GOVERNMENT EXPENDITURE, EFFICIENCY, INSTITUTIONAL QUALITY AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICAN COUNTRIES

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DECLARATION

I, the undersigned, declare that this Thesis is my original work and has not been presented for a degree in any other university

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APPROVAL

This Thesis has been submitted with our approval as the University Supervisors.

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DEDICATION

This work is dedicated to my life partner Harriet Tzindoli, my daughter Hailey Amondi and my son Lukayo Ochieng'.

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ABBREVIATIONS

ARDL	Autoregressive distributed Lag
BCC	Banker, Charnes, and Cooper
CAR	Central Africa Republic
CCR	Charnes, Cooper and Rhodes
CPIA	Country Policy and Institutional Assessment
CRS	Constant Returns to Scale
DEA	Data Envelope Analysis
DMUs	Decision Making Units
DRC	Democratic Republic of Congo
EBA	Extreme Bound Analysis
ECM	Error Correction Model
EU	European Unions
FDH	Free Disposal Hull
FE	Fixed Effect
FM-OLS	Fully Modified Ordinary Least Squares
GDP	Gross Domestic Product
GMM	Generalised Methods of Moments
ICRG	International Country Risk Guide
IMF	International Monetary Fund
LLC	Levvin, Lin and Chu
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
PRS	Property Rights
R& D	Research and Development
RE	Random Effect
SDGs	Sustainable Development Goals
SFA	Stochastic Frontier Analysis
SSA	Sub-Saharan Africa
SUR	Seemingly Unrelated Regression
UCM	Unobserved Components Methodology
UK	United Kingdom
VAR	Vector Autoregressive

VRS	Variable Returns to Scale
WB	World Bank
WGDI	Wold Development Indicators
WGI	Worldwide Governance Indicators

ABSTRACT

The aim of this thesis was threefold. First, the study scrutinized the role of government spending on output growth for SSA countries. SSA countries' economic growth has been low compared to other developing regions. Empirical evidence has shown that government expenditure is a significant driver of output growth. However, SSA economic performance has largely lagged despite the increase in government expenditure. The second objective assessed the efficiency of public spending and the sources of inefficiencies in spending across Sub-Saharan African countries. The third objective analysed the role of institutional quality on income variation among Sub-Saharan countries. The issues of institutional quality have been considered to be fundamental in explaining income variation across countries. Botswana's growth miracle has been achieved by the strong institutions it embraced. This thesis therefore analysed the effect of institutional quality on output growth. In addition, we examined if income variation differs with the income level of SSA countries.

Objective one and three adopted dynamic panel data and were estimated using two-step system GMM while taking into account the problem of instrument proliferation. Panel data of 35 SSA countries was considered for the periods 2006-2018. Efficiency score for objective two was achieved by adopting two-step bootstrap output-oriented DEA technique. Both CCR, BCC and scale efficiency were estimated.

The study provided evidence that education and health expenditure are key determinants of income growth for SSA. The impact of education spending on cross-country income variation is more effective in low income SSA countries than the middle income SSA countries. However, military expenditure on output growth is more effective in improving income level of middle income SSA countries than low income SSA countries. SSA countries should allocate more funding towards education sector and should also avail compulsory and free primary and secondary education. SSA should carry out health reforms which improve primary health and universal health insurance coverage.

The average bias-corrected inefficiency score was 48percent between 2006 and 2018 and the uncorrected spending inefficiency score averaged 32.3percent. Income per capita, secondary school enrolment rate, domestic savings, rule of law, political stability, capital formation, and accountability significantly determine the inefficiencies of government spending across SSA countries. Spending efficiency can be improved through efficient management of public resources. Distortions in SSA government expenditure can be eliminated by designing policies that improve income per capita and institutional quality.

Institutional quality plays a significant role on output growth of SSA countries. Government effectiveness contributes more to income growth in middle income countries than in low income SSA countries. There exists regional difference on the effect of institutional quality on economic growth across the four regions of SSA. The contribution of institutional quality to output growth is more effective at the lower level of income and upper level of income than the middle level of income of SSA countries. SSA countries should strengthen institutional bodies that act as checks and balances for government operations. Strategic partnership that promotes civil liberty and independence of institutions should be adopted by SSA member states.

Key words: SSA, government spending, institutional quality, Income growth, Dynamic Panel

Model.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The effect of government expenditure on cross country income variation has elicited considerable interest in the past decades. Government intervention in the economy is necessary because private markets do not produce efficient outcome. Therefore market failure defined by externalities, incomplete markets, information asymmetry and public goods necessitates government intervention through fiscal policy. Government involvement in the economy through public spending could either enhance or retard economic growth.

Literatures that explored the effect of spending on output growth have largely remained ambiguous. One strand of literature posits that productive spending accelerates growth while unproductive spending is growth retarding (Landau, 1985; Ram, 1986).However, most of Sub-Saharan African (SSA) countries have experienced dwindling economic performance since independence despite increase in government expenditure (Ghura&Hadjimichael, 1996; Gyimah-Brempong&Traynor, 1999).

Government expenditure policies that maintain sustainable economic growth remain key objective that governments pursue. Efficient resource allocation, distribution and stabilization are also important in the realization of fiscal discipline that improves the economic growth of a particular country (Afonso *et al.,* 2006). A sound fiscal policy significantly contributes to stable economic environment which creates expectation in the economy which foster long run income growth of a country (Afonso, Schuknecht and Thone, 2005).

SSA countries have experienced underdevelopment and low economic growth. This perception is supported at the aggregate level by low average income per person and low

average growth rates of income over the last several decades (Garner, 2006).Figure 1 depicts the trend in GDP per capita for various global economic regions.

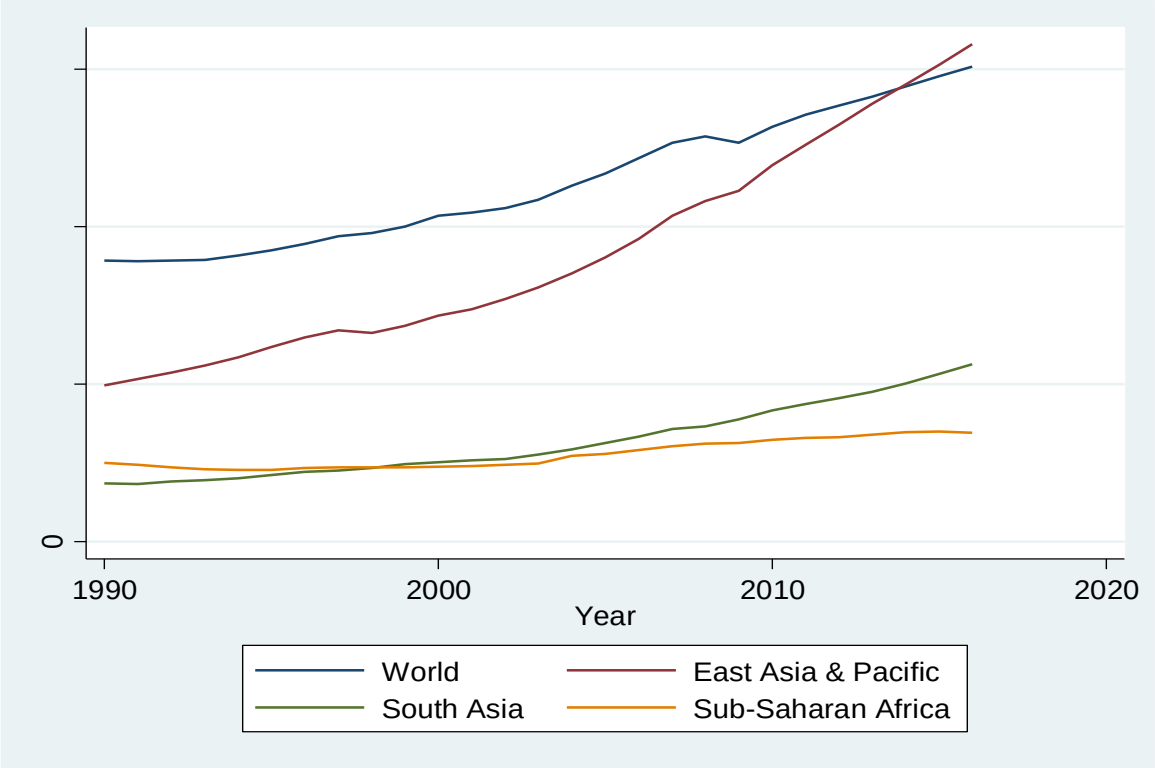


Figure 1: GDP Per capita

Figure 1 indicates that although SSA had experienced a higher GDP per capita than South Asia, by 1999 it had been overtaken by the South Asia region. Figure 1 further shows that the gap between the world GPD per capita and SSA GDP per capita has been widening from 1990. Evidently, GDP per capita for SSA has stagnated below $5000.

Table 1 presents GDP growth rate across world economic regions from 1969 to 2017.

	Average Growth 1969 to 1979	Average Growth 1980 to 1999	Average Growth 2000 to 2017
World	4.35	2.84	2.9
East Asia Pacific	5.43	4.36	4.48
Latin America Caribbea	6.08	2.44	2.67
Middle East North Africa	8.78	2.27	3.91
South Asia	3.27	5.51	6.64
Sub Saharan Africa	4.77	1.711	4.81

Table 1: GDP growth across world regions

Source: World Development Indicators, GDP growth (annual percent), 2016

Table 1 illustrates that over the period 1969-1979; SSA GDP growth rate averaged 4.77 percent which is slightly higher than both the world annual growth rate and South Asia countries. However, between 1980 and 1999, SSA recorded an average GDP growth rate of 1.711 percent. This implies that SSA was falling further behind the South Asian region and the OECD countries. However, the period from 2000 to 2017, Sub-Saharan Africa recorded an improvement in GDP growth, but this was still below the South Asian countries' growth rate.

In explaining slower economic growth in SSA, Graner (2006) postulates that lower capital formation and lower secondary school enrolment, and higher population growth rates explain poor economic performance in SSA. Artadi et al. (2004) assert that high fertility rate; low education level and low investment rates contribute to dwindling economic growth in SSA. Despite the low investment rates in Africa relative to other undeveloped regions, low investment in itself cannot explain the slow output growth. This is because the productivity of investment in Africa is low (Devarajan et al., 2003).

Sachs et al. (1997) in contrast argued that SSA's slow economic growth is attributed to dutch-disease, limited access to oceans, misaligned trade policies, inadequate savings, lack of market-supporting institutions and demographic factors. SSA can only experience good

economic performance if the problem of Dutch-disease costs and prevalence of disease and lower life expectancy are addressed (Sachs et al., 1997).

Various studies have explained the poor economic growth in SSA. Macroeconomic policies that encourage human capital development and lower population growth can stimulate African economic growth (Ghura&Hadjimichael, 1996). However, low human development, low investment rates or high population growth rate cannot entirely contribute to poor economic growth in SSA. Higher investment alone in Africa would not enhance faster GDP growth(Devarajan, Easterly, & Pack, 2003). The gist of the thesis picks up at this point. According to Devarajan (1996), a country's economic performance depends on whether it adopts productive or unproductive public expenditure

What could be the possible causes of poor economic growth in SSA? Governance has been cited by many authors to be the root cause of Africa's poor performance. For example, high degree of ethnic and linguistic diversity found in most African nations contributes to poor governance and low growth(Easterly & Levine, 1997). Allocation of public resources alone may not necessarily result to efficient outcome if institutions entrusted with the budgetary process are not optimal in resource allocation (Rajkumar&Swaroop, 2008). This illustrates that poor institutions contributes significantly to low income in SSA which discourage growth.

Despite poor economic performance of SSA countries, Botswana is an example of success story in Africa. WDI (2000) showed that Botswana had income per capita of $5,796 in 1998, which was almost four times average African income per capita. For the periods 1965 to 1998, Botswana's income per capita grew 7.7 percent annually (WDI 2000). According to Acemoglu, Johnson and Robinson (2002), Botswana achieved robust economic growth because it embraced better institutions than other African countries. Good institutions provide

an environment for property rights (PRs) protection, enhance political stability and cushion investors against interference from political elites. In contrast, Democratic Republic of the Congo (DRC) despite having large mineral deposits has still remained underdeveloped. Therefore poor governance arising from corruption that distorts economic incentives, can lead to low investment and the inefficient use of resources.

The problem then is seen not as one of the resource constraints in SSA but rather institutional weakness and poor policies. Institutional quality includes civil and political liberties, extent of corruption, political stability, public sector efficiency, regulatory framework and economic freedom. Governance should be seen as a function of the country's institutions which implies that good institutions translate into good governance and policies, transparency and accountability. This paves way to allocation efficiency and visionary leadership.

According to Comeau (2003) institutional checks and balances that renew policy makers through elections cushion the economy against corruption and misallocation of resources. Institutions that embrace democracy are believed to enhance economic prosperity by providing an environment that protects PRs and it also nurtures civil rights. This therefore provides economic players with incentives to undertake investment which consequently enhances economic growth. The mixed economic activity outcome in SSA therefore suggests that economic growth is determined by the strength of institutional variables.

This study therefore examined whether government spending has significant impact on output for SSA countries. Secondly, the study analysed the efficiency of spending and the determinants of efficiency of government spending for SSA countries. Lastly, this thesis examined the link between output and institutional quality. This thesis is motivated by two reasons. First, public expenditure for SSA has been increasing over the years yet there exists mixed economic performance among SSA countries. For instance, some SSA countries like

Botswana and Mauritius experience positive economic performance. However, some countries in SSA do experience shrinking or stagnated economic growth. The DRC had the worst growth performance which averaged -2.83 percent so that GDP per capita in 1996 was less than third of the 1961 level. Although endowed with substantial mineral resources, the DRC suffered from years of economic mismanagement and civil strife. Secondly, good institutions are vital for economic performance. Developing countries have not reached the levels attained by other regions despite advocating for democracy. Lastly, policy makers need to be informed of the status and source of inefficiency of public spending for SSA countries so as to identify the channels through which wastages of government expenditure occurs.

1.2 Statement of the Research Problem

Numerous research papers that involve output growth and government expenditure for SSA have been conducted. The findings have remained inconclusive on whether spending significantly retards or enhances output growth. The decline in output growth resulting from state spending is attributed to crowding out phenomenon. Provision of public goods through domestic borrowing could lead to a decrease in private sector. However, this understanding of crowding out does not consider the efficacy of public expenditure (Rajkumar and Swaroop, 2008). In contrast, it is argued that resources alone are not enough but the institutional capacity i.e, nature of structure and policies and institutional quality are also important drivers for economic growth.

Improving the quality of institutions could boost Sub-Saharan African's output growth by 0.9 of a percentage (International Monetary Fund (IMF), 2015). However, very few SSA countries have managed to better their institutional quality. Some countries in SSA are experiencing political strife, mega corruption scandals and poor implementation of budgetary policiesi.e, DRC, Kenya, and Central African Republic (CAR). Consequently, an important issue in public sector expenditure is whether an improvement in institutional quality can help

in ameliorating public spending on economic growth in SSA. Although increased public spending as a form of fiscal policy can spur economic growth, efficient outcome can be achieved with well-functioning institutions.

Existing empirical researches which analysed the function of institutional quality on output growth in SSA have produced conflicting results (Fuje, 2008; Olutwatyin and Folassade, 2014; Kilishi *et al*., 2013). However, institutional quality, public expenditure and economic growth are interlinked. Understanding how public spending impact economic growth and exploring the role institutions play on growth is important for various reasons. The finding will add to literature on the role institutional quality plays on output growth in SSA. Additionally, if institutional quality influences economic growth, then government decision making unit should shift their focus to policies that strengthen institutional variables and institutional reforms in SSA. Lastly, knowledge on the status of efficiency and sources of inefficiency of government spending is important for government in designing programs that realize optimal resource allocation.

This thesis therefore answered the following questions. (1) What is the effect of public expenditure on output growth in SSA? (2) What is the status of efficiency of public spending in SSA? (3)How does institutional quality affect economic output growth in SSA? These three questions formed the research gap that this paper addressed.

1.3 Objectives of the study

The core objective of this thesis was to examine the effect of government expenditure on cross country income variation for SSA. The specific objectives of this thesis are:

i. To determine the effect of public expenditure on economic growth in SSA
ii. To analyse the efficiency of government spending in SSA
iii. To estimate the effect of institutional quality on economic growth in SSA

1.4 Significance of the study

Researchers and policy makers around the globe are concerned with the poor output growth witnessed in SSA despite the increase in government expenditure. Various remedies have been proposed ranging from strengthening institutions, offering economic stimulus and productive spending that reduces wastages. However, SSA growth prospect has remained dimmed compared to other economic regions. This thesis contributes significantly by performing disaggregated analysis of various components of government expenditure and how these components individually impact on SSA economic growth.

The relevance of this study also anchors on the classification of SSA countries into low-income and middle-income countries. We examined the effect of government expenditure on output growth for each category of low and middle income SSA countries. Low and middle income SSA countries might respond differently to various proposed policies that are geared towards alleviating economic growth. This paper takes cognisance of this and therefore draws policies from the study that are unique to low and middle income countries.

The study may contribute in the SSA growth discourse by analysing spending efficiency and the sources of inefficiency in government expenditure. SSA countries need to know the status of the efficiency of government spending. This would be important for each country to optimize output with the given level of limited resources. Only a study by Gupta and Verhoeven (2001) examined spending efficiency for Africa. However, no study has investigated the sources of inefficiency of spending for SSA countries. This paper therefore bridges this knowledge gap by scrutinising the determinants of efficiency of government spending for SSA countries. Knowledge on the efficiency of government expenditure is significant for government policy actors to implement various policies that reduce on wastefulness in spending.

