informal sector wages (growth rate), human capital (growth rate), life expectancy, openness, passable roads, inflation rate, lending rate, financial deepening, foreign direct investment (FDI), digital technology, and conflict with total factor productivity (TFP) as the dependent variable. All the explanatory variables were not highly correlated.

The third set of variables were those used in model 3 to address the third objective which was to estimate the effect of the informal sector on poverty alleviation in Kenya. The explanatory variable included the depth of informality with savings, real effective exchange rate (REER), government debt, human capital (growth rate), roads (earth or bitumen or total road network) and conflict as control variables. The correlation coefficients are presented in Table A7 in Appendix C. The explanatory variables were not highly correlated, except the depth of informality and passable roads (bitumen); the depth of informality and the REER with correlation coefficients of 0.8722 and 0.8144. The coefficients for total road network and earth roads; and the total road network and bitumen roads were 0.9627 and 0.8244, respectively as the earth roads and bitumen roads constitute the total road network. Three different variants of the model were estimated with only one of the three road classifications.

4.2.5 Residual Diagnostic Tests

Various diagnostic tests were conducted on the different models estimated in the study. These include test for normality of regression residuals, for serial correlation, for heteroscedasticity, and for model stability. The discussion of each test is embedded in the presentation of the various estimated models.

4.3 The Contribution of the Informal Sector to Output Growth in Kenya

This section addresses objective one which was to estimate the contribution of the informal sector to output growth in Kenya. Equation (3.8) was estimated using ordinary least squares. The growth accounting model in equation (3.5) which was based on the Solow growth model was used to decompose output growth into the contributions of capital, formal labour and informal labour using the Cobb-Douglas production function. The basic model was first estimated. Additionally, three variants of the model with various restrictions were estimated. The first had a restriction of constant returns to scale while the second included dummy variables to cover structural breaks in informal labour and capital as outlined in section 4.2.1. The different variants of the model were evaluated based on the expected signs, sizes and significance of coefficients as well as other diagnostic tests. The output elasticities obtained from the basic model and the first two variants of the model are presented in Table A8, Table A9 and Table A10 in Appendix D.

The third variant of the model was specified based on the analysis of the regression residuals from the second variant of the model as expressed in equation (3.14). The residual plot showed the presence of outliers outside the 2 standard deviation bands.

This indicated that the country experienced some unique occurrences that affected output growth over various time periods. Negative outliers indicating economic recessions were observed in the years 1974, 1975, 1985, 1994, 1999, 2002, 2003, 2004 and 2005. These can be attributed to the high petroleum prices in 1973/1974 which had spill-over effects into 1975; and the attempted coup in 1982 which had a negative lag effect on economic output in 1985 coupled with the 1984 to 1985 drought. The uncertainty caused by the first multi-party elections in the country in 1992 negatively affected economic output to 1994 which was compounded by the drought experienced in the period 1993 to 1994. The period 1999 is also explained by the uncertainty following the 1997 elections, and reduced aggregate demand following increased international competition arising from the implementation of liberalization measures. The period after 2000 (2002 to 2005) can be attributed to the poor macroeconomic environment and uncertainty prior to and following the disputed 2002 elections.

The positive outliers representing periods of economic boom were observed in 1977, 1978, 1981, 1996, 2006, 2007 and 2016. These followed increased export earnings due to increased tea and coffee prices (1977 to 1978) and good weather conditions and agricultural harvest in 1981. The period 1996 is explained by increased agricultural exports, a stable macroeconomic environment and increased market following the establishment of the East African Co-operation with the treaty formalized in 1999; while the years 2006 and 2007 followed increased domestic demand due to the benefits realized with the implementation of the 2003-2007 Economic Recovery Strategy (ERS) policies and increased tourist numbers. The period 2016 can be attributed to the 2014 rebasing of

the national accounts, and the rapid increase and improvement in infrastructure which was not only reflected as an increase in government spending, but also led to increased aggregate demand and increased output across the country.

The model was tested for normality using the Jarque-Bera test with a null hypothesis of normally distributed residuals. The presence of serial correlation among the regression residuals implies model mis-specification. This was tested using the Breusch-Godfrey test which is a Lagrange multiplier test with a null hypothesis of no serial-correlation (Greene, 2012). Though the OLS estimator is still unbiased in small samples, the presence of heteroscedasticity means that the variances will be large, therefore the estimator is inefficient. The presence of heteroscedasticity was tested using the Breusch-Pagan-Godfrey test. The results of the diagnostic tests are presented in Table 4.3.

Table 4.3: Results of Diagnostic Tests for the Production Model

Test	**Statistics**	**P-value**
Jarque-Bera Normality Test	2.4937	0.2873
Breusch-Godfrey Serial Correlation LM	0.6675	0.5944
Breusch-Pagan-Godfrey	0.1486	0.1511

Source: Author‟s Computation

The Jarque-Bera statistic was 2.4937 which is less than the relevant critical value of the Chi-square at two degrees of freedom of 5.991 with a probability value of 0.2873. This implies that the residuals were normally distributed at 5 percent level of significance. The null hypotheses of no serial correlation and no heteroscedasticity were also not rejected at the 5 percent significance level as the probability values were greater than 0.05, i.e.

0.5944 and 0.1511, respectively. The estimated model 1c conformed to all the assumptions of the classical linear regression model.

Tests for model stability were also conducted using the CUSUM and CUSUM of squares tests. The tests check for structural change in the data set with a null hypothesis of no structural change by comparing the cumulative sum of recursive residuals with a pair of five percent critical lines. The null hypothesis is not rejected if the residuals are within the five percent critical lines, thus the model is stable. The model is unstable if the residuals go outside of the five percent critical lines boundary. The results are presented in Figure A1 and Figure A2 in Appendix E. The residuals for both the CUSUM and the CUSUM of squares test lay within the five percent critical lines. The coefficients in model were stable.

The results of the estimated model expressed in equation (3.14) and presented in Table **4.4** were therefore adopted in the study. The elasticity of output with respect to capital, formal labour and informal labour were all positive. The signs of all the coefficients including the dummies were in line with economic theory and statistically significant at the one percent level of significance.

Table 4.4: Regression Data Estimates for the Growth Equation (Model 1c)

Dependent variable: log GDP			
Variable	**Coefficient**	**Standard Error**	**P-value**
Constant	3.6400***	0.1126	0.0000
Log Capital	0.4203***	0.0415	0.0000
Log Formal Employment	0.5383***	0.0229	0.0000
Log Informal Employment	0.0414***	0.0105	0.0004
Dummy capturing structural break in GDP	-0.0819***	0.0049	0.0000
Dummy capturing structural break in capital	0.0048***	0.0004	0.0000
Dummy capturing structural break in informal employment	-0.0099***	0.0018	0.0000
Dummy capturing economic recession	-0.0289***	0.0030	0.0000
Dummy capturing economic boom	0.0206***	0.0030	0.0000
Adjusted R-Squared	0.9958		
Durbin-Watson Statistic	2.0357		
Prob. F-statistic	0.0000		

*NB: *** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %*

Source: Author‟s Computation

According to the estimated results, the coefficients for the log of capital, log of formal labour and log of informal labour were 0.4203, 0.5383, and 0.0414, respectively. All the coefficients were statistically significant at the one per cent level of significance (

). The results imply that output response to the size of the informal sector in Kenya is low when compared to that of the formal sector. The size of the coefficient suggests that a one percent increase in the size of the informal sector causes a 0.0414 percent increase in output. Informal enterprises in Kenya are small therefore do not benefit from economies of scale and face various limitations including lack of access to external

markets, finance and technological limitations which negatively affect productivity and output. Additionally, firms in the sector avoid tax payment which undermines government revenue collection, leading to the overcrowding of public infrastructure compromising total output in the country (Cimoli *et al*, 2006). The dummy coefficients for the log of capital and log of informal labour were 0.0048 and -0.0099, respectively. This implies that over the time period 1990 to 1999 the response of output to capital was higher than the average rate of 0.4203 by 0.0048; while the response of output to informal labour reduced from the average of 0.0414 by 0.0099 in the period after 1990.

The findings on output elasticities compare well with those of Hammouda *et al* (2010) where the elasticity of output with respect to capital and labour was found to be 0.371 and 0.629, respectively; while the study found 0.4203 and 0.5797. However, Hammouda *et al* (2010) did not decompose labour into formal and informal labour. The relatively higher output response for capital obtained in this study can be explained by the heavy investment in infrastructure in the country from the year 2003 following the implementation of the 2003 to 2007 Economic Recovery Strategies. Other growth accounting studies for Kenya (Oduor & Khainga, 2010; Kalio *et al*, 2012; Bunini, 2017) do not report the elasticities obtained, but the contributions of TFP, capital and labour to output growth.

The elasticities obtained were then used to calculate the contribution of capital, formal labour and informal labour to output growth over the period 1974 to 2016 by multiplying the computed elasticities of the specific inputs with the growth rate of the factor inputs in

each time period as shown in equations (3.9) and (3.10), while taking into account the dummies for breaks in capital and informal labour which were found to be statistically significant at the one percent level of significance. The dummy coefficient for the break in capital was positive with a coefficient of 0.0048. It can be observed that when capital reduced during the 1990 to 1995 period, GDP also reduced, thus a positive coefficient indicating co-movements of capital and output. However, the dummy for the break in the informal sector was negative, i.e. -0.0099. This makes the coefficient for the informal sector lower than the estimated value of 0.0414 over the period 1991 to 2016.

The growth accounting results are presented in Table A15 in Appendix D. This shows the average annual rate of growth in output and the corresponding contributions of capital, informal labour and formal labour addressing objective one which was to estimate the contribution of the informal sector to output growth in Kenya. The results were summarized in five year periods following the various national development plans as each planning period may have different political regimes, usually accompanied by changes in government focus, policy direction and resource use which may affect output growth. Table 4.5 shows the average factor contributions over the various national plan periods.

Table 4.5: Growth Accounting Results (Average)

Time Period	Growth in GDP (%)	Factor contributions to output growth			
		Capital (%)	Formal Labour (%)	Informal Labour (%)	TFP (%)
1974-1978	2.38	-2.74	2.00	0.56	2.56
1979-1983	1.11	-0.31	2.00	0.31	-0.88
1984-1988	3.75	1.16	2.12	0.40	0.06
1989-1993	-5.41	-3.55	1.16	1.22	-4.23
1994-1996	14.47	2.12	1.70	0.67	9.99
1997-2001	0.31	2.99	0.39	0.37	-3.43
2002-2007	3.47	1.09	1.17	0.26	0.96
2008-2012	2.23	1.48	1.30	0.22	-0.77
2013-2016	7.04	3.90	2.38	0.19	0.56

Source: Author‟s Computation

The country‟s first development plan was for the period 1974 to 1978. This marked the transition from the *Sessional Paper No. 10 of 1965* where having attained independence from the colonial masters, the government was keen on equity, economic growth and integration. The policy objectives of the first development plan were poverty reduction and the elimination of disease and ignorance. The formal sector was seen as an avenue for increased employment though mention is also made of the informal sector. Employment was largely formal. This period closely followed the formal identification of the informal sector by the International Labour Organization (ILO) in 1972. The contribution of the informal sector to output growth was lower than that of the formal sector. The informal sector contributed 0.56 percent of the average growth of 2.38 percent, which translates to 23.45 percent; while the formal sector contributed 2.0 percent or 84.03 percent of the average output growth. The contribution of capital was -2.74 percent. The reduction in the contribution of capital is explained by a decrease in the

gross fixed capital formation expenditure in both the public and private sectors following the completion of the construction of the Mombasa oil refinery in 1974.The high rate of output growth can be attributed to good agricultural policies (Were *et al,* 2005) and a smooth functioning business and governance system inherited from the colonial regime.