Equally, the paper assesses the effect of each of indices of institutional quality on economic growth. Policies to remedy SSA economic growth should therefore be unique to each component of government expenditure and the indices of institutional quality.

1.5 Organization of the thesis

The thesis is arranged in four chapters. Chapter two presents the relationship that involves economic growth and government spending for SSA. Chapter three involves the efficiency of government spending. Chapter four involves examination of the nexus between institutional quality and output growth in SSA. Chapter five presents summary, conclusion and policy implications.

CHAPTER TWO

GOVERNMENT EXPENDITURE AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA

2.1 Introduction

The nexus between government expenditure and output growth is an important subject that has been studied by (Devarajan et al., (2013), Barro (1990), Kimaro et al., 2017),and among many other researchers. Of interest to researchers is whether fiscal discipline contributes to output growth equation. One view is that public spending on human capacity building, infrastructure, and health, enhance economic growth although financing of such government expenditure is associated with tax distortion which can be growth-retarding. The public sector has expanded significantly over the years for various countries. At the beginning of the twentieth century, public sector for many countries was small. However, expenditure increased gradually for the next sixty years. For SSA, the public sector has grown from 18.5 percentage of GDP in the 1980s to about 29 percentage of GDP in 2018.Despite the increase in public expenditure; SSA has experienced dwindling economic performance.

Figure 2 illustrates the trend in annual percentage growth of government expenditure for developing regions. Between 1982 and 1984, public spending fell in SSA. This was attributed to the aftermath of the second oil shock (Sahn, 1992). Comparison between SSA region and low-income regions like Asia and Latin America, reveal that SSA registered a steady increase in government expenditure from 0.47 percent in 1990 to 14.45 percent in 2004. The increase in government expenditure in SSA resulted from many SSA countries adopting policy reform programs in response to growing current account imbalances and poor economic performance (Sahn, 1992). However, government expenditure varies across countries. A country like Botswana registered an average total expenditures growth of about 7 percent annually since the beginning of the year 2000 compared to Asia's giants (China and India) while Cote d'Ivoire, Togo, and Zimbabwe have slumped in growth (Fan and Saurkar, 2008).

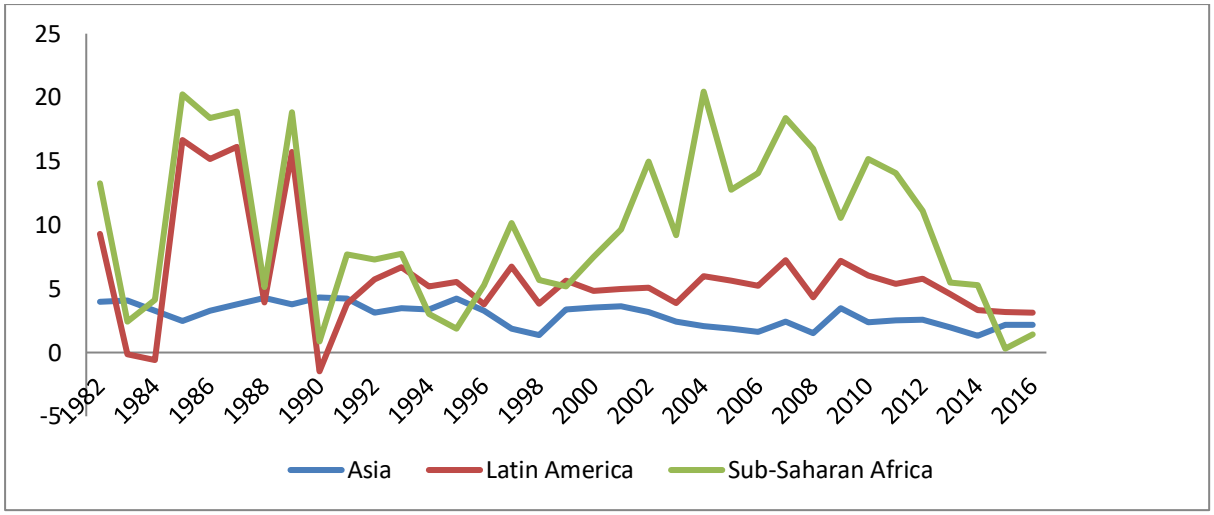


Figure 2: Government Expenditures in Developing Regions, 1982-2016

Source: Computed from World development indicators

SSA has experienced mixed economic performance despite the increase in government expenditure. Garner (2006) suggested four classifications of SSA countries based on their growth performance; positive growth, negative growth, stagnation in growth and uneven growth (See Appendix 1). During the time period 1990-2017, the following countries have shown consistent and positive growth; Botswana, Cape Verde, Burkina Faso, Gambia, Ghana, Mauritius, Mozambique, Tanzania, Seychelles, Kenya and Lesotho. Consistent with negative growth are Zimbabwe, DRC, Central Africa Republic and Burundi. Countries in SSA that have stagnated in growth are Gabon, Guinea-Bissau, Niger, Togo while Liberia, Malawi, while Gambia and Cote d'Ivoire are associated with uneven growth. Low income SSA countries experience unsatisfactory economic growth compared to other regions (Asiedu, 2002).

Most of the SSA countries with negative and stagnating growth fall under low-income category. This is according to World Bank Classification 2018. SSA has 48 countries out of which 24 have GNI per capita less than USD 995 and therefore classified as low income-countries by World Bank Classification 2018. However, the remaining 24 countries with GNI

per capita between USD 996 and USD 12055 are classified as middle income countries (See appendix 3). Of interest to both researchers and policy makers is to unravel why some countries have moved to middle income category while others have remained as low income economies. Why is the process of public resource allocation working in countries like Botswana while countries like Central Africa Republic have not experienced better economic performance?

Positive Growth/Consistent	**Negative growth**	**Stagnation**	**Uneven Growth**
Botswana	Zimbabwe	Gabon	Liberia
Cape Verde	Democratic Republic of Congo	Guinea-Bissau	Malawi
Burkina Faso	Central Africa Republic	Niger	Gambia Cote d'Ivoire
Mauritius	Burundi	Togo	
Mozambique			
Seychelles			
Kenya			
Lesotho			

Table 2: Growth-Categories of countries in SSA (1990-2017)

Classified by pattern of average growth rates from 1990-2017 of real GDP per capita PPP (see appendix 1)

There exists vast literature that examines the relationship between output growth and public spending for SSA countries (Sahn, 1992; Kimaro *el al*., 2017; Akinlo, 2008; Kagundu, 2006; Gyimah-Brempong *et al*., 2004; Menyah *et al*., 2013; Nurudeen and Usman, 2010). However, these studies focussed on the impact of public spending on output growth in SSA without considering the mixed economic performance of the individual countries. None of these studies have dichotomized SSA countries into low and middle income countries. Knowledge on which components of government expenditure contribute significantly and positively towards output growth for low and middle level economics SSA will be of great importance for policy makers. Policy action based on these empirical findings will be useful in designing policies that are specific to level of economies, growth and which will spur economic growth

for low and middle level income economies of SSA. By classifying SSA countries into two categories of low and middle income group, this study uniquely adds to literature on output growth and public spending.

2.2 Specific Objectives

a) To examine the effect of government expenditure on cross-country income variation for SSA countries.
b) To determine if the effect of government expenditure on output growth varies with the income level of SSA countries,

2.3 Significance of the study

Novelty of this thesis originates from analysing public expenditure and growth by considering the income level of SSA countries. First, this is virtually the first study to conduct an analysis based on the WB classification of SSA according to income level. This is imperative in drawing inferences on the effects of spending on output growth of low and middle income countries in SSA. Some previous studies classified SSA countries in terms of regional location. However, some countries share same geographical region but with fundamentally different economic prospects. The analysis based on income classification will inform policy makers on what low income countries need to adopt in the process of resource allocation. This will be instrumental in improving their economic prospects and they can also borrow some lessons from middle income economies. Equally, the result from this study will form basis for policy makers in the middle income countries on policy action plan necessary to attainment high income status.

Secondly, the study contributes in terms of methodology. The application of difference and system generalised methods of moments (GMM) for dynamic panel data has increased among researchers since it was established by Arellano and Bond (1991). GMM is considered

to be efficient as it solves the problem of fixed effects and endogeneity of regressors. However, both system and difference GMM suffer from instrument proliferation (Roodman, 2009). This is associated with the poor performance of instrumental variables (IV). Previous studies that have employed GMM estimators have not attempted to correct the problem of too many instruments. Therefore the parameter estimates might be biased. This study therefore implemented solutions suggested by Roodman (2009) in handling the problem associated with too many instruments in GMM. The solution involves collapsing instruments count and limiting lag depth amounts.

2.4 Organization of this chapter

This chapter has four sections. Section 2.5 presents literature review, section 2.6 involves a discussion on methodology adopted for this chapter. Section 2.7 presents the findings while section 2.8 entails study summary, conclusion and policy implication

2.5 Literature review

2.5.1 Theoretical literature

2.5.1.1Wagner's Organic State Theory

Wagner's law postulates that state activities in relation to private economic activity increase in the process of economic development (Bird, 1971). According to Wagner's law, complexity of government structure leads to the growth of the economy. This is necessitated by the need to introduce statutory laws and the development of legal structure which increases the public sector expenditure. Wagner law further opines that the urbanization process is associated with externalities which call for government intervention to mitigate their effects. Government interventions to curb externalities result in the introduction of new laws, policing and authorities, consequently leading to the expansion of public sector.

Wagner's law is applicable in the context of SSA with regards to state spending. The urbanization in developing countries is on the rise due to the perceived economic benefits like employment opportunity and high standard of living. Big cities across SSA countries are experiencing influx of rural-urban immigration. According Wagner, proliferation of cities require protection of PRs, extra security for the urban dwellers, legislation to govern externalities and this would result to an expanded public sector.

Wagner's' law could also explain increased public expenditure in SSA countries resulting from political changes. Kenya, for example, adopted the new constitution in 2010 that ushered in two tiers of government; devolved system of government and the national government, this in effect expanded the size of the government expenditure. Constitutional reforms in developing countries saw the formation of institutional bodies that aim at formulating policies for good governance in Sub-Saharan African countries. Therefore Wagner' law of state expansion underpins the need for increasing government expenditure in SSA.

2.5.1.2 Keynesian Theory

Keynes, in "The General Theory of Employment, Interest and Money" proposed that state intervention in economic activity is necessary since economies do not stabilize very quickly (Keynes, 1973). According to Keynes, there is need for government spending to increase employment when the economy is in depression. Government spending is necessary for promoting growth (Branson, 1989). Keynes believed that microeconomic interventions by both firms and individuals can lead to inefficient macroeconomic outcomes, leading to a general glut where the economy operates below its potential output and growth rate. While classical economists believed in Say's law, Keynes believed that economic downturn characterised by high unemployment and loss of potential output occurs due to insufficient aggregate demand for goods. Therefore Keynes proposed government intervention during

economic depression to increase aggregate demand for goods and services to boost economic activities thereby reducing unemployment.

Keynes further argued that economic stimulation through low interest rates and government investment can solve the problem of economic depression. Government investment has the multiplier effect by stimulating spending in the general economy and this in turn encourages more production and investment.

Keynesian theory finds relevance in the context of Sub-Saharan African Countries. Government expenditure in infrastructure like road construction has been used by many governments to reduce unemployment during economic downturn. Economic stimulus like road construction has multiplier effect of increasing aggregate demand of economy and hence improving aggregate economic performance.

2.5.1.3 Crowding Out Theory

This theory is premised on the view that increased government intervention can reduce private activities. Expansionary fiscal policy where government finances expenditure through taxes or debt issuance results to crowding out. Crowding out is also a multidimensional concept that constitutes direct and indirect effects of state intervention on the private activities.

Crowding out is manifested in several ways. First, when the state finances its expenditure through deficit financing by borrowing in the domestic market, it competes with the private sector for the available funds. Government competition with the private sector makes interest rate bearing funds too expensive for the private sector thus leading to shrinking of the private sector borrowing. Inadequate funds for the private sector reduce private investment resulting in low aggregate demand. Reduced private investment negatively effect on overall economic performance.

Second, Crowding out can occur through government spending which crowds out private spending. State intervention in the provision of public goods like education can crowd out private spending in some of these sectors. Efficient provision of public services by the government can create low demand for similar goods in the private sector hence discouraging private sector investment.

Third, indirect crowding out occurs when government expenditure is financed through increased taxation thereby reducing private savings (Cagan, 1965). A decrease in private savings is associated with low investment undertakings and this could result in low aggregate demand subsequently leading to slow economic growth. Sub-Saharan African countries facing financial constraints resort to domestic borrowing to finance their expenditure thereby crowding out private sector. Therefore, crowding-out theory is applicable in explaining economic phenomenon associated with SSA countries.

2.5.1.4 Neo-Classical Theory of Growth

Neo-classical theory advanced by Solow-Swan (1956) is premised on the idea that increasing physical capital results in diminishing returns thus capital has a transitional effect on economy's income level. The theory therefore suggests that it is necessary to increase labour productivity to spur economic growth. Accordingly, steady state economic growth can be achieved through accumulation of capital and labour, and advances in technology. The theory states that an equilibrium state can be achieved by varying the right quantities of capital and labour in the production function. Technological changes significantly augment output therefore output growth cannot be realized in the absence of advanced technology. Neo-classical growth theory therefore suggests investments in modern technology to augment the existing labour force to enable steady economic growth rate.

2.5.1.5 Endogenous Growth Theory

The assumption of decreasing returns in capital in the neoclassical model inhibits the explanation of income variation in the long run. To remedy the shorting comings of neoclassical model, endogenous growth theory was conceived to model long run growth through technological transfer. In endogenous growth theory, steady economic growth is achieved through technological change that is endogenously determined (Frankel (1962), Romer (1990), Mankiw, Romer and Weil (1992), Barro and Sala-i-Martin (1992) and Evans (1996)). Government investment in R&D that develops new ideas and human capacity building will increase economic growth. Endogenous growth model predicts that an increase in the proportion of people working in the research and development and the knowledge sectors will increase economic growth of a country. Therefore countries can stimulate growth by investing in capital, education and R&D. This theory emphasizes that the key to economic growth is investment in education.

2.5.2 Empirical Literature

This section reviews three strands of literature thematically. Literature is developed along: (1) Ordinary Least Square (OLS) panel estimation (2) Static panel model and (3) Dynamic panel data. Various studies that examined public expenditure and income-variation have used different estimation techniques.

The first strand of literature reviewed studies that have employed OLS to estimate panel data. Barro (1990) predicts that public spending has both temporary and permanent effect on income growth. Barro (1991) conducted a cross sectional study on economic growth for 98 countries. The study used OLS estimation technique to arrive at the estimates. One of the key findings of this study was that government consumption expenditure negatively impacts economic growth. This was attributed to distortions emanating from tax rates. Tax discourages investment hence inhibits growth.

For 96 non-communist countries between 1960 and 1970, Landau (1983) analysed spending and output growth. OLS inference approach was used by the author. Findings provided evidence that public spending by government negatively impacts income growth. The study does not address the potential simultaneity problem arising from including control variables like share of labour in agriculture and student population ration which have reverse causality with growth rate.

Devarajan (1996) employed OLS and FE estimation technique for 43 least developed countries for the years1970-1990 to approximate the nexus between government expenditure and income variation. The study found that productive expenditure (health, education, communication, capital, and transport) either negatively or insignificantly impacts on growth while unproductive expenditure (current expenditure) was found to be growth-enhancing. The weakness of this study emanates from its methodological approach. By employing pooled regression, the study assumes individual country heterogeneity. In addition, OLS may lead to spurious regression because it is unable to surmount potential endogeneity problem. Arellano and Bond (1991) established that GMM is more efficient than static methods when estimating panel data.

Hansson and Henrekson (1994) applied OLS regression to study the effect of spending on income growth. The study used 14 OECD countries for the years 1970-1987.To circumvent the problem of endogeneity and spurious regression, the study examined the link between spending and productivity at a disaggregated level. The result showed that government spending on education positively influence growth while transfer and consumption spending negatively impacts income level.

Fölster et al. (1994) studied the effect of fiscal policy on income for 22 OECD countries for the period1970 to 1995. Extreme bound analysis (EBA) was used to statistically test if OLS

estimates were robust. The study found that government expenditure negatively impacts growth for rich countries. Tests based on robustness on regression based on EBA are highly doubtful. Pedroni (2001) proposed the use for fully modified OLS (FM-OLS) which allows for stationarity test and long run equilibrium test for panel with longer time dimension.

Adopting a panel data for 100 countries from the years 1970-1988, Easterly et al.,(1993)analysed the impact of fiscal policy on income. OLS regression technique was used to estimate the model. The study found that productive expenditure (transport and communication expenditure) positively correlate with growth. The study adopted basic regression and correlation analysis to achieve results. However, new approaches (for example, GMM) for estimating panel data have evolved which can produce efficient results.

Landau (1986) studied spending on growth for 96 undeveloped countries for a period spanning 1961 to 1976. To avoid the problem of relationship between regressors and the disturbance, the study employed OLS with lagged values of regressors. In the findings, expenditure on military and transfer payments insignificantly impact output. Results further showed that consumption expenditure negatively impacted income growth. The weakness of this study is on its use of lagged values of explanatory variables in estimating the growth equation. Lagged values of regressors in OLS are correlated with the disturbance term therefore this creates the problem of endogeneity which is not corrected for in the study.

Using annual growth rate for 16 developed countries for the period 1952 to 1976, Landau (1985) analysed statistical relationship ofspending and income growth. The paper used OLS estimation technique. The paper predicted that government expenditure in general impedes income per capita products while expenditure on transfers have positive link with growth. The current development in estimating panel data might invalidate the findings from this study.

Ram (1986) examined the significant function of government on income growth. Both cross-section and time series data set were used. Pooled OLS technique was used in the study. The study predicted that government size positively impact income. The study did not test for potential non-stationary of the variables used. A new econometric technique has evolved that test for unit root. Spurious regression is a potential risk when estimating time series models without testing for unit root.

Bose et al. (2007) based on aggregate and disaggregated public expenditure data for 30 undeveloped countries for the periods 1970 to 1990 assed how public spending contributes to output growth. The paper used seemingly unrelated regression (SUR) approach for estimation. The analysis suggested that at the aggregated level, government capital expenditure positively influence income level. At the disaggregate level, education spending has a long-lasting effect on output growth. The study might suffer from the problem of measurement error since the data used are from different sources (See Bose, 2007)

The first strand of literature applied OLS to estimate panel data. These studies suffer from econometric estimation problems. Estimates from OLS may be spurious because OLS is unable to surmount potential endogeneity problems. An unobserved country specific characteristic renders OLS inconsistent if the unobserved characteristics are correlated with the regressors.

The second strand of literature employed static panel estimation technique: Fixed effect and Random effect models. The following studies fall in this category.

Afonso et al. (2010) analysed two samples of 15 EU and OECD countries to investigate the how the size of the government stimulate output growth. The study used both pooled panel and FE estimation technique. The result predicted that government size negatively influences income level.

Yasin (2011) investigated public spending and economic growth for SSA countries from 1987 to 1997. Both FE and RE estimation techniques were used. The study concluded that government expenditure on capital formation significantly improves income level. The study did not apply hausman test to control for country specific characteristics.

Kwendo et al. (2015) analysed the link between public spending and income level for five Eastern African countries (Uganda, Kenya, Rwanda, Burundi and Tanzania). The study period covered 1995-2010 and used both FE panel estimation techniques. The author used hausman test to decide between FE and RE. The findings showed that agriculture and defence expenditure negatively impact income level while health and consumption expenditure positively impact on economic growth.

Studies that used static panel model were unable to estimate the dynamic dependent variable. Both the RE and FE estimates are rendered inconsistent when estimating dynamic panel.

The third strand of literature composed of studies that used dynamic panel data.

Loizides et al. (2005) researched on how government size stimulates output growth. The author used yearly data from UK, Greece and Ireland. The result showed public expansion enhances income level. The strength of this paper relies on the application of modern econometric technique. With longer period (1950-1990) and fewer observations ie three European countries, the paper used dynamic panel estimation technique to arrive at the findings. The weakness noted in this paper emanates from the failure to control for potential endogeneity resulting from reverse causality between output growth and government size.

Gyimah-Brempong (2004) examined how the investment on human capacity building impacts on income level for SSA and OECD countries. For SSA, the study sampled 21 countries over 20 year period and employed GMM estimator. The result showed that stock of human capital significantly improves income level. The strength of this study lies on the use

of modern econometric technique that provides efficient estimates in panel data. However, the study did take into account the problem of too many instrument counts when using GMM.

Wu et al. (2010) investigated the contribution of spending on income level for 182 countries for the periods 1950 and 2004. The test result was achieved by applying panel granger causality. Panel unit test was done using Levin, Lin and Chu (LLC). The result showed reverse causality between spending and income level. The finding further showed that the impact of spending on growth varies with income level of each country.

Kimaro et al. (2017) studied government spending, efficiency and income level for 25 low income SSA countries. The author used data covering the period 2002-2015 and used both panel cointegration and GMM to arrive at the empirical result. The paper provided evidence that government spending positively predicts income level of low income SSA countries. The weakness of this study emanates from its failure to correct for the problem of too many instruments

Using 13 samples of SSA countries for the periods 1967-1985, Dunne et al., (1995) examined the determinants and economic effect of military spending. The study employed pooled OLS estimation technique to carry out econometric analysis. The finding showed that military spending negatively impact economic growth. The study failed to control for potential endogeneity of military expenditure and economic growth. It is possible that a country's military expenditure will rise with economic growth and a country experiencing economic growth can increase military spending.

Obialor (2017) examined the effect of government human capital investment for three middle income economies ofSSA countries (Nigeria, South Africa and Ghana). Stationarity test was done using ADF and PP test. After conducting cointegration test, VECM was estimated to determine the short run dynamics. The study concluded that health and education spending

positively and significantly impact output growth for Nigeria. Health and education expenditure negatively and insignificantly influence income level of South Africa.

Maingi (2010) analysed the effect of spending on income level for Kenya. The study period was 1963-2008. VAR estimation technique was applied. The result indicated that productive government expenditure (infrastructure, investment, economic affairs, health and defense) improves income level. However, the study revealed that expenditure on debt service negatively predicts income level.

Maingi et al., (2013) investigated how government spending contributes to income level variation among member states of East Africa. The author focused on a disaggregated expenditure over the period from 1980 to 2010. The findings showed that health and defence expenditure positively and statistically impact growth while education and agriculture expenditure were non-significant.

Adu et al., (2014) researched on the contribution of spending on income level for Ghana for the years 1970-2010.The study also tested the existence of the Wagnerian hypothesis in Ghana. The study employed ARDL model approach. Granger causality approach was used to test for causation between spending and income level. The paper predicts that spending significantly improve income level in the long run. However, spending negatively impacts output in the short run. The result also supported Wagner hypothesis for Ghana.

Musila and Balassi (2004) studied the link between education spending and income level in Uganda from 1965 to 1999. The analysis employed ECM. The study found that that education expenditure positively and significantly predicts income level both in the short run and in the long run.

These studies used dynamic panel estimation technique: system and difference GMM. However, none of the studies dealt with the problem of instrumental proliferation.

2.5.3 Overview of literature review

Three observations can be made from the review. First studies that relate spending and output growth are inconclusive. Secondly, there is no study which has been conducted on the middle income countries in SSA except Kimaro (2017) who examined the effect of spending on income level of low income countries in SSA. Third, there exists a gap in the methodological approaches for estimating government expenditure on income variation for SSA countries. Most cross-country studies employ pooled regressions, statistic model of FE and RE and dynamic GMM. The method of GMM controls for endogeneity, heterogeneity and stationarity. GMM yields estimates that are more robust than those from standard panel data methods or time series methods. However, studies that used GMM did not remedy instrumental proliferation problem which is associated with GMM. This thesis, besides using GMM, will adopt Roodman (2009) approach to surmount problems associated with GMM.

2.6 Methodology

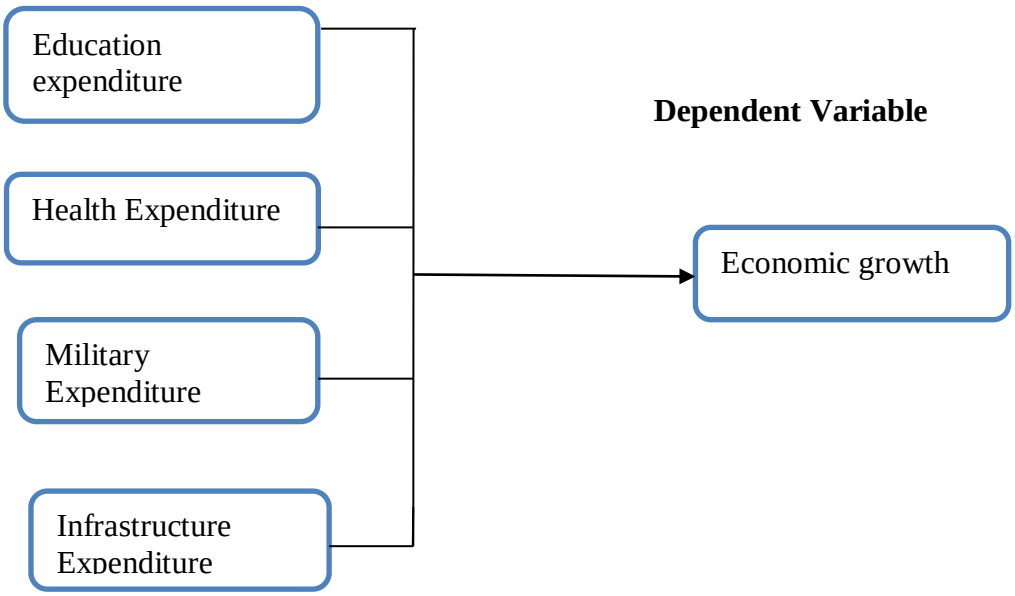
2.6.1 Conceptual framework

The primary aim of this paper is to provide empirical analysis of how spending contributes to output growth of SSA countries as a bloc. Government expenditure is classified as either productive or unproductive. Productive expenditure is associated with positive effect on growth while unproductive expenditure negatively influences growth. Barro (1991) and Landau (1983) for instance found that government consumption expenditure is unproductive. Devarajan (1996) based on a study of 43 developing countries, classified government expenditure on health, education, communication, infrastructure and capital as productive while current spending was classified as unproductive. Easterly et al. (1993) also showed that

productive spending (transport and communication) enhances growth. Expenditure towards human capacity building positively influences economic growth (Gyimah-Brempong, 2004). Still, the categorization of spending as either productive or unproductive remains unclear. This paper will examine four components expenditure (i.e, education, military and infrastructure and health). The choice of these four components is guided by empirical literature.

The Figure 3 presents a diagrammatic conceptualization of the explanatory and dependent variables. From the diagram, the independent variables, education spending, health spending, military spending and infrastructure spending are conceptualized as influencing economic growth.

Figure 3: Conceptual framework



2.6.2 Theoretical model

The theoretical model is adopted from Devarajan et al. (1996).The model links state spending and income level. The model distinguishes between productive and unproductive spending.

In their framework, productive expenditure is associated with positive outcome in economic growth while unproductive expenditure negatively impacts income growth. The framework further assumes that the composition of state expenditure is exogenously determined by policy. The model captures the difference between productive and unproductive expenditure by how a shift in the two changes the growth rate of a country.

The model assumes Cobb Douglus production function. Production is explained by private capital (k), productive spending and unproductive spending, $g_a$and g_b where $g_a$is productive spending while g_b is unproductive spending. The function is expressed as in equation (3.1)

$$y = f(k, g_a, g_b) = k^{\beta} g_a^{\delta} g_b^{\varphi} \quad \text{.....3.1}$$

Where , $\delta, \varphi \geq 0, \beta + \delta + \varphi = 1$

Following Devarajan et al. (1996) the government finances its spending by assuming a balanced budget and imposing a flat tax-rate (τ).

$$\tau y = g_a + g_b \quad \text{.....3.2}$$

The proportion, Ø (0≤ Ø≤ 1), of tax revenue goes towards productive expenditure (g_a). Therefore g_a and g_b are given as:

$g_a = \emptyset \tau y$ and $g_b = (1 - \emptyset)\tau y$.....3.3

The problem of a representative agent taking the government decision on τ and Ø is to optimize his satisfaction by choosing consumption, c, and capital, k.

$$U = \int_0^{\infty} u(c) e^{-\rho t}\, dt \quad \text{.....3.4}$$

Subject to

$$\dot{k} = (1 - \tau)y - c \quad \text{.....3.5}$$

Where ρ denotes time preference (Romer 1996, p53).

We use the utility function with a constant elasticity of marginal utility as specified in equation (93.6) to arrive at the analytical solution.

$u(c) = \frac{c^{1-\theta}-1}{1-\theta}$ ……..…3.6

We set up Hamiltonian function as follows to get the growth rate of consumption

$H = e^{-\rho t}\frac{c^{1-\theta}-1}{1-\theta} + \eta((1-\tau)k^{\beta}g_a^{\delta}g_b^{\varphi} - c)$…….3.7a

Hamiltonian first order conditions are given as;

$$H = \begin{cases} {}^{dH}/_{dc} = 0 \\ \dot{\eta} = -{}^{dH}/_{dk} \\ \dot{k} = {}^{dH}/_{d\eta} \end{cases}$$ ……3.7b

Therefore

${}^{dH}/_{dc} = e^{-\rho t}c^{-\theta} - \eta = 0$……..….3.7c

$\dot{\eta} = -{}^{dH}/_{dk} = -\eta(1-\tau)\beta k^{\beta-1}g_a^{\delta}g_b^{\varphi}$……..3.7d

Taking the natural log of equation (3.7c) above

$-\rho t - \theta lnc = ln\eta$……3.7e

Taking first order condition of equation (3.7e) with respect to time we obtain;

$-\rho - \theta\frac{\dot{c}}{c} = \frac{\dot{\eta}}{\eta}$……3.7f

From equation 3.7d

$$\frac{\dot{\eta}}{\eta} = -(1-\tau)\beta k^{\beta-1} g_a^{\delta} g_b^{\varphi} \quad \text{.....3.7g}$$

Equating equation (3.7f) and (3.7g), we obtain,

$$\frac{\dot{c}}{c} = \frac{(1-\tau)\beta k^{\beta-1} g_a^{\delta} g_b^{\varphi} - \rho}{\theta} \quad \text{.....3.7h}$$

From equations (3.2), (3.3) and setting $g_a + g_b = g$, the growth rate of consumption can be rewritten as;

$$\frac{\dot{c}}{c} = \frac{(1-\tau)\beta k^{\beta-1} \emptyset^{\delta} (1-\emptyset)^{\varphi} g^{\delta+\varphi} - \rho}{\theta} \quad \text{.....3.7i}$$

Assume the steady-state growth rate of consumption is represented by Ϙ such that equation (3.7g) is written as;

$$\Omega = \frac{(1-\tau)\beta k^{\beta-1} \emptyset^{\delta} (1-\emptyset)^{\varphi} g^{\delta+\varphi} - \rho}{\theta} \quad \text{.....3.7j}$$

From equation (3.7j) we can derive the proportion of government expenditure devoted for productive expenditure (g_a).

$$d\Omega/d\emptyset = \frac{(1-\tau)\beta k^{\beta-1} g^{\delta+\varphi} \lfloor \delta - \varphi(1-\emptyset)^{\varphi-1} \rfloor}{\theta} \quad \text{.....3.8}$$

Productive expenditure can now be defined as that component of public expenditure whose increase in proportion will raise the steady-state growth rate of the economy. From equation (3.8), component $g_a$is productive if $d\Omega/d\emptyset > 0$.

2.6.3 Empirical model

To model the how spending impact output growth, the study followed Qayyuam and Haider (2012). The study considers that the economy production function relies on Labour, capital and state of technology (A) that is exogenously determined.

$Y(t) = A(t)f\big(K(t), L(t)\big)$.....3.9

Where :

K(t) = capital

L(t) = labour and

A(t) = total factor productivity.

Consider Cobb-Douglus production of the following form;

$Y(t) = A(t)K(t)^{\delta}L(t)^{1-\delta}$.....3.10

Where:

δ =share of capital

1-δ = share of labour with 0<δ<1

Dividing equation by 3.10 *L(t)* to obtain its intensive form;

$\frac{Y(t)}{L(t)} = A(t)\frac{K(t)^{\delta}L(t)^{1-\delta}}{L(t)}$.....3.11

Equation (3.11) in intensive form is given by equation (3.12)

$y(t) = A(t)k(t)^{\delta}$.....3.12

Where *y(t)=Y(t)/L(t)* and *k(t)=K(t)/L(t)*

$f'k(t) = A(t)\delta k(t)^{1-\delta} > 0,\ f''k(t) = -A(t)\delta(1-\delta)k(t)^{\delta-2} < 0$

Equation (3.12) satisfies the Inada-condition (Romer, 1996).

The evolution of capital in the model is stipulated by equation (3.13):

$\dot{k(t)} = s.f\big(k(t)\big) - (n + \varsigma)k(t)$……*3.13*

Since $y(t) = f\big(k(t)\big) = A(t)k(t)^{\delta}$, we substitute equation (3.12) into equation (3.13) to give:

$\dot{k(t)} = s.A(t)k(t)^{\delta} - (n + \varsigma)k(t)$……*3.14*

Dividing equation (3.14) by *k(t)*

$$\frac{\dot{k(t)}}{k(t)} = s.A(t)k(t)^{\delta-1} - (n + \varsigma)$$

Given that $y(t) = A(t)k(t)^{\delta}$ therefore, $y(t)^{*} = A(t)\delta k(t)^{\delta-1}$. To obtain the growth rate of y(t), we divide , $y(t)^{*}$ by *y(t)*therefore;

$$y(t)^{*}\Big/_{y(t)} = \alpha k(t)^{-1}$$

$y(t)^{*}\Big/_{y(t)} = s.f'\big(k(t)\big) - (n + \varsigma)\alpha$……3.15

where$f'\big(k(t)\big) = A(t)\delta k(t)^{\delta-1}$

Therefore the general behavioural equation is specified by equation (3.16)

$y(t)^{*}\Big/_{y(t)} = q\big(s, n, \varrho, \alpha, A(t)\big)$ ……3.16

Based on equation (3.16), the baseline model is specified as:

$GRGDP(t) = f\big(\big(K(t), L(t), ED(t), INFR(t), HLT(t), MLT(t), X(t)\big)$……3.17

Where the components of government spending are comprised of education spending (ED), infrastructure spending (INFR), health spending (HLT), and military spending (MLT). X represents control variables.