There was a marked reduction in the average rate of output growth between 1979 and 1983 to 1.11 percent from the previous 2.38 percent in 1974 to 1978. This period was marked by political instability following the 1982 attempted coup. Additionally, poor governance led to the enforcement of the Structural Adjustment Programs (SAPs) in the early 1980s to cushion a stagnating economy (Kabubo-Mariara & Kiriti, 2002; Were *et al,* 2005). The SAPs targeted fiscal discipline, macroeconomic stability and economic liberalization. The government focus remained on the generation of formal employment opportunities for poverty alleviation. The contribution of the informal sector remained below that of the formal sector at 0.31 percent compared to 2.0 percent; while that of capital though still negative improved to -0.31 percent of the realized output growth. Though the rate of output growth was lower than in the previous time period, the informal sector contributed 27.93 percent of the realized growth from 23.45 percent in the previous period. The negative contribution of capital is explained by a reduction in development expenditure under the SAPs.

The period 1984 to 1988 saw a rebound in the average rate of output growth to 3.75 percent with the informal sector contribution still low at 0.40 percent compared to 2.12 percent for the formal sector and 1.16 percent for capital. This period was marked by a

change of leadership which focused on the development of the informal sector for employment creation. The implementation of the SAPs resulted in a rapid decline in the rate of growth in formal employment, with the informal sector absorbing most of the unemployed workforce. The period also saw the implementation of the *Sessional Paper No. 1 of 1986* which targeted employment generating economic growth in view of a growing labour force; equality in income distribution; the promotion of the private sector development and economic liberalization. This was the first government policy document on the development of the informal sector for economic growth, employment creation and equity. Though informal employment and output contribution increased, the sector‟s contribution to output growth was low when compared to that of capital and formal labour. Additionally, the average contribution of the informal sector to total output growth reduced from 27.93 percent in the previous period to 10.66 percent.

The period 1989 to 1993 experienced the largest decline in output growth (-5.41 percent). The country still in a recession continued with the implementation of SAPs. The economic decline was made worse by the uncertainty following the onset of multi-party politics with the 1992 general elections. There was a marked increase in the contribution of the informal sector to output growth from 0.40 percent to 1.22 percent. This can be explained by the jump in the size of the sector in 1991 (127.03 percent), with the annual contribution of the sector to output growth in the year at its highest (4.0 percent – Table A15 in Appendix D). The increase in size has been attributed to better data collection methods (Omolo, 2010: 2013; Bigsten *et al,* 2016) This is the only time the informal sector contribution to GDP growth exceeded that of the formal sector.

The period 1994 to 1996 only covered a three-year period with the highest recorded average growth in output of 14.47 percent. However, the contribution of the informal sector reduced from 1.22 in the previous time period to 0.67, while that of the formal sector and capital increased from 1.16 and -3.55 to 1.70 and 2.12, respectively. This translates to 4.63 percent of the total output growth.

The average output growth in the plan period 1997 to 2001 was low at 0.31 percent following the 1997 pre-election violence that caused social and economic uncertainty. This is explained by the negative rates of growth experienced in the years 2000, 2001, 2002 and 2003 of 2.97 percent, -0.31 percent, -0.47 percent and -0.46 percent, respectively as presented in Table A7 in Appendix D. During this plan period, the government implemented an industrialization policy under the *Sessional Paper No. 2 of 1996* with the theme, *"Industrial Transformation to the Year 2020"* for increased employment and poverty alleviation. The promotion of the Small and Medium Enterprises or the informal sector was one of the pillars. The sector‟s contribution to output growth was the lowest at 0.37 percent with the formal sector and capital contributing 0.39 percent and 2.99 percent, respectively.

The implementation of the Economic Recovery Strategies (ERS) under the 2002 to 2007 National Development Plan saw a marked increase in government spending in health, education and infrastructure. The ERS targeted economic growth, macroeconomic stability, employment creation, improved governance, the development of infrastructure, civil service downsizing for increased efficiency, and enforcement of the rule of law. The

active development of the informal sector first implemented in 1986 and carried into the ERS and the Medium Term Plans (MTPs) under the Vision 2030 resulted in a steady increase in the size of the sector. The ERS policies resulted in an increase in the average rate of output growth to 3.47 percent from 0.31 percent in the previous five-year period. However, there was a decline in the contribution of the informal sector to 0.26 percent from 0.37 percent in the previous period despite the steady increase in the rate of growth of the sector, while the contribution of the formal sector increased to 1.17 percent from the previous 0.39 percent. The informal sector contributed 7.49 percent of the realized growth in output.

In the period 2008 to 2012 the average rate of output growth reduced from 3.47 percent in 2002 to 2007, to 2.23 percent following the 2008-2010 global economic and financial crisis and the adverse effects of the Post-Election Violence (PEV) experienced in the country after the disputed 2007 general elections. The informal sector contributed 0.22 percent of the output growth of 2.23 percent which translates to 9.87 percent.

Though the informal sector employed about 84 percent of the total workforce over the period 2013 to 2016, with more than 90 percent of new jobs created in the sector, the contribution of the sector to an average output growth of 7.04 percent was 0.18 percent which translates to 2.70 percent of the total output growth. The implementation of the new constitution, and improved infrastructure contributed to the high average output growth. The gains can also be explained by increased efficiency in both the public and private sectors following restructuring measures implemented in the 1980s and early

1990s. Additionally, the current system of devolved governance implemented in 2010 facilitates improved service delivery at the local level resulting in improved output. However, the reported increase in output growth may not all be attributed to increased production, but may be due to increased government spending with the new system of governance.

On average, the GDP of Kenya grew by 2.66 percent over the study period (1974 to 2016), with the contributions of capital, formal labour and informal labour standing at 0.55 percent, 1.55 percent and 0.46 percent, respectively as presented in Table A15 in Appendix D. These translate to 20.64 percent, 58.19 percent, and 17.23 percent of the average output growth for capital, formal labour and informal labour, respectively (Table 15 – Appendix D). The combined contribution of labour over the study period was found to be 75.40 percent. The study findings on the contribution of labour compare favourably with those of Hammouda *et al* (2010). Hammouda *et al* (2010) found that of the average GDP growth of 2.9 percent from 1981 to 2000, labour contributed 2.19 percent or 75.71 percent of the average GDP growth. However, the study did not decompose the contribution of labour into formal and informal labour. Though the size of the informal sector has consistently increased from 1974, the percentage contribution of the sector to output growth has remained low, standing at 23.53 percent in the period 1974 to 1978; 4.63 percent in 1994 to 1996; 7.49 percent in 2002 to 2007; and 2.69 percent in 2013 to 2016.

This study covered a forty-three-year time period (1974 to 2016). There have been variations in output growth and changes in informal sector policy measures which have affected the size and output contribution of the sector both directly and indirectly. This explains the differences in the reported contributions of the sector from various sources. These include 14.3 percent (Baseline Survey on Micro and Small Enterprises, 1999); 25 percent (ILO, 2002); 18.5 percent (Charmes, 2006); 12 percent for 1980 to 1990, 26 percent for 1990 to 2000, and 20 percent for 2000 to 2005 (Ouma *et al*, 2007); 18 percent (Republic of Kenya, 2008a; 2008b); 33.8 percent for 2015 (Republic of Kenya, 2016); and 35.5 percent for 1999 to 2007 (World Bank, 2016). While most of the studies used survey data, only Ouma *et al* (2007) carried out an econometric study to estimate the size of the sector in Kenya using the excess currency demand approach. This study conducted a growth accounting exercise with labour decomposed into formal and informal labour to determine the contribution of the sector to output growth in the country.

From the study findings, the contribution of the informal sector to output growth in Kenya between 1974 and 2016 was the lowest of all the factor inputs at 0.46 which is 17.23 percent of the average growth, followed by the formal sector at 1.55 percent or 58.19 percent, and capital at 0.55 or 20.64 percent of average growth. The contribution of the informal sector was 29.60 percent of formal sector contribution. This is consistent with the findings of Bigsten *et al* (2010: 2004) who however did not quantify the relative sectoral contributions. Bigsten *et al* (2010: 2004) using firm level productivity analysis in Kenya‟s manufacturing sector found that the productivity of firms in the informal sector in Kenya was lower than that of their formal sector counterparts.

Studies from other countries which however do not estimate the output contribution of the sector include Tabunan (2006) who found no conclusive relationship between the size of the sector and economic growth in Argentina; while Cimoli *et al* (2006), Taymaz (2009), Pablo (2014), and Abou-Ali and Rizk (2015) found that the informal sector has a negative effect on economic growth in Latin America, Turkey, Spain and Egypt, respectively, explained by the low productivity of the sector. Macias (2008) found a positive relationship between the size of the informal sector and economic growth in Mexico; which concurs with the findings of Beck *et al* (2004), while Biau (2011) using cross-country data found a non-monotonic relationship. However, Beck *et al* (2004) used formal firms employing between 100 to 500 workers which are large scale firms according to Kenyan classification, therefore more productive than the informal firms in the country. Additionally, the study was a cross-country study which may fail to capture country specific situations.

The findings of this study concur with economic growth theories. The Solow growth model attributes economic growth to the amount of capital and labour employed; but more importantly, the productivity of labour which depends on the knowledge and skill of the worker. The Ramsey-Cass-Koopman‟s model attributes economic growth to savings and investment, technological progress and capital accumulation; while the new growth theories attribute economic growth to the effectiveness and knowledge therefore productivity of the worker, the social infrastructure, strength of property rights, and the cultural attitude towards work and entrepreneurship. The informal sector in Kenya is characterized by low levels of savings and investment, hence low technology and utilizes

outdated technology; is labor-intensive and uses workers with low levels of knowledge and skills which limit firm and worker productivity. Additionally, the firms have no property rights, no permanent work sites, and have inadequate infrastructural facilities. This explains the low contribution of the sector to output growth in the country.

The study findings on the contribution of capital compare well with those of previous studies. This was found to be 20.64 percent for the period 1974 to 2016 (Table A15 – Appendix D), while Oduor and Khainga (2010) found 17 percent for the period 1982 to 2006, Bunini (2017) found 21.01 percent for the period 1960 to 2011 though Hammouda *et al* (2010) found 30.94 percent covering the period 1981 to 2000. However, all studies used the perpetual inventory method to calculate the capital stock.

4.4 The Effect of the Informal Sector on Total Factor Productivity in Kenya

The second objective of the study was to analyze the effect of the informal sector on TFP in Kenya. The analysis was based on the endogenous growth models which acknowledge that there is a portion of output growth that is not explained by the quantities of capital and labour employed referred to as total factor productivity (TFP). The models seek to explain factors that determine TFP in any economy which was calculated as a residual from the growth accounting exercise conducted to address objective one as presented in equation (3.16).

A set of three variants of model two were estimated with the rate of growth in the average annual real wages in the sector used as an indicator of the size of the sector. The results

are presented in Table A11 and Table A12 in Appendix D. The first model was estimated with all the explanatory variables as specified in equation (3.16). Only four of eleven of the explanatory variables were statistically significant pointing at possible multi-collinearity. Each of the explanatory variables was regressed against the others. Passable roads had the highest correlation with R-squared of 0.879. The variable was omitted and model 2a estimated.

A graphic analysis of the residuals in model 2a showed the presence of outliers outside the ± 2 standard deviations band. Unique favourable occurrences indicating economic booms captured by the positive outliers occurred in the years 1976, 1977, 1986, 1992, 1996, and 2006; while the years 1990, 1991, 2000, 2001, 2002 and 2013 experienced economic recession due to various unfavorable occurrences. The favourable occurrences include the high coffee prices experienced in the 1975 to 1976 period which had a lag effect to 1977; a general improvement in economic growth from the period 1986 following sound macroeconomic policies with the implementation of the *Sessional Paper No. 1 of 1986 on Economic Management for Renewed Growth,* good weather conditions and increased agricultural prices; and the implementation of the Economic Recovery Strategies under the 2002 to 2007 National Development Plan which emphasized infrastructure development positively affected TFP and output growth in the years after 2005. The unfavourable occurrences include the negative effects of the SAPs that led to a domestic recession. The period was characterized by a reduction in both public and private sector spending; while the period 2013 was affected by uncertainty following the general elections held early in the year. Dummy variables to smooth out the spikes were

introduced and model 2a again estimated. The results are presented in Table A12 in Appendix D.