From Equation (3.17), based on empirical literature, priori expectation of physical capital GDP growth rate is positive. An increase in physical capital stock increases output because it enhances labour productivity. The mechanism through which physical capital influences output is that capital is part of the production process. Physical capital increases productivity which helps drive economic performance of a country. A priori expectation between education expenditure and growth is positive. Workers with quality education can easily adopt new technologies in the firm. Educated workforce is also innovative and can easily acquire new skills.

The parameter estimates for infrastructure expenditure is expected to be positive. From theoretical literature, government provision of infrastructure such as roads, highways, street lights, airports and mass transit provides enabling environment for growth. Based on literature, military spending influence on income level is indeterminate. Military spending provides security and helps protect PRs which increase business performance. However, military spending can retard growth since higher military spending implies lower level of domestic investment.

The following equation was estimated to examine how government expenditure influences economic growth in SSA.

$$GRGDP_{it} = \delta_{0i} + \delta_1 GRGDP_{it-1} + \delta_2 K_{it} + \delta_3 L_{it} + \delta_4 ED_{it} + \delta_5 INFR_{it} + \delta_6 lnHLT_{it} + \delta_7 MLT_{it} + \delta_8 INF_{it} + \delta_9 DS_{it} + \upsilon_{it} \quad \text{.....3.18}$$

υ_{it} is the disturbance and is composed of FE and time-specific effects. A number of control variables were used; savings, inflation and lagged GDP growth rate. Savings is expected to positively predict income level as suggested by(Modigliani, 1970). Inflation captures the effect of macroeconomic instability on growth and expected to negatively predict economic outcomes. There exists dynamic interaction between a country's current economic

performance with that of the previous income level, i.e the economic activities in the preceding year have a bearing on current economic activities. Therefore lagged values of GDP growth rate were included in the model. The study therefore adopted dynamic panel model.

Equation (3.18) is further modified to include dummy variable for middle-income SSA countries. Two income categories of SSA was included; the middle income and lower income group. Therefore instead of estimating two different equations for each group, we included dummy variables.

For example

$$y_{it} = \begin{cases} y_{it} = \gamma_{0i} + \gamma_1 x_{it} + u_{it} & for\ middle\ income\ countries \\ yit = \gamma_{1i} + \gamma_1 x_{it} + u_{it} & for\ low\ income\ countries \end{cases}$$

We can combine the two equations into a single equation (see Madala 2001, p307).

$$y_{it} = \gamma_{0i} + (\gamma_{1i} - \gamma_{0i})D + \gamma_1 x_{it} + u_{it} \quad \text{.....3.19}$$

Where

$$D = \begin{cases} 1 & if\ the\ country\ is\ middle\ income \\ 0 & if\ the\ country\ is\ \ low\ \ \ income \end{cases}$$

The variable D is the dummy variable. The coefficient of D measures the difference in the two intercept terms. Therefore equation (3.18) can further be modified to include a dummy variable such that;

$$GRGDP_{it} = \delta_{0i} + \delta_1 GRGDP_{it-1} + \delta_2 K_{it} + \delta_3 L_{it} + \delta_4 ED_{it} + \delta_5 INFR_{it} + \delta_6 lnHLT_{it} +$$

$$\delta_7\ MLT_{it} + \delta_8 INF_{it} + \delta_9 DS_{it} + \xi D + \upsilon_{it} \quad \text{.....3.20}$$

Where $\xi = (\delta_{1I} - \delta_{0i})$

Equation(3.20) is modified to include the interactions involving the middle income and dummy variables. This is to test whether the effect of spending on output growth varies with income level of countries. Equation (3.20) thus becomes;

$$GRGDP_{it} = \delta_{0i} + \delta_1 GRGDP_{it-1} + \delta_2 K_{it} + \delta_3 L_{it} + \delta_4 ED_{it} + \delta_5 INFR_{it} + \delta_6 lnHLT_{it} + \delta_7 MLT_{it} + \delta_8 INF_{it} + \delta_9 DS_{it} + \xi D + \delta_{10} Comp_{it} * D + \upsilon_{it} \quad \text{.....3.21}$$

$Comp_{it}$ isthe component of government expenditure for a given country and at a given time while δ_{10}captures the coefficient of the interaction term between each component of government expenditure and the middle income dummy variable. Therefore ξ measures the difference in intercept between middle and lower income countries in SSA while δ_{10} measures the difference in the effect of spending between middle and lower income economies in SSA. The study estimated equation (3.21) to answer the mentioned objectives of the paper.

2.6.4 Estimation procedure

Equation (3.21) suffers from several potential econometric problems. First, from empirical literature, capital, education, infrastructure, health and military expenditures are endogenous. Endogeneity emanates from reverse causality with economic growth. Secondly, the unobserved time-invariant country specific effect maybe associated with the X variables. Thirdly, $GRGDP_{it-1}$ as an explanatory variable may lead to the problem of autocorrelation. Lastly, the dataset used in this paper has short time period (T=10) and a large country dimension (N=35).

Various estimation approaches have been proposed to estimate panel data. Some studies have employed OLS to estimate cross-sectional data with time dimension. However, OLS estimates are inconsistent if the FE characteristics correlate with the explanatory variables. To remedy these problems, FE and RE models have been proposed. We provide a brief exposition of estimation technique of FE and RE.

Given

$$y_{it} = \delta_i x_{it} + \upsilon_i + \mathcal{U}_{it} \quad \text{.....3.22}$$

Where y_{it} is the dependent variable, υ_i is the time-invariant unobserved FE and $\mathcal{U}_{it}$ is the idiosyncratic disturbance, and x_{it} is the vector of control variables. The RE model assumes that the unobserved individual characteristics (υ_i) is a random variable. The random variable is not associated with explanatory variables (x_{it}) in the RE model. However, the RE estimates are inconsistent since the composite errors ($\upsilon_i + \mathcal{U}_{it}$) are serially correlated because of individual specific characteristics in the disturbance term. The RE estimator is given as:

$$\hat{\beta}_{RE} = (\sum_{i=1}^{N} X_I' \, \Omega^{-1} X_I)^{-1} (\sum_{i=1}^{N} X_I' \, \Omega^{-1} y_I) \quad \text{.....3.23}$$

In the RE model, υ_i is a random variable that is correlated with the X variables. The FE transformation is obtained by first weighing equation (3.22) over $t = 1, \ldots, T$ to get the cross section equation.

$$\bar{y}_i = \bar{x}_i \delta + \upsilon_i + \bar{\mathcal{U}}_i \quad \text{.....3.24}$$

Where $\bar{y}_i = T^{-1} \sum_{I=1}^{T} y_{it}$, $\bar{x}_i = T^{-1} \sum_{I=1}^{T} x_{it}$, $\bar{\mathcal{U}}_i = T^{-1} \sum_{I=1}^{T} \mathcal{U}_{it}$. The time demeaning of the original equation has removed the individual specific effect, υ_i. To obtain the fixed effect transformed equation, we subtract equation 3.24 from equation 3.22.

$$(y_{it} - \bar{y}_i) = (x_{it} - \bar{x}_i)\delta + (\mathcal{U}_{it} - \bar{\mathcal{U}}_i) \quad \text{.....3.25}$$

Estimates of equation (3.25) can be obtained by pooled OLS. However, the fact that x_{it} cannot include time-constant explanatory variable is a drawback of the fixed effect estimator. Transformation eliminates any observable time-invariant explanatory variables.

Both the RE and FE are inconsistent estimators when we have lagged dependent variables in the right hand-side of equation. In the presence of dynamic and endogenous independent variables, both system and difference GMM provide consistent estimates (Roodman, 2009). System and

difference GMM are both suitable for small T and large N with dynamic dependent variable and fixed effects. For example, let the growth rate presented by the equation:

$$GRGDP_{it} = \gamma GRGDP_{it-1} + X_{it}^{'}\beta + \xi_{it} \quad for i = 1, \dots, T \text{ and } t = 1, \dots, T \dots\dots\dots\dots\dots 3.25$$

Where $\xi_{it} = \mathcal{U}_i + v_{it}$

$GRGDP_{it}$ is the GDP growth rate of a country at a given time, X represents control variables, $GRGDP_{it-1}$ is the lagged values of GDP growth rate, the fixed effect ($\mathcal{U}_i$) and idiosyncratic shock (v_{it}).We difference equation 3.25 to eliminate country-specific effect.

$$GRGDP_{it} - GRGDP_{it-1} = \gamma(GRGDP_{it-1} - GRGDP_{it-2}) + (x_{it} - x_{it-1})'\beta + (v_{it} - v_{it-1}) \dots 3.26$$

Equation (3.26) can be estimated using difference or system GMM. In Difference GMM, panel data is first differenced to eliminate the FE. The differenced lag of the growth rate ($GRGDP_{it-1} - GRGDP_{it-2}$) is endogenous and X also contains endogenous variables. Equation (3.26) can provide consistent estimate by including instrumental variables. For example, $GRGDP_{it-2}$ instruments $\Delta\, GRGDP_{it-1}$ (Anderson and Hsiao, 1982).The moment conditions in equations (3.27) and (3.28) instruments the differenced lagged dependent variable and endogenous variables.

$$E[GRGDP_{it-s}\Delta v_{it}] = 0 \qquad for\ t = 3, \dots, T \text{ and } s > 2 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.27$$

$$E[x_{it-s}\Delta v_{it}] = 0 \quad for\ t = 3, \dots, T \text{and } s > 2 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.28$$

The moment conditions presented in equations (3.27) and (3.28) make it possible to use lagged levels of variables to instrument the first differenced endogenous variables. However, difference GMM suffers from weak instruments. To surmount problems associated with difference GMM, Blundell and Bond (1998) and Arellano and Bover (1995) proposed system GMM. System GMM augments difference GMM by estimating the two equations simultaneously at both levels and at first difference (see Roodman, 2009).System GMM

results to additional instruments which increases efficiency. However, system GMM suffers from the problem of instrument proliferation. Roodman (2009) suggested collapsing the instruments count as a possible remedy to the problem of too many instruments. This paper therefore estimated equation (3.21) using two-step system GMM and collapsed the number of instruments. Instrument validity was checked using Sargan over identification test while Arellano-Bond was used to test serial correlation.

2.6.5 Long-run coefficients

Equation 3.21 of the dynamic GMM presents the short run coefficients of regressor's measuring the immediate response of the expenditure variables and control variables on economic growth. According to Bruno et al. (2017), long-run coefficients capture the persistence of the dependent variables on growth. Therefore long-run coefficients in dynamic GMM are achieved by:

$$LR - coefficients = \frac{\delta_k}{1 - \phi}$$

Whereϕ is the coefficient of lagged dependent variable ($GRGDP_{it-1}$) while δ_k is the short run coefficients estimates.

2.6.6 Definition and Measurements of Variables

This section entails definition, description and source of data. Column one of Table 2.2 captures variable name and the second column gives data description. The data was sourced from WDI (2017).

VARIABLE	Data Description	Data Source
GDP growth rate	"Is the average annual growth rate of real GDP measured by change in GDP at constant prices as share of GDP" WDI	World Bank Data Indicators
Education expenditure	"It is measured as the total expenditure	World Bank Data Indicators

	on education (current and capital) as a percentage of GDP." WDI	
Fixed capital formation	"Measured as a percentage of GDP includes land improvements (fences, ditches, drains); plant, machinery, and equipment" WDI	World Bank Data Indicators
Health expenditure	"It consists of all expenditure made by the central government for hospitals, clinics, and public health affairs and services for medical, dental and paramedical practitioners; for medication, medical equipment and appliances; for applied research and experimental development. It was used as a proxy for human capital development that affects the labour force. It is measured as the total health expenditure (current and capital) as a percentage of GDP"WDI	World Bank Data Indicators
Military Expenditure	"This is the administration, supervision and operation of military affairs and forces: land sea, air and space defense force; administration, operation and support of civil defense forces. It is measured as the total military expenditure (current and capital) as a percentage of GDP." WDI	World Bank Data Indicators
Labour force	"Total of productive workforce (ages 18 to 60 years) to the total population." WDI	World Bank Data Indicators
Inflation	"The percentage change in Consumer Price Index (CPI) on a year-on year basis." WDI	World Bank Data Indicators
Domestic saving	"Gross savings is the gross national income less total consumption, plus net transfers as a percentage of GDP." WDI	World Bank Data Indicators

Table 3: Definition of Variables

2.7 Empirical result

2.7.1 Descriptive statistics

Table 4 displays descriptive statistics based on means and standard deviation. In particular, Table 4 reports mean variables for pooled observation for SSA, middle-income groups and low-income groups. The pooled mean GDP annual growth rate for the 35 SSA countries during 2006 to 2018 was 4.53percent. However, the average growth rate for middle income countries stood at 4.6percent with low income countries registering an average growth rate of 4.47percent. Education spending was high in the middle income countries (5.10percent of

GDP) compared to the overall spending on education by SSA countries (4.28percent). Low income countries spend an average of 3.7percent of GDP on education. In terms of government expenditure on health, the pooled mean for SSA countries was 6.04percent with middle income countries spending an average of 2.8percent on health while low income countries spending on health was highest at 8.19percent of GDP. Military expenditure for middle income countries on the average was higher than for both the pooled and low income SSA countries. The average military spending was 1.79percent for middle income countries, 1.65percent for pooled SSA and 1.56percent for low income countries.

The average inflation was recorded highest in low-income group at 104.457percent compared to middle-income group with low inflation of 7.56percent. The pooled mean inflation for SSA countries was 65.70percent. On average, labour force for pooled SSA countries was52.10percent of the working age population while middle income countries have an average labour force of 42.07percent with low income countries recording an average of 57.79percent labour force. Middle income countries had the highest mean of fixed capital formation of 22.35percent with low income countries recording an average of 18.53percent of fixed capital formation. The descriptive statistics further shows that mean domestic saving was highest in middle income economies of SSA (17.69percent), low income level economies of SSA had a mean of 2.43percent and pooled mean for SSA countries was 8.43percent.

	SSA			Middle-Income SSA countries			Low-income SSA countries		
Variable	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.
GDPannual(percent)	455	4.535173	4.847151	182	4.624263	3.98084	273	4.475779	5.353648
Education	455	4.28748	2.086798	182	5.105493	2.482839	273	3.742138	1.555706
Health	455	6.04436	14.02473	182	2.817745	1.538712	273	8.195437	17.75156
Military	455	1.655077	1.126365	182	1.793001	1.319136	273	1.563128	0.9687337
Inflation	455	65.70173	1145.341	182	7.568872	6.888506	273	104.457	1478.431
Labour force	455	52.10555	15.30606	182	42.07362	12.22271	273	58.79351	13.39354
Capital	455	20.06598	8.68033	182	22.35933	9.285973	273	18.53708	7.906899

Domestic Saving	455	8.432712	20.88508	182	17.42304	17.6928	273	2.439157	20.72687

Table 4: Descriptive statistics

Source: Author's own computation from stata

2.7.2 Government expenditure and growth in SSA countries

Table 5 displays the estimates that relate public spending and income level across SSA and across different income levels of SSA countries. The Arellano-Bond autocorrelation test suggests no correlation in the second first difference disturbances of these models. The significance level of the Sargan test statistic validates the instruments. Diagnostic tests suggest the models correctly predict the income level.

The coefficient of the lagged GDP growth rate in model 1 is significantly enhance output growth ($p<0.001$). This shows that growth persistence by one unit improves income level by 0.206 unit in the short run. Return on education expenditure is significantly ($p<0.05$) and positively associated with economic growth. *Ceteris paribus*, 1percent increase in education expenditure predicts 0.199 unit improvement in income level for SSA in the short-run. The finding validates Devarajan (1996) and Obialor (2017) who found a similar result. The parameter estimate for health expenditure is positive and significant ($p<0.05$). This illustrates that one unit rise in health expenditure will boost income level by 0.034 uint the short run. Military expenditure has an insignificant coefficient and negatively influences income level in the short run.

Inflation negatively and significantly influences GDP growth in the short run ($p<0.05$). Therefore 1 unit increase in inflation is associated with 0.0001 unit decrease in income level. Thus the magnitude of the effect of inflation on output in SSA is marginal. Productive labour force significantly improves GDP growth. One unit increase in labour force productivity will enlarge output by 0.0512 unit in the short run.

The coefficient of the dummy variable is statistically significant (p<0.1). The output growth of middle income economies is 2.26percent than those of low income category in the short run. Model 2 provides the beta estimates for the interaction term between education expenditure and the dummy variable. The beta estimates of the interaction term is negative and significant (p<0.001). This illustrates that the effect of education expenditure on output growth is less in middle income SSA countries than in low income SSA countries. In particular, income level of middle income SSA countries will grow by less than 2.031 unit as compared to low income SSA countries for every 1 unit additional expenditure on education.

The interaction term in model 3 tests if the effect of military expenditure on economic growth differs by the income level of SSA countries. The interaction term for military expenditure is negative and statistically significant at 1 percent level. This suggests that the impact of military expenditure on income growth for middle income SSA countries is less than for low income SSA countries. Output growth in middle income SSA economies will be 4.08 unit lower than low income SSA economies for 1 unit increase in military expenditure. Model four captures the interaction term on the return to health expenditure. The beta estimate of the interaction term on health expenditure is positive but non-significant.