The model had good explanatory power with R-squared of 0.775 implying that the explanatory variables explain 77.5 percent of variations in TFP in Kenya. The model was also statistically significant as the probability value of the F-statistic was 0.0000 which is less than 0.05. To meet the OLS requirements for model estimation, the model was tested for normality of residuals, serial correlation and for heteroscedasticity to confirm the soundness of the model and reliability of the estimates. The results of the diagnostic tests are presented in Table 4.6.

Table 4.6: Results of Residual Diagnostic Tests for TFP (Model 2a)

Model	Test	F- Statistic	P-value
Model 2a	Jarque-Bera	0.3303	0.8477
	Breusch-Godfrey Serial Correlation LM	0.4202	0.5344
	Breusch-Pagan-Godfrey	3.9272	0.0098

Source: Author‟s Computation

The null hypotheses of normality of residuals and no serial correlation were both not rejected at the five percent level of significance as the p-values were greater than 0.05, (0.8477 and 0.5344), respectively. However, the null hypothesis testing the presence of heteroscedasticity was rejected at the five percent significance level as the p-value was 0.0098 which is less than 0.05. The estimated coefficients though unbiased and consistent were inefficient (Greene, 2012). Additionally, the CUSUM and the CUSUM of squares tests were conducted to determine model stability. The results of the CUSUM and CUSUM of squares tests for each model are presented in Figure A3 and Figure A4 in Appendix E. The model was then estimated using robust least squares (RLS) which gives

accurate estimates even in the presence of heteroscedasticity (Atkinson *et al*, 2016). The results are presented in Table 4.7.

Table 4.7: Results for the Effect of the Informal Sector on TFP (Model 2b - RLS)

Dependent Variable: Total Factor Productivity			
Variable	**Coefficient**	**Standard Error**	**P-value**
Constant	-13.6096	9.4600	0.1503
Informal sector wage (growth rate)	-6.6940**	3.1434	0.0332
Life expectancy	0.1752	0.1381	0.2047
Human capital (growth rate)	-2.8283*	1.6063	0.0783
Openness	0.1948***	0.0487	0.0001
Inflation rate	-0.2679***	0.0497	0.0000
Lending rate	0.2336***	0.0724	0.0013
Financial deepening	-0.2576***	0.0964	0.0075
Foreign Direct Investment	1.7999***	0.5445	0.0009
Digital technology	0.0111	0.0084	0.1863
Conflict	-1.2025	0.8787	0.1712
Dummy capturing economic boom	4.8275***	0.7606	0.0000
Dummy capturing economic recession	-4.3065***	0.8502	0.0000
Adjusted R-Squared	*0.8837*		
Prob. Rn Statistic	*0.00000*		

*NB: *** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %*

Source: Author‟s Computation

From the results the estimated coefficient for the average real wage in the informal sector was -6.694 and statistically significant at the five percent level of significance. An increase in the rate of growth of the informal sector by one percent as measured by the rate of growth in the average real wage causes a reduction in TFP by 6.694 percent. This is consistent with theoretical literature (Romer, 2012; Todaro & Smith, 2015) and empirical findings of other country studies (Cimoli *et al*, 2006; Elbadawi & Loayza,

2008; Taymaz, 2009; Bento & Restuccia, 2014). According to the *efficiency-wage* models, workers are attracted by high wages (Romer, 2012) so that the increase in the rate of growth of informal sector wages causes more workers to join the sector. However, Bento and Restuccia (2014) in a cross-country study found a positive relationship between firm size and productivity, implying that due to the small size of informal sector firms in Kenya, the contribution of the sector to total factor productivity will be low despite the growth in the sector. The findings are also consistent with Cimoli *et al* (2006) who using the *efficiency-wage* theory attributed the reduction in output growth in Latin America from 1990 to 2000 to a growing informal sector, where workers were attracted by increasing wages, but total productivity and economic growth was compromised due to the inefficiency inherent in the sector. Additionally, Elbadawi and Loayza (2008), and Loayza *et al*, (2009) found that informal firms operate sub-optimally to avoid state detection and minimize operation costs. This results in resource misallocation, increased inefficiency and prevents the sector from enjoying the advantages of formalization which include state protection, formal credit and access to markets. The sector is also characterized by tax evasion thus burdens the existing public infrastructure, which further compromises total factor productivity Cimoli *et al* (2006). Bigsten *et al* (2004) in a study of the implication of the size of the informal sector on economic growth in Kenya found that the productivity of the sector was lower than of the formal sector, implying that the growth of the sector compromises total productivity in the country.

Studies on TFP in Kenya include Onjala (2002), Hammouda *et al* (2010), Oduor and Khainga (2010) and Kalio *et al* (2012). However, none of the studies analyzed the effect

of the informal sector on TFP. All the studies used labour as one component. This study assumed a dual economy, hence formal and informal labour, then estimated the contribution of the informal sector to TFP in the country. The study findings concur with theoretical literature. The endogenous growth models point at the type of production process, infrastructure, literacy and skills as factors affecting TFP (Romer, 2012); while Todaro and Smith (2015) describes the informal sector as a low productivity sector. Cimoli *et al* (2006) found that due its low productivity, the growth of the informal sector in Latin America had a negative effect on TFP in the region.

Other variables that were found to have a negative and statistically significant effect on TFP in Kenya include the rate of growth in human capital with a coefficient of -2.8283 which was statistically significant at the ten percent level of significance; and inflation with an estimated coefficient of -0.2679 and financial deepening (-0.2576) which were both statistically significant at the one percent level of significance. According to the endogenous growth models, the level of education and skill of labour, hence human capital determines worker effectiveness which directly affects TFP (Romer, 2012). Kenya has experienced a large increase in human capital measured by secondary school enrollment in this study. However, the negative effect which concurs with the findings of Hammouda *et al* (2010) and Oduor and Khainga (2010) point to a possible mis-match between the imparted skills and education, and the quality of labour that the country needs for improved TFP and economic growth (Oduor & Khainga, 2010). Though the rate of growth in enrollment has increased, the quality, therefore productivity of the workforce in the country has reduced. This can also be due to loss of qualified and highly

productive labour as workers leave the country in search of better paying foreign jobs (Oduor & Khainga, 2010). However, Kalio *et al* (2012) found a positive, though insignificant effect.

From the estimated coefficient for inflation, a one percent increase in the rate of inflation results in a 0.2679 percent decline in TFP which was significant at the one percent level of significance. This finding is in line with theoretical literature. High inflation erodes purchasing power reducing aggregate demand and output as explained in the inflation-output trade-off (Romer, 2012). Inflation also creates uncertainty and increases both transaction and input costs which discourage investment. The study findings concur with those of Oduor and Khainga (2010) where inflation was found to have a negative, though insignificant effect on TFP in Kenya. Inflation is an indicator of macroeconomic stability so that increased macroeconomic instability results in a reduction in TFP in the country.

The estimated coefficient for financial deepening of -0.2576 was statistically significant at the one percent level of significance. This implies that increased monetization of the economy results in a reduction in TFP in Kenya which is contrary to theoretical expectation. Improvements in the financial sector boost TFP by reducing transaction costs, improving the speed and reliability of transactions in the economy; and increases the level of investment, research and innovation in an economy by linking savers and investors. The result casts doubt on the value of the transactions. It is possible that there has been increased transactions, but of lower value items over time. However, these findings concur with those of Hammouda *et al* (2010), and Oduor and Khainga (2010)

who analyzed the mediatory role of the sector. Hammouda *et al* (2010) used the domestic credit by the banking sector as a percentage of GDP while Oduor and Khainga (2010) used the interest rate spread where wide margins indicate an inefficient financial sector. Both studies found a negative and insignificant relationship. This negative relationship is explained by Hammouda *et al* (2010) as resulting from a failure of the financial sector to channel resources to the productive sector, limited investment opportunities, and the possibility that credit uptake may be directed to consumption as opposed to investment. Oduor and Khainga (2010) concluded that the decision to invest in Kenya is not affected by the efficiency of the financial sector as the TFP declined despite increased efficiency in the financial sector.

Variables that were found to have a positive and statistically significant effect on TFP in Kenya all at the at the one percent level of significance include openness, the lending rate and Foreign Direct Investment. The estimated coefficient for openness was 0.1948 implying that a one percent increase results in an increase in TFP of 0.1948 percent which concurs with the findings of Hammouda *et al* (2010) and Kalio *et al* (2012). Increased trade improves output growth by opening new market, facilitates importation of inputs and the transfer of skills and technology which all facilitate increased productivity. However, Oduor and Khainga (2010) found a negative relationship which the study attributed to increased competition with liberalization and an unfavourable balance of trade position which stifles local production and TFP.

The estimated coefficient for foreign direct investment (FDI) was 1.799. This implies that FDI is an important determinant of TFP in the country as it facilitates increased capital, improved skill and technology, increased resource utilization, brings new employment opportunities. This is consistent with theoretical expectations. Romer (2012) attributes the rapid growth in the Newly Industrialized Countries (NICs) to increased trade which facilitates both increased factor availability and more intensive use of inputs. However, the findings contradict those of Oduor and Khainga (2010) and Kalio *et al* (2012) which found that FDI has a negative effect on TFP in Kenya. Oduor and Khainga (2010) attributed the negative relationship to the crowding out of local investment by foreign investors who repatriate most of their profit with limited transmission of skill and technology to the local population as the key jobs are held by foreigners. Additionally, Kalio *et al* (2012) attributed the negative relationship to the use of technology that is not suited to local conditions, and the ability of FDIs to influence government policy in their favour e.g. tax rebates and terms for profit repatriation, that do not favour the host country.

The study found that the lending rate had a positive and statistically significant effect on TFP in Kenya at the one percent level of significance which is contrary to theoretical expectation as high lending rates are associated with low investment, low consumption and low economic activity (Romer, 2012) therefore a reduction in TFP. The finding implies that the level of investment and consumption which determine aggregate demand and productivity in the country increase with an increase in the lending rate. This result suggests that investment and consumption in Kenya is greatly influenced by other factors

apart from the lending rate and also points to the possibility of low credit uptake. Though the lending rate increases, it has over the study period been accompanied by increasing investment and TFP in the country. Other factors that affect investment and consumption decisions may include the business, economic and political environment.

The estimated coefficients for life expectancy, digital technology and conflict were all statistically insignificant.

4.5 The Effect of the Informality on Poverty Alleviation in Kenya

The third objective was to estimate the effect of the informal sector on poverty alleviation in Kenya. The analysis was based on the Marxian theory of poverty which acknowledges the existence of a dual labour market where work in the secondary market is low-paying and insecure, and the Keynesian theory of poverty which states that employment may cause poverty if it is low paying. Equation (3.17) was estimated using Ordinary Least Squares with the poverty headcount index as an indicator of poverty. Three variants of the model were estimated. The first, model 3 used earth roads as a proxy for passable roads as these are widely found in the rural areas which have the highest poverty levels (Mwabu *et al.,* 2000). A second variant, model 3a was estimated using bitumen roads, and a third variant, model 3b utilized the total road network. The results of models 3a and 3b are presented in Table A13 and Table A14 in Appendix D.

All the three estimated models were statistically significant at the one percent level of significance. However, the basic model which had the highest explanatory power with R-squared of 0.8717, and a Durbin-Watson statistic of 1.8531 was adopted. Additionally,

the model utilized earth roads which are common in rural areas with the highest prevalence of poverty in Kenya (Mwabu *et al*, 2000).

A graphic analysis of the residuals showed the presence of outliers, indicating that the level of poverty in Kenya was affected by various unique occurrences which had both positive and negative effects over the study period. Again positive outliers that resulted in increased poverty were identified for the years 1983, 1989, 1990, and 1996 to 2002; and negative outliers in 1976, 1992, 1994, 1995, 2006, 2015 and 2016.

The positive outliers are explained by political instability experienced in 1982, worsening terms of trade due to reduced coffee prices over the 1989 to 1990 period, and a general recession which affected the period from 1996 to 2002 following the negative effects of the SAPs implemented from the 1980s. Negative outliers implying a reduction in poverty levels were identified in 1976, 1992, 1994, 1995, 2006, 2015 and 2016. The period 1976 can be explained by increased coffee prices; while the period after 1986 and 2006 can be explained by sound macroeconomic policies implemented under the *Sessional Paper No. 1 of 1986 on Economic Management for Renewed Growth* and the *2002-2008 Economic Recovery Strategy (ERS) Paper*. The ERS sighting poor implementation of macroeconomic policies and general mismanagement as causes of the deteriorating living standards in the country sought to enforce sound macroeconomic policies; create increased employment opportunities; improve social and physical infrastructure by providing free primary education, improved communication (roads, railway, phone, air transport), and better health care. The period 2015 to 2016 can be explained by a stable

macroeconomic environment following the implementation of the first and Second Medium Term Plans (MTPs) under the Vision 2030 targeting poverty reduction, creation of quality jobs and increased productivity in both the agricultural and industrial sector. The model was therefore estimated with the addition of dummy variables to smooth out the spikes.

The model was tested for normality of residuals, for serial correlation and for heteroscedasticity to check if the necessary OLS conditions were satisfied. The results of the diagnostic tests are presented in Table 4.8.

Table 4.8: Results of Residual Diagnostic Tests for Poverty Alleviation

Model	Test	F- Statistic	P-value
Model 3	Jarque-Bera	0.1774	0.9151
	Breusch-Godfrey Serial Correlation LM	0.0426	0.9422
	Breusch-Pagan-Godfrey	0.7517	0.6028

Source: Author‟s Computation

The model was found to be robust. All three null hypotheses of normality of residuals, no serial correlation, and no heteroscedasticity were not rejected as the p-values were all more than 0.05. The models were then tested for stability. The CUSUM and CUSUM of squares test results are presented in Figure A7 and Figure A8 in Appendix E. The residual lines lay within the 2 standard deviations boundaries, confirming stability of the model.

The results of the estimated model are presented in Table 4.9.

Table 4.9 Results for the Effect of Informality on Poverty Alleviation

Dependent variable: Poverty Headcount Index		
	Model 3	
Variable	**Coefficient**	**t-value**
Constant	58.7726***	10.0835
Depth of informality	18.1645***	7.3085
Earth Roads	-0.0003*	-1.9582
Savings	-0.1644**	-2.3238
Real effective exchange rate	-0.1211***	-9.0911
Government debt	3.6307	0.9892
Human capital (growth rate)	-3.2262**	-2.0776
Conflict (dummy)	-2.0322***	-2.9000
Dummy capturing economic boom	4.6131***	6.8425
Dummy capturing economic recession	-3.0294***	-4.0184
Adjusted R-Squared *Durbin-Watson Statistic* *Prob. F-statistic*	*0.8717* *1.8531* *0.0000*	

*NB: *** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %*

Source: Author‟s Computation

From the findings, the depth of informality has a positive and statistically significant effect on poverty in Kenya at the one percent level of significance with a one per cent increase resulting in an increase in the poverty headcount index by 18.1645 percent. This can be explained by the low productivity, low wages and poor working conditions that characterize the informal sector in the country. The findings concur with theoretical literature. According to Davis and Sanchez-Martinez (2015), the human capital theory attributed to Becker (1964) under the Neo-Classical theories states that the skill of a worker determines their income level; while the Keynesian / Liberal theory of poverty states that high levels of unemployment and the nature of employment may cause poverty if the work is temporary, low-paying or part-time (Davies & Sanchez-Martinez, 2015).

The study findings are also in line with those of Oiro *et al* (2004), Loayza e*t al* (2009), and Nazier and Ramadan (2014). Nazier and Ramadan (2014) in a study of the causal relationship between the size of the informal sector and poverty in Egypt concluded that the nature and quality of employment is important for employment to be poverty alleviating, and that working in the informal sector increases the probability of a worker being poor. Loayza *et al* (2009) found that the incidence of poverty in the Caribbean and Latin America between 1985 and 2005 increased with increased informality, a finding that is shared by Oiro *et al* (2004) who using household data from the 1994 Welfare Monitoring Survey and the 1989 census found the levels of poverty in Kenya were highest among workers in the agricultural and informal sectors. However, the Kenyan study and was basically descriptive in nature. Other studies on the determinants of poverty in Kenya reviewed include Mwabu *et al* (2000) and Geda *et al* (2005). None of the reviewed studies investigated the effect of the nature of employment (informality) on poverty in the country.

The kilometers of earth road in the country had a negative (-0.0003) and statistically significant effect on poverty in the country at the ten percent level of significance. As the earth roads increase, the level of poverty reduces. The finding concurs with theoretical literature as it implies that improved infrastructure through an increase in the earth roads results in a reduction in poverty in Kenya. From theoretical literature, an increase in the quality of infrastructure opens up areas to economic opportunities and facilitates labour mobility, thus has a positive effect on earnings and consumption, therefore reduces poverty. The Keynesian theory on poverty proposes increased government spending on

infrastructure for income generation and poverty alleviation (Davies & Sanchez-Martinez, 2015); while geographical isolation and poor worker mobility are some of the factors that cause poverty following the Marxian and Keynesian theories of poverty (Davies & Sanchez-Martinez, 2015). This finding points to the possibility that the increased earth road surface in Kenya has resulted in the creation of income generating opportunities and a general reduction in poverty rates in the country.

The level of savings was found to have a negative and statistically significant effect on poverty in the country at five percent level of significance. The estimated coefficient for savings was -0.1644. This implies that a one per cent increase in savings resulted in a reduction in the poverty headcount index by 0.1644 percent in Kenya over the study period. The finding is in line with theoretical literature. Increased savings facilitates capital mobilization, investment, improved technology, and skill and knowledge acquisition, therefore increases productivity and output as explained in the Harrod-Domar and the Ramsey-Cass-Koopman‟s growth models (Romer, 2012).

The estimated coefficient for the real effective exchange rate (REER) was -0.1211 was statistically significant at one per cent level. A one percent increase in the REER caused a reduction in the poverty level as measured by the headcount index by 0.1211 percent which is statistically significant. This finding does not agree with theoretical expectation. An increase in the REER implies an increase in the local prices relative to foreign prices. This results in a reduction in the international competitiveness of the country‟s produce, hence a reduction in exports and an increase in the relatively cheaper imports. If the

imports are largely for final consumption as opposed to facilitating production, the result is a reduction in output and income levels. This may be compounded by the low prices of imports leading to the loss of market for local produce, the closure of local industries, increased unemployment and an increase in poverty levels in the country. The rate of growth of imports in Kenya has over time surpassed the rate of growth of exports as evidenced by a largely unfavourable BoP position. However, the reduction in poverty levels may be attributed to the importation of intermediate commodities that have helped to improve production in the country creating increased income earning opportunities. Alternatively, the imports may largely be of low value commodities which have shielded the poor from increased poverty e.g. second hand commodities.

The estimated coefficient for the growth rate in human capital of -3.2262 was statistically significant at five percent level of significance. A one percent increase in the rate of growth in human capital resulted in a reduction in the poverty headcount index by -3.2262 percent. This concurs with both theoretical and empirical literature. According to the endogenous growth models, an increase in the knowledge and skill of labour increases worker effectiveness. This improves the productivity of labour and empowers the worker to secure high paying jobs (Romer, 2012). The finding is also in line with those Geda *et al* (2005) and Ngunyi *et al* (2015). Geda *et al* (2005) using household data from the 1994 Welfare Monitoring Survey found that lack of education predisposes individuals to being poor in Kenya. Ngunyi *et al* (2015) using the 2009 household population census data for the Kenyan lake region found that the education of the

household head positively and significantly affected welfare, therefore reduced the chances of the individual being poor.

Conflict was measured using a dummy variable where 1 indicates the presence of conflict and 0 otherwise. Widespread conflict that distorts economic activity at the national level in Kenya as seen in Chapter three have been associated with political instability so that the periods associated with conflict in the study are the periods the country had election related political instability. The estimated coefficient was -2.0322 and statistically significant at the one percent level of significance. This implies that conflict has resulted in a reduction in the poverty headcount index, therefore reduced the poverty levels in the country despite the negative social and economic effects which include the displacement of persons, loss of property and a poor business environment that has discouraged investment. These findings do not agree with theoretical literature. According to the Liberal theory of poverty, macroeconomic factors that determine productivity and income also determine poverty (Davies & Sanchez-Martinez, 2015). The endogenous growth models sight social infrastructure which is affected by social and political stability as a determinant of productivity, economic growth and income (Romer, 2012). This relationship was found in Hammouda *et al* (2010) where conflict in Kenya was found to negatively and significantly affect total factor productivity. The conflicting result may point at economic and social programs put in place by the government that have cushioned persons adversely affected by conflict so that the welfare of the general population has improved from the initial position.

The estimated coefficient for government debt was 3.6307 but insignificant. This implies that though the increase in the debt burden in the country has increased poverty levels, the effect is not significant. However, the positive relationship concurs with the Keynesian / Liberal theory of poverty which states that increased debt diverts resources from poverty alleviation and may fuel inflation resulting in reduced purchasing power. The insignificant effect may be explained by the fact that while the study captures data from 1974 to 2016, the rapid increase in government debt in the country has been experienced only from the year 2012.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Introduction

This chapter presents a summary of the study and the conclusions. The chapter also presents the suggested policy implications based on the study findings and the contribution of the study to knowledge. Areas for further study are suggested based on the gaps identified in the study.

5.2 Summary of the Study

The Kenyan economy is dual and predominantly informal. The country targets increased economic growth averaging 10 percent per annum, and poverty reduction to 28 percent of the total population by the year 2030. Efforts to develop the informal sector for economic growth, employment creation and poverty reduction can be traced to the period 1986, under the *Sessional Paper No.2 of 1986 on Economic Management for Renewed Growth.* The growth of the sector in the country has led to a marked increase in employment numbers. However, the reported contributions of the sector to economic growth are largely conflicting, while not much is known about the effect of the sector on poverty. This study analyzed effect of the size of the informal sector on economic performance in Kenya as measured by contribution of the sector to output growth, the effect of the informal sector on total factor productivity in Kenya, and the effect of the informal sector on poverty alleviation in Kenya.

To address the first objective, the study utilized the production theory which shows the relationship between inputs and output. A growth accounting exercise was conducted using the Cobb-Douglas production function with the traditional factor inputs of capital and labour, while assuming that technological improvement results in an increase in the productivity of both capital and labour and is therefore *Hicks- neutral*. The analysis assumed constant returns to scale following Euler‟s theorem. Based on the dualist approach of the economy, the study decomposed labour into formal and informal labour. The informal sector was the lowest contributor to output growth in the country from 1974 to 2016.

The second objective was to determine the effect of the informal sector on TFP in Kenya. The TFP was calculated as a residual from the growth accounting exercise conducted to address objective one. The study used the rate of growth in the average annual wage in the informal sector as an indicator of the size of the sector as increased earnings attract workers following the *efficiency-wage* theories. The explanatory variables used in the estimated model were guided by theoretical literature and other studies on TFP in the country. These included human capital (growth rate), openness, passable roads, inflation, lending rate, financial deepening, foreign direct investment (FDI), digital technology, life expectancy and conflict. The rate of growth in the average annual wage in the sector was found to be important in determining TFP in the country. Increased wages attract workers to the sector, however, the effect is a reduction in the total factor productivity in the country. This can be explained by the small firm sizes; the use of low quality inputs, limited and outdated of technology; and other constraints that undermine firm

productivity including lack of credit, poor infrastructure and lack of access to external markets. The sector is also characterized by tax evasion which places a burden on public infrastructure compromising total factor productivity in the country.

The third objective was to examine the effect of the informal sector on poverty alleviation in the country. The analysis was based on the Marxist and Liberal theories of poverty. The dependent variable, which was used as a proxy for poverty was the poverty headcount index calculated using linear interpolation based on data from various sources, with the depth of informality as the explanatory variable. Other explanatory variables used were passable roads (earth roads or bitumen roads or total roads), savings, real effective exchange rate, government debt, human capital growth rate and conflict. The depth of informality was found to be important in explaining poverty in the country.