VARIABLES	Model 1 (LDPD) GDP	Model 2 (LDPD) GDP	Model 3 (LDPD) GDP	Model 4 (LDPD) GDP
L.GDP	0.206***	0.167***	0.209***	0.206***
	(0.00930)	(0.0108)	(0.0195)	(0.00935)
Education	0.199**	0.902***	-0.00882	0.198**
	(0.0948)	(0.146)	(0.0989)	(0.0958)
Education*Middle		-2.031***		
		(0.436)		
Health	0.0340**	0.00342	0.171**	0.0305**
	(0.0137)	(0.00939)	(0.0799)	(0.0137)
Military	-0.565	-0.944***	-2.001***	-0.548
	(0.344)	(0.193)	(0.257)	(0.367)

Inflation	-0.000108***	-0.0057705***	-0.000163***	-0.000109***
	(1.24e-05)	(1.23e-05)	(1.63e-05)	(1.25e-05)
Labour	0.0512***	0.0288***	0.114***	0.0511***
	(0.00813)	(0.00580)	(0.0135)	(0.00840)
Middle (Dummy)	2.267*	10.09***	-8.756***	2.121
	(1.126)	(1.427)	(2.329)	(1.403)
Military*Middle			4.089***	
			(0.879)	
Health*Middle				0.0662
				(0.226)
Observations	420	420	420	420
Number of ID	35	35	35	35

Diagnostic tests	Model 1	Model2	Model3	Model4
F-Test, (p-value)	2053.82 (0.000)	335.07 (0.000)	674.74 (0.000)	1942.20 (0.000)
Sargan Test chi2, (p-value)	32.22 (0.938)	28.67 (0.972)	28.19 (0.976)	32.18 (0.924)
Arellano-Bond Autocorrelation test (AR2) z-value (p=value)	1.31 (0.190)	0.58 (0.563)	1.25 (0.211)	1.31 (0.190)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: The effect of government expenditure on growth in middle income SSA countries –Short-run estimates

Table 6 provides long-run estimates of the relation between spending and output growth. A unit change in education expenditure is associated with 0.25 unit increase in income level in the long run. The result demonstrates that education expenditure has a significant larger effect on output growth in the long run (0.25) than in the short run (0.199). Health expenditure significantly explains output variation in SSA in the long run. Output will grow by 0.042 unit in the long run for 1percent rise in health spending. Health expenditure has a larger positive effect on output growth in the long run (0.042) than the short run effect (0.0340). However, in the long run, military expenditure negatively impacts on output growth albeit non-significant.

Variable	Coef.	Std.Err.	z	P>|z|
Education	0.250603	0.121071	2.07	0.038
Health	0.042884	0.017002	2.52	0.012
Military	-0.71186	0.4366216	-1.63	0.103
Inflation	-0.00014	0.0000153	-8.91	0.000
Labour	0.064547	0.0105648	6.11	0.000

Middle	2.855703	1.394178	2.05	0.041

Table 6: The effect of Government Expenditure on growth in SSA-Long-run estimates

2.8 Summary, Conclusions and Policy Implications

2.8.1 Summary

The study aimed to determine the effect of spending on income level for SSA economies. The study assessed whether the effect of spending on income level varies significantly with income level of SSA. On average, SSA had income growth of 4.53percent over the period 2006-2018. Middle income countries had a higher income growth than low income countries. Middle income countries spend more in education in the short run (5.10percent) than low income countries (3.7percent). Health expenditure is higher in low income economies (8.19percent of GDP) than in middle income countries (2.8percent of GDP). Expenditure on military was higher in middle-income SSA economies (1.79percent) than in low-income SSA economies (1.56percent).

Both education and health expenditure significantly predicts and improvement in income level of SSA countries. Military spending does not predict income level of SSA countries both in the long run and in the short run. Education and health spending effectively predict income level in the long period than in the short period. The study provided evidence that education and military spending is less effective in improving output level of middle income SSA countries than in the low income SSA countries.

Military expenditure significantly improves income level of low income economies of SSA countries than middle income SSA countries. In contrast, health expenditure does not significantly predict income variation for SSA countries. Productive labour force is associated with significant and positive effect on income level. Inflation meets the priori expectation of negative influence on income level of a country.

2.8.2 Conclusion

In conclusion, different components of government expenditure have diverse effect on income level for middle and low income countries. Taking SSA as a block, education and health expenditure significantly accelerate output growth both in the long run and in the short run. However, military spending insignificantly contributes to output growth in SSA countries. Education spending significantly contributes more to income growth in low income SSA countries than for their middle income counterparts.

Budgetary allocation towards military and education expenditure in low income SSA countries improves economic performance more than for the middle income SSA countries. Inflation generally retards growth while labour force productivity is associated with economic growth.

2.8.3 Policy implications

Relying on the findings, the study makes the following policy suggestions. Due to the significant effect of education and military expenditure on growth, the governments need to increase budgetary allocation for education and military expenditure. Funding in education will enhance provision of quality education infrastructures and better remuneration of teachers which will enhance literacy. Low income countries need also to consider free and compulsory primary and secondary education. This will work towards improved literacy level and consequently impact on growth. Policy makers in the education sector need to introduce skill based courses, technical institutions and the government should invest locally to create employment opportunities. Creation of employment opportunities locally will discourage brain drain. Military expenditure for low income SSA countries needed to be expanded but with a caution. The government in low income countries could consider external borrowing rather than domestic borrowing in funding military expenditure. Domestic borrowing has the crowding out effect which might retard growth.

Middle income countries should cut on budgetary allocation for military expenditure. Some of the money spent on military should be diverted to productive expenditure like building roads and schools which have multiplier effects on the economy. SSA needs to address health reforms throughincreased funding towards social policies which involve improved primary health and universal health insurance coverage as wells as R&D to eliminate tropical diseases such as malaria.

CHAPTER THREE

THE EFFICIENCY OF PUBLIC SPENDING IN SUB-SAHARAN AFRICA

3.1 Background

Government role in economic development is crucial in markets characterised by asymmetric information. Imperfect markets results in economic distortions and consequently worsen off welfare (Chan and Karim, 2017). Government interventions in the economy through efficient spending not only enhance long-run growth but are also important in macroeconomic stabilization. With SSA countries faced with limited resources, it is crucial to investigate the efficiency of public spending since a marginal change can have a great impact on the attainment of government objectives which are in line with Sustainable Development Goals (SDGs).

Different econometric techniques have been used to measure spending efficiency. Government is viewed as a producer since it uses different combination of labour and inputs to produce different outputs. According to Afonso et al. (2003), governments that produce more outputs with fewer inputs are considered more efficient than governments that produce fewer outputs but use more inputs. Some governments in the African region are characterised by inefficiencies in the provision of public goods (Gupta and Verhoeven, 2001). An empirical finding that details the extent of efficiencies of government expenditure is crucial in correcting for government wastages. In addition, caution needs to be taken in budgetary allocation of resources by the government and mechanisms that improve efficiencies of public expenditure.

Figure 4 illustrates the wastefulness of spending for a sample of countries across the globe. Developed countries like United States of America (USA), Germany, New Zealand, and Singapore have efficiency score of above 5.0 implying efficiency of public resource

allocation. Curiously, Rwanda is the only SSA country with efficiency scores of above 5.0. However, low income economies: Kenya, Ghana, South Africa, Venezuela and Zimbabwe have efficiency scores of less than 4.0. Stylized facts, high income economies are characterised by efficiency in public resource allocation while low income economies are characterised by wastefulness of government spending.

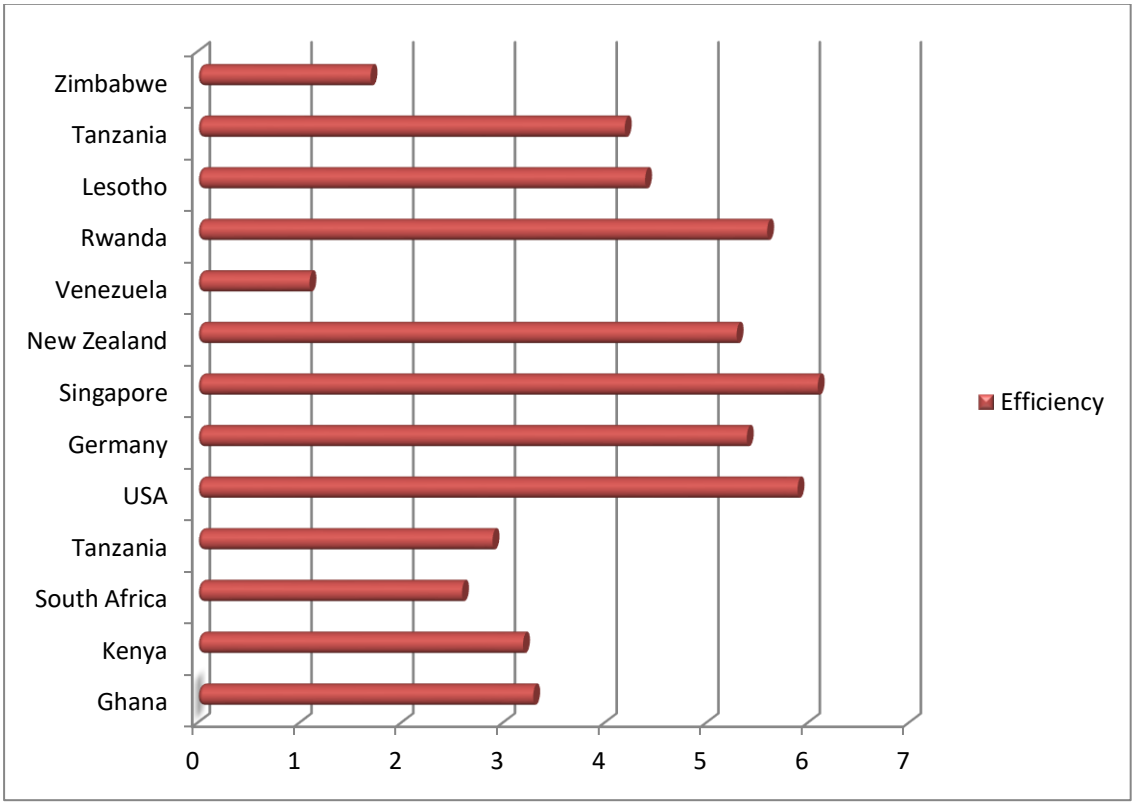


Figure 4: Efficiency of government spending

From the Global Competitiveness Report (2017). "The composition and quality of public spending in the country (1 = extremely inefficient; 7 = extremely efficient in providing necessary goods and services). Data rounded to two decimal places."

Theories explain that a more effective economy is associated with more effective governments. Previous studies have established that effective government accelerate output growth (Rajkumar and Swaroop, 2002). Tanz (2004), for example, suggested that the attainment of economic growth is associated with efficient use of public resources.

Sustainable economic growth is possible through sound public finance and efficient public expenditure.

Many factors explain cross country income variation. Such covariates include magnitude of the government expenditure multiplier. Different multipliers result in different realizations of change in Gross Domestic Product (GDP). Other covariates include the efficiency in the execution of government public expenditure (Wang and Alvi, 2011).Spending efficiency in turn is associated with a number of factors. This study therefore analyses spending efficiency in SSA countries. Secondly the study investigated how the environmental factors contribute to inefficiencies of spending in SSA.

3.2 Statement of the problem

Empirical studies have demonstrated that African countries are less efficient in fiscal policies than other regions (Gupta and Verhoeven, 2011). Wastefulness in government spending coupled with constrained domestic resources mobilization has resulted in the rise in public debt. Inefficiencies of government spending have caused public debt to rise in most SSA countries as from 2015 hence African countries run deficit spending. SSA governments have therefore resorted to both internal and external borrowing to finance deficits. However, internal borrowing by SSA countries has created the crowding out problem for private investments. Higher borrowing cost associated with high interest rate on loans has significantly contributed to reduction in local investment and increase in unemployment (Hernández-Catá, Schwab and Lopez-Claros, 2004).

With growing government size and increased demand for public services, public expenditure has been on the increase across SSA countries. However, this has not translated to an improvement in economic growth across SSA countries. Empirical studies needed to be

conducted to know the status of efficiency scores for public expenditure and also to investigate the sources of distortions in public spending across SSA countries.

Although adequate public spending is important for sound economic growth, more spending may be ineffective if fiscal discipline is not observed by the government. SSA countries, for instance, are characterized by high levels of corruption (Teorell *et al*. 2011). The average Transparency International Corruption Perception Index (CPI) for SSA countries was 2.9 out of the maximum possible 10. High level of corruption in SSA countries is therefore sources of inefficiency in public expenditure. Previous studies have not analysed the determinants of the efficiency of public expenditure for SSA countries. Besides, previous studies have used different approaches to measure public expenditure efficiency which contributes the mixed results.

3.3 Research questions

The main research question addressed in this study is: what is the status of government spending efficiency for SSA countries? The specific research questions are:

i. What is the efficiency of government spending for SSA countries between the years 2006 and 2018?
ii. What is the relative efficiency spending for each SSA countries?
iii. What is the effect of institutional quality on the efficiency of government spending?

3.4 Research Objectives

The main objective of the study is to analyse the status of the efficiency of government spending for SSA countries: Specific objectives are:

i. To analyse the efficiency of government spending for SSA countries between 2006 and 2018

ii. To examine the relative efficiency spending for each SSA countries

iii. To investigate whether institutional quality influences the efficiency of public expenditure for SSA countries.

3.5 Significance of the study

There exist limited studies on the analysis of efficiency of government expenditure in SSA countries. This paper adds to the literature by analysing the status of efficiency of public spending for SSA countries. Information on inefficiency could be utilized by SSA countries to design policies that reduce wastage in public expenditure. In particular, the study analysed the efficiency of different components of government expenditure (Health and education) of SSA countries. Results from this study are significant for policy actors in understanding the extent of inefficiencies across SSA countries. Secondly, environmental factors like institutional quality might influence the efficiency of government expenditure. The study incorporated these exogenous factors in the analysis by examining how institutional quality impacts the efficiency of government spending. Such evidence can provide a framework within which governments can put in place institutional arrangements aimed at fighting corruption to realize sound fiscal policy.

Many studies have used different approaches to measure efficiency of public expenditure. Kimaro et al. (2017) used indexes and performance indicators to measure efficiency of public expenditure for SSA countries. Analyses of efficiency is concerned with providing information on the maximum possible achievement, however, performance indicators used by Kimaro et al., (2017) does not elicit optimal possible outcome (Mandl *et al.* 2008). This paper contributes significantly by analysing efficiency of public spending for SSA countries by applying Data Envelopment Analysis (DEA). The approach is very common with studies examining technical efficiency given that it is free from the restriction of a priori functional form and it also allows for multiple output technologies. However, DEA is known to suffer

from serial correlation problem. This paper therefore contributes significantly by adopting two-stage bootstrap DEA as suggested by Simar and Wilson (2007). No single study has applied Simar and Wilson approach to estimate the efficiency of government spending in SSA.

3.6 Organization of the chapter

This chapter is organized into five sections: Section 3.7contains review of empirical literature, section 3.8 presents overview of the literature, section 3.9 provides methodology adopted in the study, section 3.10 provides the findings while Section 3.11entails summary and policy implications.

3.7 Literature Review

Governments play a crucial role in providing public goods hence there are many reasons to quantify efficiency measures in order to analyse government performance. According to Farrell (1957), efficiency allows for comparison across similar units making it possible to evaluate relative efficiency. Further analysis can be pursued if measurements across the units result into inefficiency (Kumbhakar and Lovell, 2003;Kalirajan and Shand, 1999). Lovell (1995) asserts that analysis arising from measurements of efficiency provides practical policy that might improve efficiency and may assist in policy decision making process. According to De Borger et al. (1994), the measurement of efficiency is not detached with accountability since the public generally believes governments are not efficiently using public resources

Afonso et al. (2005) examined public sector efficiency for twenty three industrialised countries. The study relied on Free Disposal Hull (FDH) analysis. FDH is a non-parametric production frontier. FDH was used to analyse the efficiency of public sector for industrialised countries for the period 1990 and 2000. The study found that private sector performance for big governments is 35percent lower than small governments. This paper had its limitations on

the methodology adopted. In particular, by using FDH, the paper failed to statistically assess differences across countries.

Similarly, Afonso and Fernandes (2006) analysed the spending efficiency for Lisbon municipality. The study took a sample of 51 municipalities and used DEA for production frontier estimation. On the average, spending in Lisbon municipalities was found to be inefficient. The composite output measure, found that municipalities on average could have reduced resources by 41percent to achieve the same level of output.

Rahmayanti and Horn (2010) analysed efficiency score for government spending for 63 developing countries for the period between 1990 and 2003. The study estimated the efficiency index for expenditure using Data Envelopment Analysis (DEA). The study found that developing countries can maximize growth using smaller resources if expenditure is efficiently utilized.

Prasetyo and Zuhdi (2013) examined the efficiency of government spending on human capacity building. The study sampled 81 countries for the period2006 to 2010. Efficiency was estimated by employing DEA approach. The study found that mixed result for efficiency score for different countries. For example, some countries were on the efficiency frontier with only Singapore and Zambia showing positive improvements on efficiency frontier.

Hsu (2013) examined government spending efficiency on health for 46 Central Asia countries and Europe and used DEA method. On the average, the overall technical efficiency was found to be 98.8percent and the productivity growth decreased by 7.7percentannually over the sample period. The findings from the study further established a regional effect between Europe and Central Asia in terms of efficiency scores.