5.3 Conclusions of the Study

The Kenyan economy is dual and predominantly informal. The purpose of the study was to determine the contribution of the informal sector to output growth in Kenya, to analyze the effect of the informal sector on total factor productivity in Kenya, and to analyze the effect of the informal sector on poverty alleviation in Kenya.

The size of the informal sector is important in explaining economic growth in Kenya. The sector is the lowest contributor to output growth in the country. This can be explained by retrogressive characteristics of production processes in the sector which is labour-intensive; labour is largely unskilled with low levels of education; technology where used is outdated; and the firms are small which hinders the ability of firms to enjoy economies

of scale. The firms in the sector also face multiple challenges with include lack of access to credit, poor infrastructure, low access to markets, no secured work sites, lack of property rights, and low access to technology and information. Additionally, the firms avoid payment of taxes and remain informal to avoid the costs of formalization which acts as a barrier to their ability to benefit from state provided support. These challenges compromise firm efficiency, resulting in the survival of inefficient firms, therefore resource mis-allocation. Other challenges faced by the firms which limit output include lack of access to markets, limited information, and poor linkages with large and medium enterprises. As a result, the existence and growth of the sector in the country has not been accompanied by the desired increase in output contribution.

The size informal sector impacts total factor productivity in Kenya. Though workers are attracted to the sector, firm productivity in the sector is low due to the small size of firms, lack of benefit from formal support systems due to the informality status of firms, the burden placed on public infrastructure as firms largely avoid tax payment, and inherent inefficiency all which compromise the productivity of firms. An increase in the size of the informal sector compromises TFP in Kenya.

The size of the informal sector is important in explaining poverty levels in Kenya. This can be attributed to the influx of workers into the sector which assuming a perfect labour market reduces earnings in the sector, and sector specific characteristics which include poor working conditions; the lack of skills and limited education of the workers; and the low productivity that characterize the informal sector in the country. As the sector is the

lead employer in the country, an increase in the size of the sector increases poverty levels in the country.

5.4 Policy Implications

The size of the informal sector in Kenya makes it important for the achievement of the country‟s macroeconomic objectives of increased economic growth, income generation and poverty reduction for improved livelihood for the general population as stated in the vision 2030. However, the growth of the informal sector in Kenya has not been accompanied by the anticipated increase in output, and income therefore reduction in poverty. This can be explained by the characteristics of the informal sector in the country which encourage inefficiency resulting in low productivity, low output and low earnings.

The government should place more emphasis on firm growth in the sector for improved output, increased productivity, and increased income therefore poverty alleviation. Productivity increases with firm growth as large firms are usually more capital-intensive than the small firms. This has been addressed by various policy documents that address the challenges facing the informal sector in the country that limit firm growth and productivity. These include the Sessional Paper No. 2 of 2005 on the *Development of Micro and Small Enterprises for Employment Creation and Poverty Reduction;* the *Private Sector Development Strategy;* the *Kenya Vision 2030: First Medium Term Plan (MTP) 2008-2012;* and the *Micro and Small Enterprises (MSE) Act No. 55 of 2012* which provide a 25 percent public procurement from the sector, increased firm linkages, improved access to capital, development of SME Industrial parks in key towns in the country, technology and market development, among others.

5.5 Contribution to Knowledge

This study gives insight into the effect of the informal sector on output growth, total factor productivity and poverty in Kenya in view of the continued emphasis placed by the government on the development of the sector. The three policy objectives of the sector which is the largest employer of labour in the country are employment creation, income generation and poverty alleviation. The study investigated the effect of the sector on output growth, TFP and poverty alleviation in the country. These have not been addressed by any previous empirical studies on the sector in the country. The previous studies on the sector have looked at the constraints to firm growth and productivity in the sector, while the growth accounting studies used labour as one component thus did not consider the dual nature of the Kenyan economy. From the study findings, the informal sector is the lowest contributor to output growth in Kenya, the sector determines total factor productivity and poverty in the country.

5.6 Areas for further study

As the lead employer, the informal sector largely determines economic performance in Kenya. Various policy measures have been put in place overtime to develop the sector for employment creation, economic growth, and poverty alleviation. The effect of these measures has been an increase in employment numbers in the sector. The other desired objectives of increased output and poverty alleviation have not been realized. There is a need to investigate the effect of policy on productivity in the sector, which affects output growth, and income levels therefore poverty in the country. This calls for a study on the effectiveness of policies implemented in the sector.

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APPENDICES

APPENDIX A: Derivation of Capital Stock

The growth accounting exercise conducted to estimate the contributions of capital, labour and total factor productivity to output growth in addressing objective one required the use of capital stock which is not readily available in Kenya and had to be estimated. The variable was calculated from the annual gross fixed capital formation (gross fixed investment) using the Perpetual Inventory Method (PIM) as outlined in Berlemann and Jan-Erik (2012). This requires a basic value for the existing capital stock, the annual gross fixed capital formation and an average annual depreciation rate. The data was then converted from market values to constant 2010 prices using the 2010 Consumer Price Indices (CPI) obtained from the 2017 World Development Indicators while the gross fixed capital formation was sourced from the country economic surveys. The PIM method works on the basis that the capital stock in any given time period is an accumulation of past investment, but allows for depreciation following Nehru and Dhareshwar (1993); and Berlemann and Jan-Erik (2012). At the beginning of any given time period t, the net capital stock (K_t) is determined by the net capital stock at the beginning of the previous period (K_{t-1}) plus gross fixed investment in the previous period (I_{t-1}) less consumption of fixed capital or depreciation in the previous period (ϕ) as shown in equation 1.1.

$$= \square \quad (1.1)$$

If depreciation occurs at a constant rate of δ, then the capital stock can be written as:

$$K_t = (1 - \delta)K_{t-1} + I_{t-1} \qquad (1.2)$$

Capital stock was calculated using past gross fixed capital formation, the initial capital stock (K_0), and a generally used constant depreciation rate of 5.5 percent following Altar *et al*. (2010) and Njuguna, *et al.* (2005) using equation (1.3).

$$K_t = (1-\delta)^{t-1} K_0 + \sum_{i=0}^{t-1} (1-\delta)^i I_{t-(i+1)} \qquad (1.3)$$

According to Berlemann and Jan-Erik (2012) the initial capital stock can be calculated using various methods which include the steady state approach, the disequilibrium approach and the synthetic time series approach. Assuming that the economy grows at a steady state, the steady state approach assumes that the capital stock grows at the same rate as the rate of growth in output. The initial capital stock in period $t-1$ can be calculated as:

$$K_{t-1} = \frac{I_t}{gGDP + \delta} \qquad (1.4)$$

where *gGDP* is the rate of growth in output

The disequilibrium approach attributed to Griliches (1980) and De La Fuente & Domenech (2000) assumes that the initial capital stock can be estimated from the rate of growth in investment (Berlemann and Jan-Erik, 2012). According to Berlemann and Jan-Erik (2012) the initial capital stock is given by:

$$K_{t-1} = \frac{I_t}{g_I + \delta} \qquad (1.5)$$

where g_I is the rate of growth in investment.

The synthetic time series approach attributed to Jacob, Sharma and Grabowsky (1997) and Kamps (2006) first calculates time series data for investment based on an annual average rate of 4 percent per annum (the average rate of growth in investment in the United States between 1960 and 2001). The calculated series is then used to derive the initial capital stock using an appropriate rate of depreciation (Berlemann & Jan-Erik, 2012).

The steady state approach gives unreliable values for the initial capital stock where there are fluctuations in the average rate of growth in output, while the disequilibrium approach requires the use of filters to get the investments adjustment path which leads to information loss as the first observation is dropped, and the first observation heavily determines the initial capital stock when using the synthetic time series approach (Berlemann & Jan-Erik, 2012). The study therefore used the unified approach developed by Domenech and De La Fuente (2000) following Berlemann and Jan-Erik (2012). The initial capital stock was calculated as:

$$K_{t-1} = \frac{I_{t1}}{g_I + \delta} \qquad (1.6)$$

where g_I is the estimated long-run rate of growth in investment measured by in

equation (1.7).

is the value of the initial investment

The initial investment is derived using regression analysis from the full time series for investment, then regressing the logarithms of the series on time using equation (1.7)

$$= + *t+ \qquad (1.7)$$

Using the estimated parameters in equation (1.7), an estimated value for the logarithm of investment in the first time period, is calculated using equation (1.8)

$$= + .t_1 \qquad (1.8)$$

The estimated value is then transformed using the anti-log giving a full time series of investment where the first value is used to calculate the initial capital stock.

The study period was from 1974 to 2016, hence K_{t-1} is the initial capital stock (1973) and I_t is the gross fixed capital formation in 1974, while g_I is the calculated average growth in investment over the stated time period, . To get the average rate of growth in investment, the study used ordinary least squares to regress the log of investment on time following Nehru and Dhareshwar (1993) using the following equation:

$$\log I_t = \qquad (1.9)$$

Where:

is the log of investment over time

is the coefficient of the rate of growth in investment over time

is the error term

The rate of growth in investment over the study time period was found to be 5.78 percent as shown in Table A1 in Appendix A. This was used to calculate the initial capital stock facilitating the derivation of subsequent values of the capital stock using equation (1.3).

Table A1: OLS Regression Results for Log of Investments against Time

Independent Variable: Log of Investments	Coefficient (t – value)
Constant	9.538287***
Time	0.0578242*** (79.91)
Number of Observations	43
Adjusted R-squared	0.9932
Prob>Chi Square	0.0000

***Indicates variable significant at one per cent

Source: Author‟s Computation

Appendix B: Data Used

Table A2: Factor inputs (Objective One)

Year	GDP (Kshs 2010)	Capital (Kshs 2010)	Formal labour	Informal labour
1974	1,680,363,047,573	2,702,639,818,836	826,300	132,100
1975	1,591,514,094,357	2,398,922,253,568	819,100	131,000
1976	1,734,577,934,603	2,335,322,088,338	857,500	152,400
1977	1,932,935,253,889	2,223,852,460,955	902,900	160,900
1978	1,821,762,676,546	2,143,870,241,669	911,600	173,500
1979	1,917,995,664,886	2,299,320,335,551	972,300	184,600
1980	1,948,630,664,918	2,231,339,627,870	1,005,800	185,000
1981	2,008,574,102,075	2,209,311,288,764	1,024,300	219,400
1982	1,885,512,200,036	2,040,016,959,918	1,046,000	234,900
1983	1,917,743,774,424	2,052,632,618,971	1,093,300	246,100
1984	1,949,752,072,436	2,073,852,229,884	1,119,700	265,700
1985	1,949,009,715,763	2,030,179,431,112	1,174,400	287,600
1986	2,214,752,310,069	2,199,402,389,268	1,226,600	316,500
1987	2,276,362,763,712	2,313,490,658,790	1,274,100	350,200
1988	2,292,468,530,719	2,345,353,688,972	1,326,600	390,100
1989	2,315,198,767,072	2,359,709,583,031	1,359,000	434,300
1990	2,265,926,405,103	2,275,749,658,234	1,407,700	491,300
1991	2,153,956,435,502	2,180,511,627,839	1,441,700	1,115,400
1992	1,995,187,664,091	1,940,185,043,299	1,462,100	1,291,300
1993	1,724,070,306,195	1,482,614,674,938	1,474,900	1,522,700
1994	1,607,398,254,460	1,314,361,916,550	1,505,500	1,850,700
1995	1,837,970,282,776	1,521,783,916,693	1,557,000	2,301,600
1996	2,496,628,662,257	1,682,048,296,738	1,618,800	2,707,000
1997	2,510,137,927,146	1,786,269,232,734	1,647,400	3,051,000
1998	2,597,803,477,015	1,943,623,127,473	1,678,400	3,418,300
1999	2,618,784,338,789	2,122,084,950,142	1,688,700	3,803,900
2000	2,541,063,259,123	2,194,649,655,965	1,695,400	4,216,200
2001	2,533,226,354,833	2,362,926,416,758	1,677,100	4,689,800
2002	2,521,396,672,272	2,640,987,591,996	1,699,700	5,173,500
2003	2,509,820,864,055	2,668,419,578,795	1,727,300	5,783,100
2004	2,531,650,730,190	2,615,177,963,099	1,763,700	6,059,100

Table A2 ***continued***

Year	GDP (Kshs 2010)	Capital (Kshs 2010)	Formal labour	Informal labour
2005	2,549,619,085,598	2,613,450,561,258	1,808,700	6,695,100
2006	2,929,919,396,997	2,574,373,761,685	1,859,700	7,115,900
2007	3,084,165,216,564	2,734,998,367,216	1,907,300	7,543,000
2008	2,819,793,303,446	2,535,110,373,882	1,943,900	8,009,700
2009	2,977,129,818,309	2,680,143,349,902	1,999,300	8,400,200
2010	3,169,301,000,000	2,966,154,038,395	2,059,100	8,899,600
2011	3,267,731,409,813	3,023,940,987,455	2,084,100	9,993,600
2012	3,416,712,484,236	3,221,130,839,767	2,149,000	10,588,100
2013	3,599,215,421,595	3,564,769,857,388	2,283,100	11,233,900
2014	3,830,713,359,935	3,845,629,121,152	2,370,200	11,949,000
2015	4,144,335,998,736	4,233,704,475,151	2,478,000	12,658,600
2016	4,484,047,887,857	4,592,994,425,329	2,554,300	13,442,200

Table A3: TFP Analysis Data

	Total Factor Productivity	Real Average Earnings in the Informal Sector	Human Capital	Life Expectancy	Passable Roads ('000 kms)	Openness	Inflation Rate	Lending Rate	Financial Deepening	Foreign Direct Investment	Digital Technology	Conflict
1974	0.68	12.76	195779	54.50	4022.40	74.57	17.81	9.50	25.71	0.79	0.00	0
1975	-0.07	17.12	226800	55.04	4046.80	64.34	19.12	10.00	27.39	0.53	0.00	0
1976	6.90	21.67	280400	55.59	4044.90	64.21	11.45	10.00	28.18	1.33	0.00	0
1977	10.36	26.34	319982	56.15	4376.30	66.55	14.82	10.00	32.80	1.26	0.00	0
1978	-5.08	28.25	362025	56.71	4330.50	67.62	16.93	10.00	34.53	0.65	0.00	0
1979	-1.62	33.41	384389	57.25	5335.90	57.36	7.98	10.00	34.35	1.35	0.00	0
1980	0.98	45.41	419201	57.76	5541.80	65.42	13.86	10.58	29.93	1.09	0.00	0
1981	1.74	55.75	410550	58.21	6416.80	64.28	11.60	12.42	29.47	0.21	0.00	0
1982	-4.34	69.96	438424	58.59	6400.90	58.22	20.67	14.50	30.42	0.20	0.00	1
1983	-1.18	81.69	493710	58.87	6720.70	54.16	11.40	15.83	28.18	0.40	0.00	1
1984	-0.39	98.20	498146	59.04	6720.70	58.80	10.28	14.42	28.34	0.17	0.00	0
1985	-2.13	129.33	437207	59.08	6730.70	55.45	13.01	14.00	26.68	0.47	0.00	0
1986	7.31	140.58	458712	58.99	6730.70	55.74	2.53	14.00	30.39	0.45	0.00	0
1987	-1.93	159.38	522261	58.78	6924.10	47.70	8.64	14.00	30.24	0.49	0.00	0
1988	-2.56	196.36	540192	58.47	7686.80	49.97	12.26	15.00	28.90	0.00	0.00	0
1989	-1.05	242.40	640735	58.05	7686.80	53.16	13.79	17.25	28.40	0.75	0.00	0
1990	-3.09	302.22	618461	57.54	7943.20	57.02	17.78	18.75	29.58	0.67	0.00	0
1991	-8.46	386.66	614161	56.92	8323.40	55.60	20.08	19.00	30.98	0.23	0.00	0
1992	-3.94	535.46	621443	56.21	8621.40	52.93	27.33	21.07	36.52	0.08	0.00	1
1993	-4.60	872.06	517577	55.45	8941.50	72.86	45.98	29.99	37.07	2.53	0.00	1

Table A3 ***continued***

	Total Factor Productivity	Real Average Earnings in the Informal Sector	Human Capital	Life Expectancy	Passable Roads ('000 kms)	Openness	Inflation Rate	Lending Rate	Financial Deepening	Foreign Direct Investment	Digital Technology	Conflict
1994	-3.74	1285.19	619839	54.67	8803.70	71.27	28.81	36.24	38.02	0.10	0.00	0
1995	5.03	1535.28	632388	53.91	8671.70	71.75	1.55	28.80	42.23	0.47	0.00	0
1996	28.68	1967.84	358253	53.21	8671.70	57.31	8.86	33.79	35.79	0.90	0.00	0
1997	-3.45	2673.11	687473	52.59	8671.70	54.06	11.36	30.25	38.42	0.47	0.00	0
1998	-1.64	4149.00	700538	52.11	8672.10	48.90	6.72	29.49	35.81	0.19	0.00	0
1999	-3.78	6000.00	713259	51.81	8672.10	48.19	5.74	22.38	35.77	0.40	0.00	0
2000	-4.96	7159.44	758967	51.75	8936.90	53.31	9.98	22.34	35.16	0.87	0.00	0
2001	-3.31	7649.53	736245	52.00	8936.90	55.95	5.74	19.67	35.24	0.04	0.00	0
2002	-6.47	7670.96	778601	52.57	8937.00	55.17	1.96	18.45	38.16	0.21	0.00	1
2003	-2.14	7424.40	882513	53.41	8927.90	54.13	9.82	16.57	39.02	0.55	0.00	0
2004	0.42	7110.52	923134	54.51	9130.30	59.48	11.62	12.53	39.33	0.29	0.00	0
2005	-0.97	6930.00	928149	55.82	9130.30	64.48	10.31	12.88	38.91	0.11	0.00	0
2006	13.83	7047.00	1030080	57.27	9130.30	55.24	14.45	13.64	34.60	0.20	0.00	0
2007	1.08	7479.67	1180267	58.78	9273.30	53.89	9.76	13.34	36.06	2.28	3.77	1
2008	-6.72	8209.66	1382211	60.28	9273.30	57.58	26.24	14.02	36.11	0.27	26.99	1
2009	1.49	9218.61	1472634	61.68	8879.00	50.86	9.23	14.80	36.46	0.31	52.34	0
2010	0.16	10488.18	1653384	62.94	8879.00	54.23	3.96	14.37	40.31	0.45	75.87	0
2011	1.25	12000.00	1767720	64.01	8880.00	60.45	14.02	15.05	40.85	0.33	118.08	0
2012	-0.04	13731.32	1914823	64.91	9612.00	55.22	9.38	19.72	40.86	0.32	150.16	0
2013	-2.70	15641.76	2104262	65.65	11230.00	51.28	5.72	17.31	41.41	0.67	182.50	0
2014	0.87	17686.54	2331697	66.24	11363.00	51.12	6.88	16.51	42.61	1.54	225.55	0
2015	1.31	19820.88	2558981	66.69	11373.00	44.81	6.58	16.09	42.18	0.97	267.07	0
2016	2.78	22000.00	2720563	67.03	11796.00	37.93	6.30	16.56	38.05	0.56	316.77	0

Table A4: Poverty Analysis Data

Year	Poverty Headcount Index	Depth of Informality	Earth Roads ('000 kms)	Bitumen Roads ('000 kms)	Total Roads ('000 kms)	Savings	Real Effective Exchange Rate	Government Debt	Human Capital	Conflict
1974	42.00	0.14	48332.80	4022.40	52355.20		0.40	0.30	195779	0
1975	42.63	0.14	48284.20	4046.80	52331.00	12.26	0.45	0.30	226800	0
1976	43.25	0.15	46046.60	4044.90	50091.50	17.43	0.54	0.31	280400	0
1977	43.88	0.15	46027.50	4376.30	50403.80	25.25	0.57	0.27	319982	0
1978	44.50	0.16	46240.90	4330.50	50571.40	18.24	0.58	0.29	362025	0
1979	45.13	0.16	46032.00	5335.90	51367.90	10.23	0.55	0.36	384389	0
1980	45.75	0.16	45930.40	5541.80	51472.20	17.23	0.54	0.33	419201	0
1981	46.38	0.18	47160.20	6416.80	53577.00	19.56	0.67	0.36	410550	0
1982	47.00	0.18	47378.80	6400.90	53779.70	15.06	0.92	0.39	438424	1
1983	47.23	0.18	47863.00	6720.70	54583.70	18.50	1.21	0.48	493710	1
1984	47.45	0.19	47863.50	6720.70	54584.20	14.06	1.38	0.52	498146	0
1985	47.68	0.20	47450.04	6730.70	54180.74	20.15	1.72	0.44	437207	0
1986	47.90	0.21	47540.40	6730.70	54271.10	17.18	1.71	0.47	458712	0
1987	48.13	0.22	47540.40	6924.10	54464.50	18.28	1.82	0.48	522261	0
1988	48.35	0.23	54400.90	7686.80	62087.70	20.35	2.12	0.52	540192	0
1989	48.58	0.24	54400.90	7686.80	62087.70	19.31	2.66	0.46	640735	0
1990	48.80	0.26	54341.30	7943.20	62284.50	18.55	3.32	0.49	618461	0

Table A4 ***continued***

Year	Poverty Headcount Index	Depth of Informality	Earth Roads ('000 kms)	Bitumen Roads ('000 kms)	Total Roads ('000 kms)	Savings	Real Effective Exchange Rate	Government Debt	Human Capital	Conflict
1991	46.80	0.44	54249.10	8323.40	62572.50	19.11	4.58	0.55	614161	0
1992	44.80	0.47	54498.80	8621.40	63120.20	14.62	6.64	0.65	621443	1
1993	42.55	0.51	65581.80	8941.50	74523.30	37.32	16.94	0.96	517577	1
1994	40.30	0.55	55675.50	8803.70	64479.20	33.48	20.55	0.72	619839	0
1995	48.15	0.60	55270.20	8671.70	63941.90	23.18	18.63	0.62	632388	0
1996	56.00	0.63	55270.20	8671.70	63941.90	15.82	21.88	0.51	358253	0
1997	52.30	0.65	55270.20	8671.70	63941.90	15.44	24.48	0.39	687473	0
1998	53.80	0.67	55270.20	8672.10	63942.30	18.34	26.45	0.37	700538	0
1999	55.30	0.69	54353.70	8672.10	63025.80	21.81	31.88	0.44	713259	0
2000	56.80	0.71	54353.70	8936.90	63290.60	13.51	36.74	0.39	758967	0
2001	55.40	0.74	54353.70	8936.90	63290.60	14.03	38.96	0.57	736245	0
2002	53.64	0.75	54353.80	8937.00	63290.80	13.99	39.20	0.57	778601	1
2003	51.88	0.77	54327.20	8927.90	63255.10	15.25	40.59	0.56	882513	0
2004	50.12	0.77	54442.10	9130.30	63572.40	16.05	46.01	0.54	923134	0
2005	48.36	0.79	54442.10	9130.30	63572.40	16.84	46.84	0.49	928149	0

Table A4 ***continued***

Year	Poverty Headcount Index	Depth of Informality	Earth Roads ('000 kms)	Bitumen Roads ('000 kms)	Total Roads ('000 kms)	Savings	Real Effective Exchange Rate	Government Debt	Human Capital	Conflict
2006	46.60	0.79	54442.10	9130.30	63572.40	16.01	49.56	0.44	1030080	0
2007	46.30	0.80	54301.20	9273.30	63574.50	16.55	49.38	0.39	1180267	1
2008	46.00	0.80	54301.50	9273.30	63574.80	13.79	61.69	0.36	1382211	1
2009	46.00	0.81	53066.00	8879.00	61945.00	14.51	75.62	0.39	1472634	0
2010	46.00	0.81	53067.00	8879.00	61946.00	13.27	79.23	0.42	1653384	0
2011	46.00	0.83	53074.00	8880.00	61954.00	10.89	98.16	0.43	1767720	0
2012	46.00	0.83	52431.00	9612.00	62043.00	13.11	100.12	0.36	1914823	0
2013	46.00	0.83	52410.00	11230.00	63640.00	11.32	106.29	0.37	2104262	0
2014	42.70	0.83	52479.00	11363.00	63842.00	12.05	114.12	0.41	2331697	0
2015	39.40	0.84	50689.00	11373.00	62062.00	14.86	135.66	0.43	2558981	0
2016	36.10	0.84	51281.00	11796.00	63077.00	12.03	147.23	0.45	2720563	0