Chan, et al. (2017) examined the technical efficiency of government spending for 115 countries. The study adopted DEA technique. The study found that efficient government spending enhances growth.

Wang and Alvi (2011) measured the relative technical efficiency scores and the determinant of government performance. The study sampled 7 Asian countries for the periods 1986-2007. The study adopted DEA. The result showed that Singapore and Japan were more efficient than the remaining Asian countries. Extreme bounds analysis (EBA) found corruption to be an important factor determining government performance.

Hauner and Kyobe (2010) sampled 114 countries from 1980 to 2006 and used DEA approach. DEA was used to estimate public sector performance (PSP) and public sector efficiency (PSE). The finding showed that efficiency decreases with a rise in spending. Further, results showed that government accountability and control for corruption significantly improves spending efficiency.

Herrera and Pang (2005) examined efficiency spending for a sample of 140 developing countries using data from 1996 to 2002. The frontier was estimated by both Free Disposable Hull (FDH) and DEA. The study found an average efficiency score of 0.9. Health and education expenditure for developing countries could have been increased by 10 percent by using the same level of input.

Gupta and Verhoeven (2001) analysed the efficiency of government for 37 African countries between 1984 and 1995. The study used FDH to analyze the relative efficiency of education and health spending. The result showed that African governments are less efficient in spending than the Asia and the Western Hemisphere countries. Inefficiencies experienced in Africa are attributed to relatively high government wages and the intra-sectoralallocation of government resources.

3.8 Literature overview

In summary, there exists scanty literature on the measures of efficiency for government expenditure for SSA countries. There exists one known study by Gupta and Verhoeven (2001) that analysed spending efficiency for African countries using FDH approach. However, no literature has analysed the sources of inefficiencies of public expenditure in SSA countries. This paper therefore fulfils this gap in the literature. On the methodological front, various studies have used different techniques in measuring efficiency of public spending. The review of the literature has demonstrated that no single study has employed two-stage bootstrap DEA for the case of SSA spending efficiency studies. The widely used techniques are parametric and non-parametric approaches of measuring public spending. The parametric approach imposes a specific functional form between the inputs and the outputs while the non-parametric approach does not imposing specific functional form. This study employed DEA non-parametric approach to analyse the efficiency of government spending across SSA countries. In addition, the paper adopted two-stage bootstrap as proposed by Simar and Wilson (2007).

3.9 Methodology

3.9.1 Conceptual model for government spending efficiency

Analysis of the efficiency encompasses the relationship between outputs and inputs. Farell (1957) benchmarked the measurement of government spending efficiency and its relevance to policy makers. The author, in particular, identified ways in which a productive agent could be inefficient. Inefficiency arises when the productive agent uses more inputs than technically required to produce a given output (Farell, 1957). Figure 5 shows conceptual framework for efficiency. It provides a link between input and output. The input is both monetary and non-monetary resources that produce output. For instance, government spending in education (input) produces education attainment rates (output). Environmental factors also influence the

efficiency of government pending. Through corruption, government resources might be diverted to private use thereby resulting to wastage of public resources.

The input-output ratio is therefore the widely used approach in the analysis of efficiency. The concept of efficiency incorporates the idea of production possibility frontier (PPF). PPF indicates the feasible output levels given the scale of operations. An activity is therefore considered efficient if we achieve more output for a given input or we utilize fewer inputs for a given output (Mandl *et al.,* 2008).

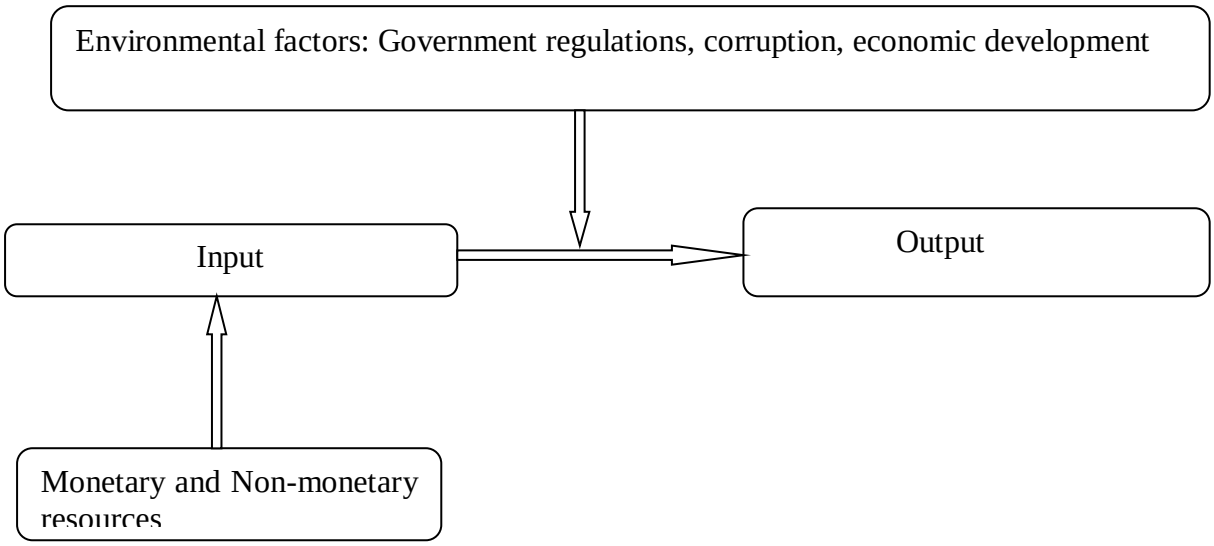


Figure 5: Conceptual framework of efficiency

Source: Mandl, et al. (2008).

3.9.2 Empirical model

Literature has proposed two main techniques in analysing the efficiency of government spending: the non-parametric (DEA or FDH) and the parametric technique (Stochastic frontier). The parametric approach in measuring efficiency imposes a priori functional form that relates inputs and the outputs. The non-parametric technique does not impose functional restrictions. Stochastic frontier (SF) has the merit of dealing with random noise while

inefficiency in DEA is measured by the deviation from the efficiency frontier (Rayp and Van De Sijpe, 2007).

The measurement of the efficiency of decision making units (DMUs) is popularly estimated by DEA technique. Charnes, Cooper, and Rhodes (1957) build on Farrell's (1957) technical efficiency (TE) to develop constant returns to scale (CRS). Banker, Charnes, and Cooper (1984) extended the BCC model to the variable-returns-to-scale (VRS) version.

Non-parametric approach (DEA) is used in this paper to estimate efficiency of government spending for SSA.DEA has the following advantages: (1) DEA, unlike SFA, does not assume a priori specification of functional form for production technology (2) it is applicable in the case of multiple-output and multiple-input (3) and it does not require distributional assumptions

DEA estimates of TE can either be input-oriented or output-oriented. The aim of input-oriented approach is to measure the percentage of input that can be reduced to produce the same level of output. Output-oriented DEA evaluate the proportionate increase in output at the given input level. Both input-oriented and output-oriented DEA approaches produce the same estimates under CRS. However, the scores for these two approaches diverge under VRS. Both approaches are immune to simultaneous equation bias and specification hence they can identify efficient decision making units (DMUs).

Sung (2007) suggested that "when a DMU produces many outputs by employing many inputs, inputs and outputs must be aggregated into an input and an output index, respectively, to enable calculation of a ratio to measure productivity. TE reflects the ability of a DMU to produce the maximum output attainable from a given set of inputs or the ability of a DMU to use the minimum amount of inputs possible to produce a given set of outputs. Using the maximum output criterion, it is assumed that DMU operates at a point on the production

possibility set that represents the set of all technologically feasible production plans for a given level of inputs."

According to Charnes et al. (1987), an equation evaluating efficiency is given by:

$$Min\ \varphi, \lambda^{\varphi}$$

$$Subject\ to\ -\gamma_i + Y\lambda \geq 0 \qquad (1)$$

$$\varphi x_i - X\lambda \geq 0$$

$$n'1\lambda = 1$$

$$\lambda \geq 0$$

Where;

φ: is a scalar which lies between 0 and 1. φ measures the TE. DMU is considered inefficient if φ is less than a unit ($\varphi < 1$). However, DMU is efficient if φ equals one unit ($\varphi = 1$); that is DMU is along the frontier.

λ: is a $(n\ x\ 1)$vector of scalar values that measures the deviation from frontier for each DMUs (Afonso and Kazemi, 2017).

$n'1\lambda = 1$: imposes convexity of the frontier, accounting for variable returns to scale.

X: is input vector of dimension K by T that produces M outputs

Y: is a vector of outputs for the whole period.

The CRS is obtainedwhen$\sum_{t=1}^{T} \lambda_t = 1$. CRS implies that if you increase input quantity by a given proportion then outputs quantity will increase by the same proportion. However, in the VRS an increase in input quantity by a given proportion will result to less or more proportionate increase in outputs quantity.

3.9.3Simar and Wilson two-stage efficiency

DEA has a number of limitations: (1) the estimates do not shed light on the sources of inefficiencies and (2) estimates are computed from a common sample which results to problem of serial correlation. Simar and Wilson (2007) developed two-stage process that remedies estimation problems associated with non-parametric DEA. Simar and Wilson (2007) approach combines efficiency measurement of DEA with regression. DEA efficiency score is used as dependent variable and regression against exogenous variables. Two-step approach yields estimated standard errors and confidence intervals that are free from bias.

Simar and Wilson (2007) consider three variables $\rho_i, \chi_i, and\ \psi_i$ for a sample of $i = 1, \dots, N$ DMUs. ρ_i denotes a vector of inputs used in the production process, χ_i is a vector of output realized while ψ_i represents a vector of K exogenous variables that influence input-output combination. $\emptyset_i$ in output oriented Ferrell (1957) measures the distance between each DMUs' output and the frontier. The inefficiencies by each DMUs is captured by $\emptyset_i$.

Equation (2) gives Simar and Wilson data generating process for efficiency $\emptyset_i$.

$$\emptyset_i = \psi_i\boldsymbol{\beta} + \boldsymbol{\mathcal{U}_i} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \mathbf{2}$$

Where $\boldsymbol{\beta}$denotes the column vector of coefficients. The disturbance term, $\boldsymbol{\mathcal{U}_i}$, is independent, truncated and such that $\boldsymbol{\mathcal{U}_i} \sim N(0, \delta)$.

Simar and Wilson (2007) proposed the following steps in performing two-stage analysis of efficiency;

1. Use DEA to estimate $\emptyset_i$for all DMUs ie $i = 1, \dots\dots, N$
2. For$\widehat{\emptyset_i} > 1$, use M DUMs for which $M < N$ in a truncated regression (left-truncated at 1) of $\widehat{\emptyset_i}$ on ψ_i to obtain coefficient estimates of $\widehat{\boldsymbol{\beta}}$ and for variance parameter $\hat{\delta}$ for maximum likelihood.

3. Loop over steps 3.1-3.4 C_1 times to obtain a set of C_1 bootstraps estimates $\hat{\emptyset}_\iota^{\,c}$ for each DMU $i = 1, \dots, N$, with $c = 1, \dots, C_1$.

   3.1 For each DMUs$i = 1, \dots, N$, draw an artificial error$\widehat{\boldsymbol{u}_\iota}$ from the truncated $N(0, \widehat{\boldsymbol{u}_\iota})$ distribution with left-truncation at $1 - \psi_i\hat{\boldsymbol{\beta}}$.

   3.2 Compute artificial efficiency scores $\hat{\emptyset}_\iota$ as $\psi_i\hat{\boldsymbol{\beta}} + \hat{u}$ for each DMU $i = 1, \dots, N$

   3.3 Generate $i = 1, \dots, N$ artificial DMUs with input quantities $\hat{\rho}_\iota = \rho_i$ and output

$$\widehat{\psi_\iota} = \left({}^{\hat{\emptyset}_\iota}\!/_{\hat{\emptyset}_\iota}\right)\psi_i$$

   3.4 Use the N artificial DMUs, generated in step 3.3, as a reference in a DEA that yield $\hat{\emptyset}_\iota^{\,c}$ for each original DMU $i = 1, \dots, N$.

4. For each DMUs $i = 1, \dots, N$, calculate a bias corrected efficiency score $\hat{\emptyset}_\iota^{\,c}$ as

$$\hat{\emptyset}_\iota - \left({}^{1}\!/_{C_1}\sum_{C=1}^{C_1}\hat{\emptyset}_\iota^{\,c} - \hat{\emptyset}_\iota\right).$$

5. Run a truncated regression (left-truncation at 1) of $\hat{\emptyset}_\iota^{\,c}$ on ψ_i to obtain coefficient estimates of $\hat{\hat{\beta}}$ and an estimate for variance parameter $\hat{\hat{\delta}}$ by maximum likelihood.

6. Loop over steps in 6.1-6.3 C_2 times to obtain a set of C_2 bootstraps estimates $\left(\hat{\hat{\beta}}, \hat{\hat{\delta}}^{\mathrm{c}}\right)$ with $c = 1, \dots, C_2$.

   6.1 For each DMUs $i = 1, \dots, N$, draw an artificial error $\widehat{\widehat{\boldsymbol{u}_\iota}}$ from the truncated $N(0, \widehat{\widehat{\boldsymbol{u}_\iota}})$ distribution with left-truncation at $1 - \psi_i\hat{\hat{\boldsymbol{\beta}}}$.

   6.2 Compute artificial efficiency scores $\hat{\hat{\emptyset}}_\iota$as $\psi_i\hat{\hat{\boldsymbol{\beta}}} + \hat{u}$ for each DMU $i = 1, \dots, N$

6.3 Run a truncated regression (left-truncation at 1) of $\hat{\hat{\emptyset}}_\iota$on ψ_i to obtain bootstrap estimates $\hat{\hat{\boldsymbol{\beta}}}^c$ and $\hat{\hat{\boldsymbol{\delta}}}_{\boldsymbol{\iota}}^{\ c}$ by maximum likelihood

7. Calculate confidence interval and standard error for $\hat{\hat{\boldsymbol{\beta}}}$ and $\hat{\hat{\delta}}$.

To obtain consistent inference on efficiency score, this paper used a double-bootstrap procedure as proposed by Simar and Wilson (2007). Based on previous studies (Levine and Renelt, 1992; Saleh and Harvie, 2005; Mankiw *et al.* 1992; Barro, 1991: Cebula, 2003; Saleh and Harvie, 2005) a number of environmental variables were considered: Institutional quality, inflation, labour force, primary and secondary enrolment, military expenditure and GDP per capita. Following previous studiesAfonso and Kazemi (2017), we performed output-oriented DEA since the primary goal of the government is to improve the education level, child mortality and to provide health services that improve life expectancy.

3.9.4 A two-part returns to scale test

The efficiency measures differ with the assumption about global technology. Efficiency scores differ under the assumptions of VRS and CTRS. Estimates of efficiency under CRS will lead to inconsistent output if technology is not CRS globally (Simar and Wilson 2002). We performed two-part returns to scale test to determine whether to run two-stage bootstrapped DEA under the assumption of CRS or VRS.

Simar and Wilson (2002) therefore suggested the following test:

Test #1

$$H_0: T \; is \; globally \; CRS$$

$$H_1: T \; is \; VRS$$

If null hypothesis is rejected a less restrictive null hypothesis may be performed:

Test#2

$H_0: T\ is\ globally\ NIRS$

$$H_1: T\ is\ VRS$$

3.9.5 Nonparametric test of independence

Nonparametric test of independence was done to decide among three types of bootstraps; (1) smoothed homogeneous, (2) smoothed heterogeneous, and (3) sub sampling (heterogeneous). The test was performed under the assumption of VRS.

3.9.6 Data and Source

Due to data limitation for SSA countries, the two inputs used are: health and education expenditure. Outputs are outcomes of these expenditures. For example education outcomes include secondary and primary enrolment while health outcomes comprise life expectancy and infant mortality. Data was sourced from WDI (2019).

	VARIABLE	Data Description
Inputs	**Public spending on education**	"It is measured as the total expenditure on education (current and capital) as a percentage of GDP." WDI
	Public spending on health	"It is measured as the total health expenditure (current and capital) as a percentage of GDP." WDI
Outputs	**Primary school enrolment**	"The number of children enrolled in a primary level, regardless of age, divided by the population of the age group that officially corresponds to the same level."WDI
	Secondary school enrolment	"The number of children enrolled in a secondary level, regardless of age, divided by the population of the age group that officially corresponds to the same level."WDI
	Infant Mortality	"Infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year."WDI
	Life expectancy	"Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout."WDI
Environmental variables	**GDP growth rate**	"Is the average annual growth rate of real GDP measured by change in GDP at constant prices as share of GDP."WDI
	Voice and Accountability	"Captures the perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media."WDI
	Political stability and absence of violence	"Measures the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism."WDI
	Government effectiveness	"Captures the quality of public services, the quality of the civil services and the degree of independence from political pressures, the quality of policy formulation and implementation."WDI
	Regulatory quality	"Captures the perception of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development."WDI
	Rule of law	"Measures the perception of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property right."WDI
	Control of Corruption	"Captures the perception of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption as well as state capture by elite and private interest."WDI
	Inflation	"The percentage change in Consumer Price Index (CPI) on a year-on year basis."WDI
	Savings	"Gross savings is the gross national income less total consumption, plus net transfers as a percentage of GDP."WDI

Figure 6: Data Source and Definition of variable

3.10 Empirical result

3.10.1 Descriptive statistics

Table 7 provides summary statistics. Governments are considered DMU's since they employ various inputs (expenditures) to produce outputs to the public. Due to data limitation for some SSA countries, the study used data from 23 SSA countries between the periods 2006-2018. The average education spending was 4.63percent of GDP with highest expenditure on education at 13.22 percent of GDP. Some SSA countries spend as low as 0.418 percent of GDP on education sector. On the average, SSA countries spend 2.805 percent of GDP towards health sector with maximum expenditure on health at 9.087 percent of GDP. The average primary enrolment is 100.04percent while secondary enrolment stands at 43.4percent.