Appendix C: Pairwise Correlation

Table A5: Results of Pair-wise Correlation Analysis (Objective One)

	Capital	Formal Labour	Informal Labour
Capital	1		
Formal Labour	0.663	1	
Informal Labour	0.804	0.946	1

Source: Author‟s Computation

Table A6: Results of Pair-wise Correlation Analysis (Objective Two)

	Wages in Informal Sector	Human Capital	Life Expectancy	Openness	Passable roads	Inflation	Lending Rate	Financial Deepening	Foreign Direct Investment	Digital Technology	Conflict
Wages in Informal Sector	1										
Human Capital	-0.043	1									
Life Expectancy	-0.287	-0.005	1								
Openness	-0.230	-0.054	-0.392	1							
Passable roads	-0.207	-0.067	0.376	-0.557	1						
Inflation	0.517	-0.058	-0.134	0.471	-0.175	1					
Lending Rate	0.522	-0.061	-0.335	0.004	0.444	0.174	1				
Financial Deepening	-0.249	0.076	0.246	-0.192	0.760	-0.194	0.386	1			
Foreign Direct Investment	0.188	-0.049	0.088	0.189	-0.059	0.228	-0.035	0.056	1		
Digital Technology	-0.224	0.029	0.812	-0.494	0.608	-0.259	-0.052	0.524	0.109	1	
Conflict	0.071	-0.050	-0.047	0.033	0.0724	0.427	0.056	-0.000	0.198	-0.164	1

Source: Author‟s Computation

Table A7: Results of Pair-wise Correlation Analysis (Objective Three)

	Depth of informality	Earth roads	Bitumen roads	Total road network	Savings	Real effective exchange rate	Government Debt	Human capital	Inflation	Conflict
Depth of informality	1									
Earth roads	0.6092	1								
Bitumen roads	0.8722	0.6406	1							
Total road network	0.7562	0.9627	0.8244	1						
Savings	-0.2604	0.3494	-0.1547	0.2031	1					
Real effective exchange rate	0.8144	0.2426	0.7946	0.4587	-0.4098	1				
Government Debt	0.1514	0.6889	0.3333	0.6252	0.5786	-0.1001	1			
Human capital	0.0324	-0.1157	-0.0584	-0.1058	-0.1322	0.0482	-0.3066	1		
Conflict	0.0174	0.2199	0.0541	0.1811	0.1220	-0.1061	0.3044	-0.0475	0.4367	1

Source: Author‟s Computation

APPENDIX D: Model Estimation Results

Table A8: Growth Accounting Results (Model 1)

Dependent variable: Log GDP		
Variable	**Coefficient**	**Standard Error**
Constant	2.3449***	0.7470
Log Capital	0.4640***	0.0458
Log Formal Employment	0.7333***	0.1301
Log Informal Employment	-0.0376	0.0245
Adjusted R-Squared	0.9375	
Durbin-Watson Statistic	0.7237	
Prob. F-statistic	0.0000	

*NB: *** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %*

Source: Author‟s Computation

Table A9: Growth Accounting Results (Model 1a)

Dependent variable: Log GDP		
Variable	**Coefficient**	**Standard Error**
Constant	3.4026***	0.2846
Log Capital	0.4521***	0.0446
Log Formal Employment	0.5513***	0.0529
Log Informal Employment	-0.0034	0.010
Adjusted R-Squared	0.9354	
Durbin-Watson Statistic	0.7163	
Prob. F-statistic	0.0000	

*NB: *** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %*

Source: Author‟s Computation

Table A10: Growth Accounting Results (Model 1b)

Dependent variable: Log GDP		
Variable	**Coefficient**	**Standard Error**
Constant	3.6951***	0.2859
Log Capital	0.4114***	0.0406
Log Formal Employment	0.5463***	0.0591
Log Informal Employment	0.0423	0.0258
Dummy capturing structural break in GDP	-0.0814***	0.0125
Dummy capturing structural break in capital	0.0047***	0.0011
Dummy capturing structural break in informal employment	-0.0103**	0.0044
Adjusted R-Squared	0.9722	
Durbin-Watson Statistic	1.1277	
Prob. F-statistic	0.0000	

*NB: *** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %*

Source: Author‟s Computation

Table A11: Total Factor Productivity Analysis Results (Model 2 - OLS)

Dependent Variable: Total Factor Productivity		
Variable	**Coefficient**	**Standard Error**
Constant	-6.0947	29.1217
Informal sector wage (growth rate)	-22.5310*	11.1801
Life expectancy	0.3614	0.4334
Human capital	-12.0271**	5.3164
Passable roads	-0.0021	0.0012
Openness	-0.0455	0.2056
Inflation rate	-0.1166	0.1734
Lending rate	0.7302**	0.2889
Financial deepening	-0.0790	0.3620
Foreign Direct Investment	3.3593*	1.7705
Digital technology	-0.0057	0.0271
Conflict	-3.6226	2.8595
Adjusted R-Squared	*0.1939*	
Durbin-Watson Statistic	*1.6527*	
Prob. F-statistic	*0.0757*	

*NB: *** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %*

Source: Author‟s Computation

Table A12: Total Factor Productivity Analysis Results (Model 2a - OLS)

Dependent Variable: Total Factor Productivity		
Variable	**Coefficient**	**Standard Error**
Constant	-12.0652	16.2732
Informal sector wage (growth rate)	-19.1170***	5.4072
Life expectancy	0.2234	0.2376
Human capital	-9.1529***	2.7631
Openness	0.1462*	0.0838
Inflation rate	-0.2378***	0.0854
Lending rate	0.5856***	0.1246
Financial deepening	-0.4004**	0.1658
Foreign Direct Investment	2.8561***	0.9366
Digital technology	0.0062	0.0144
Conflict	-2.9497*	1.5115
Dummy capturing economic boom	9.8957***	1.3084
Dummy capturing economic recession	-5.8816***	1.4626
Adjusted R-Squared	*0.7752*	
Durbin-Watson Statistic	*1.7055*	
Prob. F-statistic	*0.00000*	

*NB: *** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %*

Source: Author‟s Computation

Table A13: Results of the Ordinary Least Squares for Poverty Alleviation (Model 3a)

Dependent variable: Poverty Headcount Index		
Variable	**Coefficient**	**Standard Error**
Constant	46.3558***	1.8870
Depth of informality	14.0597***	2.1271
Bitumen roads	0.0004	0.0004
Savings	-0.2126***	0.0685
Real effective exchange rate	-0.1246***	0.0170
Government debt	-2.4508	3.7636
Human capital	-3.5042**	1.6164
Conflict (dummy)	-2.0715***	0.7319
Dummy capturing economic boom	4.0043***	0.7183
Dummy capturing economic recession	-2.6765**	0.76612
Adjusted R-Squared	*0.8599*	
Durbin-Watson Statistic	*1.4473*	
Prob. F-statistic	*0.0000*	

*NB: *** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %*

Source: Author‟s Computation

Table A14: Results of the Ordinary Least Squares for Poverty Alleviation (Model 3b)

Dependent variable: Poverty Headcount Index		
Variable	**Coefficient**	**Standard Error**
Constant	53.6279***	6.3375
Depth of informality	18.7676***	2.9320
Total roads	-0.0001	0.0002
Savings	-0.1909**	0.0788
Real effective exchange rate	-0.1318***	0.0141
Government debt	1.5596	4.4636
Human capital	-3.2137*	1.7712
Conflict (dummy)	-2.0757**	0.7998
Dummy capturing economic boom	3.7260***	0.7109
Dummy capturing economic recession	-3.3708***	0.8524
Adjusted R-Squared	*0.8328*	
Durbin-Watson Statistic	*1.6023*	
Prob. F-statistic	*0.0000*	

*NB: *** Significant at 1 %, ** Significant at 5 %, * Significant at 10 %*

Source: Author‟s Computation

Table A15: Growth Accounting Results

Year	Growth in GDP (%)	Factor Contributions			TFP contribution (%)
		Capital (%)	Formal labour (%)	Informal labour (%)	
1974	2.51	-4.35	4.59	1.59	0.68
1975	-5.29	-4.72	-0.47	-0.03	-0.07
1976	8.99	-1.11	2.52	0.68	6.90
1977	11.44	-2.01	2.85	0.23	10.36
1978	-5.75	-1.51	0.52	0.32	-5.08
1979	5.28	3.05	3.58	0.26	-1.62
1980	1.60	-1.24	1.85	0.01	0.98
1981	3.08	-0.41	0.99	0.77	1.74
1982	-6.13	-3.22	1.14	0.29	-4.34
1983	1.71	0.26	2.43	0.20	-1.18
1984	1.67	0.43	1.30	0.33	-0.39
1985	-0.04	-0.89	2.63	0.34	-2.13
1986	13.63	3.50	2.39	0.42	7.31
1987	2.78	2.18	2.08	0.44	-1.93
1988	0.71	0.58	2.22	0.47	-2.56
1989	0.99	0.26	1.31	0.47	-1.05
1990	-2.13	-1.51	1.93	0.54	-3.09
1991	-4.94	-1.78	1.30	4.00	-8.46
1992	-7.37	-4.69	0.76	0.50	-3.94
1993	-13.59	-10.03	0.47	0.56	-4.60
1994	-6.77	-4.82	1.12	0.68	-3.74
1995	14.34	6.71	1.84	0.77	5.03
1996	35.84	4.48	2.14	0.55	28.68
1997	0.54	2.63	0.95	0.40	-3.45
1998	3.49	3.74	1.01	0.38	-1.64
1999	0.81	3.90	0.33	0.36	-3.78
2000	-2.97	1.44	0.21	0.34	-4.96
2001	-0.31	3.22	-0.58	0.35	-3.31
2002	-0.47	4.95	0.73	0.32	-6.47
2003	-0.46	0.44	0.87	0.37	-2.14
2004	0.87	-0.84	1.13	0.15	0.42
2005	0.71	-0.03	1.37	0.33	-0.97

Table A15 ***Continued***

Year	Growth in GDP (%)	Factor Contributions			TFP contribution (%)
		Capital (%)	Formal labour (%)	Informal labour (%)	
2006	14.92	-0.63	1.52	0.20	13.83
2007	5.26	2.62	1.38	0.19	1.08
2008	-8.57	-3.07	1.03	0.19	-6.72
2009	5.58	2.40	1.53	0.15	1.49
2010	6.45	4.49	1.61	0.19	0.16
2011	3.11	0.82	0.65	0.39	1.25
2012	4.56	2.74	1.68	0.19	-0.04
2013	5.34	4.48	3.36	0.19	-2.70
2014	6.43	3.31	2.05	0.20	0.87
2015	8.19	4.24	2.45	0.19	1.31
2016	8.20	3.57	1.66	0.19	2.78
Total	***114.25***	***23.59***	***66.48***	***19.69***	***4.49***
Average	***2.66***	***0.55***	***1.55***	***0.46***	***0.10***
Percentages	***100.00***	***20.64***	***58.19***	***17.23***	***3.93***

Source: Author‟s Computation

Appendix E: Model Stability Test Results

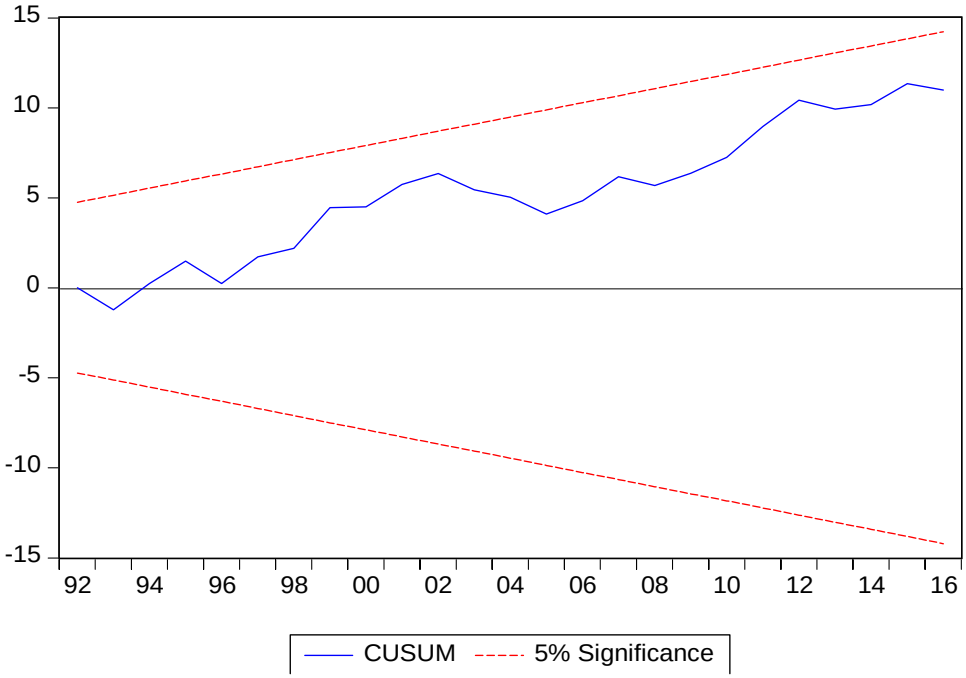

Figure A1: CUSUM test for the Growth Accounting (Model 1c)

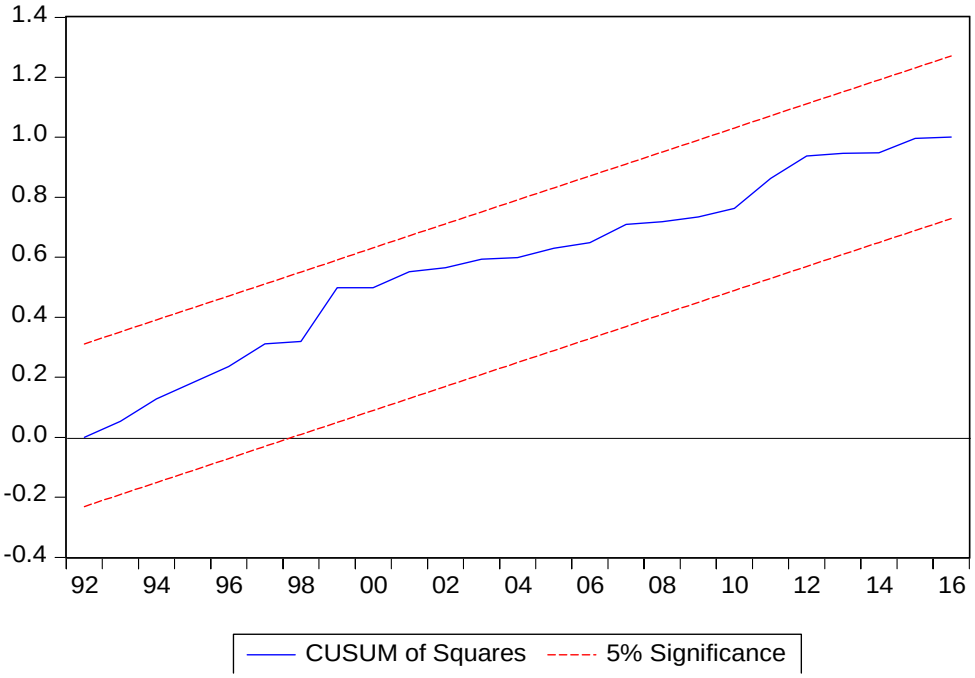

Figure A2: CUSUM of Squares test for the Growth Accounting (Model 1c)

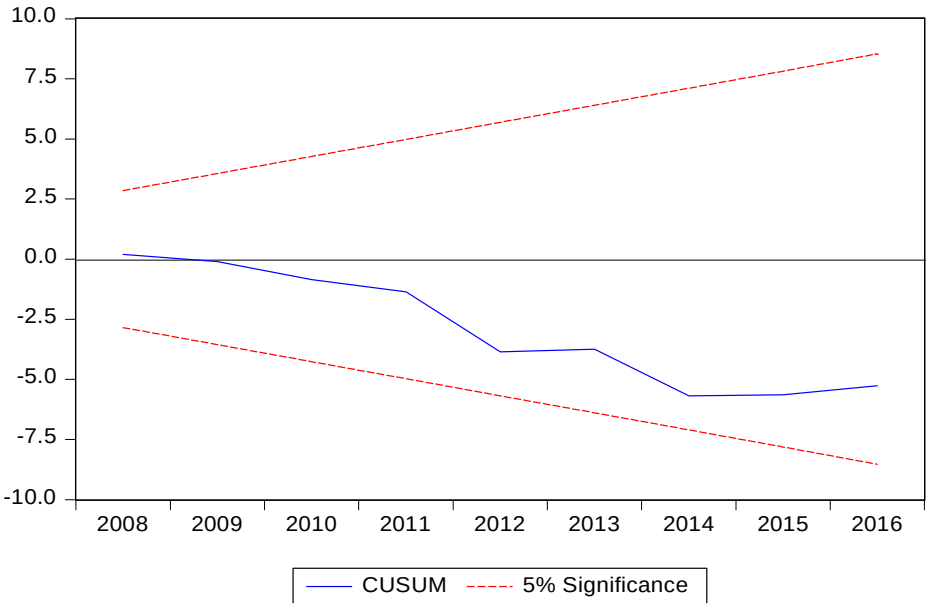

Figure A3: CUSUM test for TFP Analysis (Model 2b)

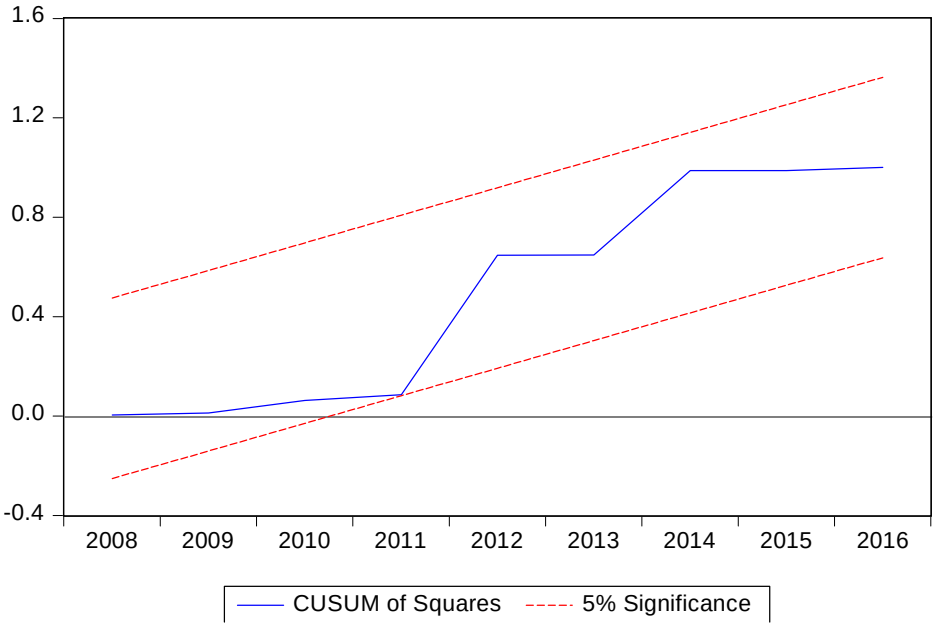

Figure A4: CUSUM of Squares test for TFP Analysis (Model 2b)

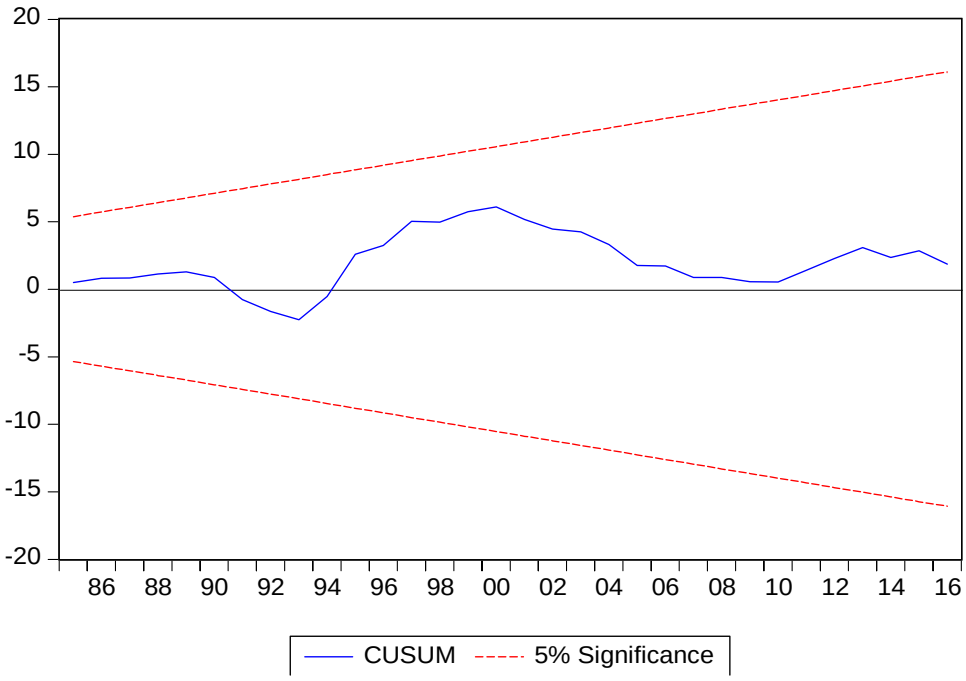

Figure A5: CUSUM test for Poverty Alleviation Analysis (Model 3)

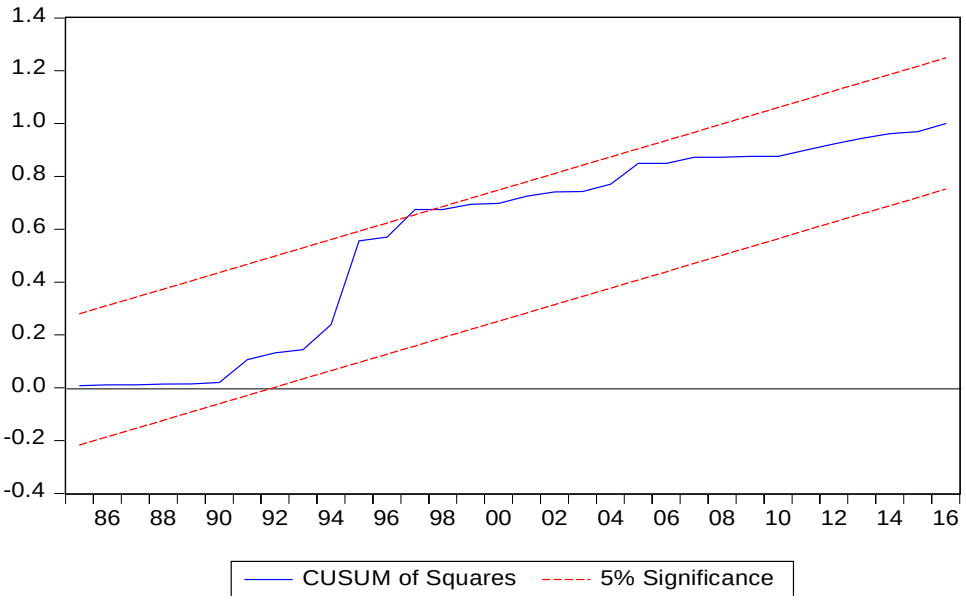

Figure A6: CUSUM of Squares test for Poverty Alleviation Analysis (Model 3)