	Variable	Obs	Mean	Std.Dev.	Min	Max
Input	Education Expenditure	299	4.631	2.256	1.098	13.220
	Health expenditure	299	2.805	1.461	0.418	9.087
Output	Primary enrolment	299	100.043	22.215	39.539	149.271
	Secondary Enrolment	298	43.391	25.428	6.547	107.804
	Infant Mortality	299	59.694	24.588	11.800	110.000
	Life Expectancy	299	57.245	7.139	42.595	74.276
Environmental Variables	GDP per capita	299	2181.409	2817.394	221.096	12850.490
	Inflation	299	7.581	7.491	-3.503	37.393
	Labour	299	52.519	13.959	25.659	78.749
	Military Expenditure	299	1.664	1.160	0.143	5.984
	Capital	299	20.516	9.229	2.557	46.732
	Government Effectiveness	299	-0.502	0.620	-1.840	1.130
	Political stability	299	-0.444	0.981	-2.670	1.080
	Rule of Law	299	-0.523	0.679	-1.830	1.060
	Voice and accountability	299	-0.345	0.717	-1.780	0.980
	Control of Corruption	299	-0.432	0.662	-1.510	1.250
	Regulatory quality	299	-0.458	0.571	-1.489	1.127

Table 7: Descriptive statistics used in the study

Infant mortality averaged 59 infants per 1000 infants while the countries with highest infant mortality between 2006 and 2018 had 110 per 1000 infants compared to countries with the lowest 11 per 1000 infants. GDP per capita for the 23 SSA countries during the study period

averaged USD 2181.409. The standard deviation for income per capita is quite high illustrating high variation in GDP per capita across SSA countries. Military expenditure had an average of 1.67percent of GDP with a standard deviation of 1.16percent. The average labour force was 52.52percent while capital formation was 20.51percent. Six components of institutional quality were considered (Government effectiveness, political stability, rule of law, voice and accountability, control of corruption and regulatory quality). All the six composite indicators values averaged below 0 indicating poor governance.

3.10.2 Average Bootstrapped Efficiency Results (2006-2018)

We run bootstrapped output-oriented (VRS) DEA efficiency model. The specification considers four outputs and two inputs. The four outputs include primary enrolment, secondary enrolment, infant mortality and life expectancy. The sets of input comprised of health and education expenditure. Since our first objective was to investigate the efficiency of government spending for SSA countries, we present the efficiency across the years 2006-2018. All results were calculated using the variables returns to scale (VRS) assumption. Applying two-step test for CRS as proposed by Simar and Wilson (2007), test result rejects CRS in favour of VRS (***See appendix 7***). Following Simar and Wilson (1998) test of independence (***See appendix 6***), we applied smooth bootstrapping.

Table 8 provides the first-stage results from both conventional and bootstrap. The DEA models capture an overall technical efficiency estimates for SSA countries from 2006 to 2018. Results in Table 8 shows that the bias-corrected efficiency scores are greater than the original DEA efficiency scores. The results show that the average bootstrapped inefficiency is 48percent. Least inefficiency was 33percent in 2014 and at maximum of 51percent in 2010. The result shows that SSA countries experienced considerable higher inefficiencies in spending between the years 2006 and 2018.

Conventional VRS model						Bootstrap VRS model					
Year	Mean	Std.Dev.	Min	Max	Ineff*	Year	Mean	Std.Dev.	Min	Max	Ineff*
2006	1.32	0.60	1	3.51	24percent	2006	1.53	0.66	1.04	3.98	34percent
2007	1.37	0.65	1	3.25	27percent	2007	1.70	0.80	1.02	3.85	41percent
2008	1.428	0.87	1	4.68	30percent	2008	1.705	0.98	1.022	5.336	41percent
2009	1.451	0.88	1	4.17	31percent	2009	1.737	0.98	1.074	4.924	42percent
2010	1.466	0.84	1	4.3	32percent	2010	2.041	1.27	1.013	6.605	51percent
2011	1.399	0.71	1	3.75	29percent	2011	1.876	0.98	1.079	5.111	47percent
2012	1.409	0.91	1	4.69	29percent	2012	1.932	1.47	1.004	7.224	48percent
2013	1.299	0.55	1	2.85	23percent	2013	1.529	0.65	1.011	3.068	35percent
2014	1.298	0.63	1	3.42	23percent	2014	1.496	0.62	1.004	3.529	33percent
2015	1.346	0.76	1	4.16	26percent	2015	1.762	1.08	1.018	5.753	43percent
2016	1.399	0.77	1	3.66	29percent	2016	1.715	0.93	1.045	4.488	42percent
2017	1.411	0.75	1	3.54	29percent	2017	1.822	1.00	1.043	4.813	45percent
2018	1.407	0.71	1	3.29	29percent	2018	1.793	0.9	1.033	4.168	44percent
Total	1.739	0.96	1	5.82	43percent	Total	1.917	1.04	1.061	6.268	48percent

Number of obs = 299

Number of bootstr. reps =2000

Wald chi2(14) = 128.71

Prob > chi2(14) = 0.0000

Table 8: Technical efficiency scores

Note: (*) "Ineff. (average firms' inefficiency) is calculated by (Mean – 1)/Mean) where 1 is best practice. The higher the efficiency score, the lower is the average inefficiency in a given year."

3.10.3 Relative efficiency scores for government spending in SSA countries

The second objective was to analyse the efficiency of each SSA country for the periods 2006-2018. The study analysed DEA output-oriented efficiency scores with CRS and VRS for 23 SSA countries for the period 2006 to 2018. Both CRS and VRS efficiency were estimated in order to assess whether inefficiency is due to scale efficiency or pure efficiency. Output-oriented DEA model maximizes output given a fixed level of inputs. The major goal of governments is to maximize social welfare of the public through public provision of goods and services while faced with constrained public resources. In this study 23 countries were taken as DMUs in order to evaluate their relative efficiency in terms of output variables (Primary enrolment, secondary enrolment, infant mortality and life expectancy).

Table 9 provides the output oriented efficiency scores when constant returns to scale is considered (CCR model). The average efficiency score is 0.677 implying that on average the

SSA countries could have increased the output level by 32.3percent by allocating the same spending. This denotes that SSA countries could improve government performance without necessarily increasing spending.

Guinea-Bissau is the most efficient country and the only country that is performing on the efficiency frontier while the other countries are performing below this frontier. Lesotho is the least efficient country with an average efficiency score of 0.264 denoting that it could increase output by 73.6percent with the same level of resources. Lesotho inefficiency in government spending is explained by poor public financial management, political instability and high recurrent expenditure (Adeniran et al., 2018). Cameroon, Central African Republic, Guinea, Guinea-Bissau, Kenya, Mauritius, Nigeria and Sudan show efficient expenditure for some periods between 2006 and 2018 while Benin, Botswana, Burkina Faso, Burundi, Cape Verde, Ghana, Lesotho, Malawi, Rwanda, Senegal, and South African were consistently inefficient for the periods 2006-2018.

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average	Rank
Benin	0.608976	0.559998	0.536288	0.486102	0.570233	0.580316	0.551877	0.741302	0.641601	0.450868	0.645401	0.695636	0.701256	0.5976811	14
Botswana	0.968697	0.809564	0.689103	0.442627	0.639633	0.486896	0.454714	0.468652	0.638525	0.687514	0.632023	0.478938	0.53092	0.6098312	13
Burkina Faso	0.447366	0.439855	0.46737	0.362998	0.392479	0.345861	0.478702	0.480969	0.491049	0.41825	0.527423	0.487751	0.543895	0.4526129	20
Burundi	0.659835	0.781724	0.449486	0.449534	0.441478	0.357788	0.359441	0.579057	0.380089	0.371432	0.440027	0.500452	0.506012	0.4827965	19
Cameroon	0.719911	0.856052	0.763534	0.710646	0.802165	0.786098	0.948297	1	1	0.969407	1	1	1	0.8889315	5
Cape Verde	0.400088	0.455034	0.475684	0.489366	0.564307	0.557781	0.583094	0.657995	0.729752	0.728428	0.691842	0.753944	0.894547	0.6139894	12
Central Africa Republic	0.912995	1	1	1	1	1	1	1	1	1	1	1	1	0.9933073	3
Ghana	0.503964	0.58852	0.41405	0.301377	0.414398	0.374689	0.388963	0.480001	0.501657	0.415189	0.398959	0.510433	0.538912	0.4485471	21
Guinea	0.808664	0.880622	0.983822	1	1	1	1	1	0.823116	0.610411	0.807217	0.667669	0.676506	0.8660021	6
Guinea-Bissau	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Kenya	0.486555	0.600958	0.672705	0.486181	0.618781	0.532227	0.874924	1	1	0.609153	0.505056	0.530425	0.571352	0.6529475	11
Lesotho	0.313773	0.32024	0.249612	0.272743	0.264371	0.219373	0.211781	0.285421	0.273677	0.247228	0.236809	0.250111	0.294892	0.2646178	23
Malawi	0.595508	0.664304	0.678191	0.600399	0.69123	0.495933	0.666976	0.687755	0.576284	0.5063	0.466444	0.469024	0.496263	0.5842008	16
Mauritania	0.483417	0.531087	0.750434	0.667738	0.839445	0.752375	0.72306	0.888808	1	0.932121	1	0.930213	0.875753	0.7980347	8
Mauritius	1	0.951802	0.973176	1	1	1	1	1	1	1	1	1	1	0.9942291	2
Mozambique	0.330693	0.431737	0.468092	0.383613	0.417375	0.394089	0.417477	0.586966	0.546214	0.393723	0.429653	0.406507	0.353529	0.4276668	22
Niger	0.568157	0.695524	0.513316	0.48952	0.517873	0.457185	0.498882	0.576332	0.743161	0.458914	0.589021	0.558595	0.39901	0.5434992	17
Nigeria	1	1	0.643661	0.601236	0.708196	0.479013	0.607713	1	1	1	1	1	1	0.8492168	7
Rwanda	0.583225	0.446945	0.54042	0.54148	0.544426	0.445327	0.58933	0.853507	0.739147	0.531392	0.678688	0.65555	0.581212	0.5946653	15
Senegal	0.46502	0.484828	0.486212	0.342079	0.422673	0.482359	0.464854	0.608488	0.662372	0.540462	0.576628	0.52566	0.466258	0.5021456	18
Seychelles	0.531052	0.552694	0.635491	0.704168	0.717495	0.626242	0.69367	0.853959	0.906634	0.803147	0.885317	0.891162	1	0.7539255	9
South Africa	0.645764	0.682555	0.734263	0.724007	0.819588	0.68843	0.690692	0.648572	0.723878	0.629084	0.605043	0.671401	0.82918	0.6994198	10
Sudan	1	1	1	1	1	0.948154	0.908543	0.890605	0.931931	0.814715	0.972272	1	1	0.95894	4
Average														**0.6772699**	
Minimum														**0.2646178**	

Table 9: CCR Efficiency Scores (2006-2018) output oriented

Table 10compares the results of output-oriented DEA model based on BCC model. The average efficiency score was established to be 98.5percent for SSA. Central Africa Republic, Mauritania, Guinea-Bissau, Mauritius, Nigeria, Rwanda, Seychelles, South Africa and Sudan were the most efficient countries in resource allocation. The expenditure was optimally utilized to attain education and health outcomes. Eight countries have efficiency score higher than 98.5percent but did not operate on the frontier: Benin, Botswana, Cameroon, Cape Verde, Guinea and Lesotho. Six countries have efficiency score under the total average: Burkina Faso, Burundi, Ghana, Kenya, Mozambique, Niger and Senegal.

Table 10 illustrates that nine countries located on the efficiency frontier and therefore labelled as the most efficient. These countries include: Central Africa Republic, Guinea-Bissau, Mauritania, Mauritius, Nigeria, Rwanda, Seychelles, South Africa and Sudan.

Table 11 presented scale efficiency (SE) of government spending for SSA countries. SE measure is obtained by comparing CRS-efficiency scores with VRS-efficiency. CRS-efficiency score represents overall technical efficiency (OTE). OTE is the inefficiency due to the configuration of inputs and output. The VRS efficiency score represents pure technical efficiency (PTE). PTE measures inefficiencies due to government interventions or managerial skills in decision making process. Scale efficiency is therefore obtained as:

$$\boldsymbol{SE = {OTE}/{PTE}}$$

.

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average	Rank
Benin	0.999811	1	1	1	1	1	1	1	1	1	1	1	1	0.999985	10
Botswana	1	1	1	1	1	0.987859	0.97877	0.98516	0.97828	0.9975	0.98848	0.9773	0.98374	0.990546	15
Burkina Faso	0.957412	0.96191	0.966359	0.968629	0.9647	0.959981	0.95646	0.9534	0.95093	0.94819	0.94633	0.9451	0.94442	0.955681	20
Burundi	0.958071	0.96587	0.962239	0.960039	0.9553	0.967604	0.97132	0.99028	1	1	1	0.9746	0.96493	0.974633	17
Cameroon	0.977833	0.96874	0.967355	0.968749	0.9624	0.983398	0.98759	1	1	1	1	1	1	0.985853	16
Cape Verde	1	0.99497	0.996294	1	1	1	1	1	1	1	1	1	1	0.999328	11
Central Africa Republic	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ghana	0.955915	0.94935	0.942106	0.942467	0.9448	0.948524	0.94921	0.94766	0.94512	0.9452	0.94072	0.9422	0.94293	0.945864	22
Guinea	0.984244	0.982	0.994845	1	1	1	1	1	1	1	1	0.9967	1	0.996752	12
Guinea-Bissau	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Kenya	0.871591	0.92867	0.916421	0.893087	0.8944	0.919173	0.94715	1	1	0.92885	0.93145	0.9379	0.94328	0.931693	23
Lesotho	0.953328	1	1	1	1	1	1	1	1	1	1	1	1	0.99641	13
Malawi	1	1	1	1	0.9974	0.944743	0.99874	1	1	1	1	1	1	0.995451	14
Mauritania	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mauritius	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mozambique	1	0.98894	0.98031	0.973726	0.9655	0.957485	0.96133	0.96061	0.96136	0.92706	0.92021	0.9225	0.9294	0.957572	19
Niger	0.967111	0.96635	0.965371	0.962829	0.9559	0.949551	0.9451	0.94156	0.94028	0.93958	0.93997	0.9413	0.94367	0.950655	21
Nigeria	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rwanda	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Senegal	0.969596	0.95489	0.960772	0.952682	0.9551	0.957428	0.96094	0.96498	0.96849	0.97055	0.96917	0.9714	0.97234	0.963722	18
Seychelles	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
South Africa	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sudan	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Average														**0.984528**	
Minimum														**0.931693**	

Table 10: BCC Efficiency Scores (2006-2018) output oriented

Scale efficiency scores help decision makers to understand the reason of inefficiency in CCR model. On average, scale efficiency for the sampled SSA countries is 0.687 compared to pure scale efficiency of 0.9845. Based on this finding, the source of the technical inefficiency of the SSA countries' government spending is the scale inefficiency instead of pure technical efficiency. The result implies SSA countries mostly suffer from the problem of operating at the wrong scale of operations. This finding could be attributed to constraints in domestic resource mobilization and low governance quality captured by public investment inefficiency. Further**,** inadequate managerial and organizational could contribute to the inefficiencies.

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average	Rank
Benin	0.609091	0.559998	0.536288	0.486102	0.57023	0.580316	0.551877	0.741302	0.641601	0.450868	0.6454	0.695636	0.70126	0.59769	13
Botswana	0.968697	0.809564	0.689103	0.442627	0.63963	0.49288	0.464579	0.475713	0.652702	0.68924	0.63939	0.490049	0.53969	0.614913	12
Burkina Faso	0.467266	0.457272	0.48364	0.374754	0.40684	0.360279	0.500496	0.5044766	0.51639	0.441103	0.55733	0.516068	0.5759	0.473986	21
Burundi	0.688712	0.80935	0.467125	0.468246	0.46214	0.369767	0.370055	0.5847401	0.380089	0.371432	0.44003	0.513501	0.5244	0.496122	20
Cameron	0.736231	0.883679	0.789301	0.733571	0.83349	0.799369	0.960209	1	1	0.969407	1	1	1	0.900404	5
Cape Verde	0.935456	0.915887	0.591821	0.63831	0.55447	0.462573	0.38539	0.5847401	0.380089	0.383154	0.44003	0.513501	0.5244	0.562294	18
Central Africa Republic	0.912995	1	1	1	1	1	1	1	1	1	1	1	1	0.993307	3
Ghana	1.024602	0.915887	0.591821	0.63831	0.55447	0.462573	0.38539	0.5847401	0.380089	0.383154	0.44003	0.513501	0.5244	0.569151	17
Guinea	0.821609	0.896766	0.98892	1	1	1	1	1	0.823116	0.610411	0.80722	0.66989	0.67651	0.868803	6
Guinea-Bissau	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Kenya	0.558238	0.647117	0.734057	0.544383	0.69183	0.579028	0.923749	1	1	0.655811	0.54223	0.565521	0.60571	0.695975	11
Lesotho	0.329134	0.32024	0.249612	0.272743	0.26437	0.219373	0.211781	0.285421	0.273677	0.247228	0.23681	0.250111	0.29489	0.265799	23
Malawi	0.595508	0.664304	0.678191	0.600399	0.69305	0.52494	0.667816	0.687755	0.576284	0.5063	0.46644	0.469024	0.49626	0.586637	15
Mauritania	0.483417	0.531087	0.750434	0.667738	0.83945	0.752375	0.72306	0.888808	1	0.932121	1	0.930213	0.87575	0.798035	8
Mauritius	1	0.951802	0.973176	1	1	1	1	1	1	1	1	1	1	0.994229	2
Mozambique	0.330693	0.436567	0.477494	0.393964	0.43228	0.411588	0.434272	0.6110366	0.568169	0.4247	0.46691	0.440666	0.38038	0.446824	22
Niger	0.587479	0.719744	0.531729	0.508418	0.54177	0.481475	0.527864	0.6121033	0.79036	0.488425	0.62664	0.593456	0.42283	0.571715	16
Nigeria	1	1	0.643661	0.601236	0.7082	0.479013	0.607713	1	1	1	1	1	1	0.849217	7
Rwanda	0.583225	0.446945	0.54042	0.54148	0.54443	0.445327	0.58933	0.853507	0.739147	0.531392	0.67869	0.65555	0.58121	0.594665	14
Senegal	0.479602	0.507731	0.506064	0.359069	0.44254	0.503807	0.483749	0.6305719	0.683921	0.556859	0.59497	0.541115	0.47952	0.520733	19
Seychelles	0.531052	0.552694	0.635491	0.704168	0.7175	0.626242	0.69367	0.853959	0.906634	0.803147	0.88532	0.891162	1	0.753925	9
South Africa	0.645764	0.682555	0.734263	0.724007	0.81959	0.68843	0.690692	0.648572	0.723878	0.629084	0.60504	0.671401	0.82918	0.69942	10
Sudan	1	1	1	1	1	0.948154	0.908543	0.890605	0.931931	0.814715	0.97227	1	1	0.95894	4
Average														**0.687512**	
Minimum														**0.446824**	

Table 11: Scale Efficiency Scores (2006-2018) output oriented

3.10.3 Determinant of efficiency

Bias-corrected coefficients of the truncated regression estimates were obtained through the two-step approach. First stage efficiency scores are not free from serial correlation hence second stage estimates are inconsistent and biased Simar and Wilson (2007). A bootstrap procedure overcomes this problem.

Table 12 presents the bias-corrected coefficients of the truncated regression model that provides the estimates for the sources of inefficiencies in government spending for SSA countries. Capital formation significantly relates to SSA spending efficiency though the effect is negative. The findings have established that domestic saving positively and significantly improve the efficiency of government spends for SSA countries. The result shows that inflation positively impacts efficiency of government spending albeit insignificantly. The result contrast Hauner and Kyobe (2010) findings who found that inflation negatively affects efficiency as it complicates the planning process of government expenditure.

Military spending negatively impacts on spending efficiency albeit non-significant. Natural log of income per capita negatively and significantly relate to SSA spending efficiency. An improvement of GDP per capita by 1percent will lead to a decrease in spending efficiency by 10.13percent. This result contradicts popular view in literature that predicts a positive impact of GDP per capita on spending efficiency. For example, previous research has shown that higher output growth improves spending efficiency (Levine and Renelt, 1992; Saleh and Harvie, 2005). Labour force has non-significant effect on spending efficiency though the effect is negative

Domestic saving significantly improves the efficiency of government spending of SSA countries. Both primary and secondary enrolment rate were used as education indicator. Primary enrolment rate has non-significant negative influence on efficiency. However,

secondary school enrolment significantly improves the efficiency of government spending. The result reinforces studies by Mankiw et al. (1992) and Barro (1991) who asserted that higher education achievement improves spending efficiency.

The estimates for institutional quality indices have mixed results. Government effectiveness, political stability and control of corruption have positive effect on efficiency of government spending. An improvement in political stability significantly translates to better spending efficiency. Both control of corruption and government effectiveness improve efficiency though insignificantly. Rule of law, voice and accountability and regulatory quality negatively influence efficiency of spending.

Literature has demonstrated that high income is associated with an improvement in education and health outcome (Afonso et al., 2006: Afonso and Aubyn, 2006; Herrera and Pang, 2005). Empirical findings have shown that institutions are key drivers of growth, financial development and spending efficiency. The degree of development of civil society impacts the efficiency spending (Putnam et al., 1994). Maintenance of rule of law has a significant and positive effect on efficiency of government expenditure. However, voice and accountability has significant negative influence on efficiency of government spending. This goes against priori expectation of positive association with efficiency. Evidence has established that controlling for corruption increases efficiency (Hauner and Kyobe, 2010). The regression result has established positive association between control for corruption and spending efficiency. However, the effect of control of corruption on efficiency of spending is insignificant

VARIABLES	Estimates
Capital formation	-0.0851***
	(0.0173)
Inflation	0.00839
	(0.0132)
Military	-0.0609
	(0.117)
Ln(GDP per capita)	-1.013***
	(0.319)
Labour force	-0.0159
	(0.0110)
Domestic Saving	0.0482***
	(0.0120)
Primary enrolment	-0.00577
	(0.00629)
Secondary enrolment	0.0749***
	(0.0123)
Government effectiveness	0.174
	(0.634)
Political stability	2.021***
	(0.257)
Rule of Law	-4.220***
	(0.684)
Voice and Accountability	-0.845**
	(0.342)
Corruption of corruption	0.603
	(0.480)
Regulatory quality	-0.965*
	(0.529)
Constant	5.342**
	(2.606)
Observations	299

Simar & Wilson (2007) eff. Analysis (algorithm #2)
Number of obs = 299
Number of bootstr. reps = 2000
Wald chi2(14) = 128.71
Prob > chi2(14) = 0.0000

Table 12: Truncated bootstrapped two-stage regression (dependent variable: BCC index)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3.11 Summary and policy implications

3.11.1 Summary

The study analysed the status of efficiency of government spending for 23 SSA countries for the periods 2006-2018 and environmental factors that explain inefficiency in government spending. Two-step bootstrap DEA was used to analyse the efficiency of government spending for SSA countries. Output-oriented DEA was also used to analyse the efficiency of government spending. The findings showed that the average bias-corrected inefficiency score was 48percent between 2006 and 2018 while the uncorrected inefficiency was 32.3percent. SSA country experienced minimum spending inefficiency of 33percent in 2014 and a maximum of 51percent in 2010.

The study established that, on average, SSA countries are relatively inefficient. SSA countries could have achieved the same level of output with 48percent fewer resources, i.e. that government efficiency could improve without necessarily increasing spending. Individual country's efficiency scores and ranking positions of SSA countries reveal a wide dispersion in performance. Guinea-Bissau was the only efficient country. The average scale efficiency for SSA countries was different from the pure efficiency. Scale efficiency was established to be 68.7percent and this demonstrated that SSA countries are not operating at optimal level.

Bias-corrected coefficients of the truncated regression estimates indicated that GDP per capital significantly cause distortion on the efficiency of government spending for SSA countries. Secondary school enrolment improves the efficiency of government spending across SSA countries. A rise in domestic saving improves efficiency of government spending while capital formation significantly distorts efficiency of spending. Political stability potentially improves efficiency of spending. Control of corruption improves efficiency of a

country spending though the effect is non-significant. Surprisingly, the finding demonstrates accountability and regulatory quality significantly distort spending efficiency of SSA government spending.

3.11.2 Policy implication

Based on the findings, SSA countries can improve on health and education expenditure efficiency. To achieve this, governments need to adopt policies that improve the efficiency of government health and education spending. Efficient outcome of health and education spending can be realized by government strengthening monitoring unit of government expenditure with decentralization strategies closely linked to each sector strategies. SSA countries also need to improve transparency in management of public resources.

SSA countries should provide conducive environment for private sector development. This can be achieved through tax exceptions to new businesses, improving ease of doing business and creating business hubs that attract investors. These policies will consequently improve GDP per capita, domestic savings and capital formation. SSA countries should prioritize institutional quality such as political stability, rule of law and regulatory quality. Well-structured political transition that takes into account inclusivity should be adopted. Strong and independent institutions should be established to deal with property rights. The monetary institutions should be accorded independence and strengthened in order control inflation and money supply. SSA countries need also to strengthen and develop public finance management which focuses on fiscal planning reforms, implementation and monitoring and legal framework.

CHAPTER FOUR

INSTITUTIONAL QUALITY AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA

4.1 Background

Public institutions and governance that are inclusive are capable of delivering quality services that are important in improving people's welfare. This is in line with the Sustainable Development Goals (SDGs) which advocate for strong institutions. Developing countries have recently embarked on radical reforms that are aimed at improving governance. This has been informed by the realization that good institutions are important in improving economic growth. North (1992) for example argues that good governance provides rules that are consistent and in the form of institutions that are important for sustainable-growth. However, poor economic performance is associated with bad institutions (Butkiewicz and Yanikkaya, 2006). If weak institutions negatively influence income growth then policy actors should design policies that strengthen institutions (Aron 2000).

Majority of the African countries possess weak institutional framework (Aron, 2000). Empirical studies have shown that SSA countries over the years have experienced stagnating economic growth in relation to other regions across the globe. CPIA (2016) indicates that institutional quality weakened in Sub-Saharan Africa. The average score for public sector management and institutional quality for SSA countries in 2016 was 3.0. The average score for fragile countries was 2.8. Non-fragile countries had an average score of 3.3 while non-resource-rich countries had a mean score of 3.1 and resource-rich countries averaged 3.0.

SSA countries lag in the protection of property rights (PRs) and corruption control (World Bank, 2017). Table 4.1 illustrates that PRs and rules-based governance indicator for SSA countries is lower than other regions. SSA countries have an average score of 2.77 while North Africa and Middle East score 2.30. The average score for PRs and rules-based

governance indicator for other regions is above 3.0. The low scores in SSA imply misappropriation of public resources that could be effectively channelled toward productive development programs. The low score in SSA is attributed to political and ethnic conflict in many countries, continued violence and corruption which are keeping institutions unaccountable (World Bank, 2017).

Region	2005	2010	2015	2016	2017	Mean
East Asia & Pacific	3.05	3.09	3.10	3.07	3.07	3.08
Europe & Central Asia	2.95	3.00	3.00	3.00	3.00	2.99
Latin America & Caribbean	3.33	3.17	3.17	3.25	3.25	3.23
Middle East & North Africa	2.50	2.50	2.25	2.25	2.00	2.30
Sub-Saharan Africa	2.76	2.76	2.76	2.79	2.76	2.77

Table 13: Property rights and rule-based governance indicator

Source: World development indicators

The low institutional quality experienced in SSA countries explains the poor economic performance in SSA. Hall et al. (2010) and Acemoglu and Robinson (2008) for example found that difference in cross country economic growth is attributed to the differences in institutions. Reforms that target institutions are therefore crucial in the realization of improved economic performance for SSA countries.

4.2 Statement of the problem

Despite major institutional reforms in SSA, institutional quality in SSA has remained weak compared to other regions. Institutional quality explains economic performance of SSA countries (Ndulu et al., 2008). Empirical studies have demonstrated that stagnating economic growth witnessed in SSA countries during 1980s was due to weak institutions while robust economic performance in the 1990s was a result of improved institutions (Ndulu et al., 2008). According to Thorbecke (2013), an improved institutional quality has been found to be important in creating enabling environment for African economic prosperity. Botswana for example has realized economic fortune because it managed to adopt good economic policies.

This is in contrast to countries like DRC, Central Africa Republic and Sierra Leone which have been bedevilled with civil wars which negatively impacts on their economic success (Acemoglu et al., 2002).

Institutional quality is critical in the realization of economic success of developing countries (Acemoglu et al., 2002). However, previous papers on institutional quality and income growth have remained largely ambiguous. Fosu (1992) and Gyimah-Brempong et al. (199) using political instability as proxy for institutional quality found that weak institutions significantly hampers income growth in SSA. In contrast, a study by Valeriani and Peluso (2011) provided evidence that institutional quality significantly enhances income growth. Literature gap still exist on the discourse around institutional quality and income level. Equally, scanty literature exists on whether the effect of institutional quality on output growth varies with the income level of SSA countries. Additionally, it is imperative to assess if the effect of institutional quality on output differs with regional location of SSA countries.

4.3 Research objective

The primary objective is to examine how institutional quality relates to output growth in SSA.

Specific objectives are;

i. To determine the effect of different indicators of institutional quality on income level of SSA countries.
ii. To investigate if the effect of institutional quality on output differs with regional location of countries.
iii. To examine whether the effect of institutional quality on economic growth varies with income level of SSA countries.

4.4 Contribution of the study

The study reinforces the 16th goal on the SDGs which advocate for peace, justice and strong institutions. Strong institutions that deliver quality education and healthcare would enhance income growth. This paper provides new evidence on output growth and institutional quality for SSA countries. Studies that focus on institutional quality and income level in SSA are scanty. Furthermore, the potential regional heterogeneity across SSA sub-regions has not been explored by the existing studies. This study therefore examined whether the effect of institutional quality on output growth varies with regional location.

Fayissa et al. (2013), for example, used the aggregated governance indicators rather than the various components of indicators of governance. This paper deviates from this approach and rather uses different measures of governance. Furthermore, the paper examined if the effect of various governance measures are similar across the varying income ranges of low and middle income groups.

Unlike other previous studies which have used OLS, fixed effect and random effect estimator, this paper employed two-step system GMM to estimate dynamic panel data. The dynamic GMM technique has the advantage that it introduces dynamics, controls for endogeneity and heterogeneity. Estimates from GMM techniques are therefore more valid than static model estimates.

4.5 Organization of the chapter

This chapter is arranged in the following order: section 4.6 explores literature that underpins this study. Section 4.7 provides exposition of methodology employed. Section 4.8 entails both descriptive and inferential statistics. The last section presents summary, conclusion and policy implication based on findings from section four.

4.6 Literature review

4.6.1 Theoretical literature

Literature still debates on the correct definition of governance[1].However; the literature is in agreement on the dimensions of institutional quality. North (1990) for example provides a broader definition of governance as "rules of the game in society or, more formally, are the humanly devised constraints that shape human interaction." Kaufmann and Kraay (2011) provided the definition of institutions as "traditions by which authority is exercised in a country. This includes the process by which governments are selected, monitored, and replaced; the capacity of the government to formulate and implement sound policies; and the respect of citizens and the state for institutions that govern economic and social interactions among them. In particular, the process by which governments is selected and monitored greatly impacts the incentive structures within government organizations." The WB provides six indicators of institutional quality: "Political stability, voice and accountability, government effectiveness, regulatory quality, rule of law, and control of corruption."

The theoretical link between democracy and growth is still unsettled. According to Butkiewicz et al. (2006), democratic institutions may either improve economic performance of a country or retard growth. Butkiewic et al. (2006) posits that democracy might undermine investment through pressures for immediate consumption. Immediate consumption leads to dissaving which undermines investment and thus reduces steady-state income. However, a number of studies have established that democracy promotes economic performance (Bardhan, 1997; Rodrik, 2000; Durham, 1999; Przeworski and Limongi, 1993). According to Rodrik (2000), "participatory and decentralized political systems enable higher-quality growth: they allow greater predictability and stability, are more resilient to shocks, and deliver superior distributional outcomes". Political instability is associated with adverse

[1]In this paper, governance is used interchangeably to mean institutional quality.

effect on growth. According to Fosu (1992), political instability is associated with lose in capital since political instability may reduce availability of factors of production as investment risk tends to go high in the presence of political instability. Further, political instability is associated with uncertainty and risks which discourages foreign direct investments and instead would lead to capital flight.

Dollar and Kraay (2000) provided evidence that better rule of law works towards improving income per capita. Rule of law encompasses maintenance of PRs and absence of corruption. North (1990) argues that well-defined PRs are important drivers of income growth. PRs and rule of law can affect the incentives to invest and innovate (Dollar et al., 2003).

Whether corruption is detrimental or beneficial to economic growth is still unsettled. Mauro (1995), Brunetti and Weder (1998) and Mo (2001) observed a significant negative link between corruption and investment that extend to growth. However, Leff (1964) and Huntington (1968) suggested "grease the wheels" hypothesis that suggest that corruption is beneficial to economic activities. According to hypothesis, corruption may circumvent inefficiencies associated with bureaucracy in investment. Corruption therefore acts as trouble-saving device that improves efficiency in investment thereby raising economic growth.

The nature of the political regime which fosters economic growth has remained inconclusive (Przeworski et al. 1995).Two strands of view on how institutions affect economic growth are grounded on liberal and authoritarian institutions. Totalitarianism contributes significantly to poor economic outcome (Ndulu and O'Connell, 1999). The argument is based on the premise that good governance allows citizens to participate in the political process and this makes them feel as part of the process which consequently improves productivity. However, under

authoritarian rule the citizens are detached from the political process of a country and this result in low morale among the public which negatively impacts on their productivity.

Liberal institutions hypothesized that democracy positively impacts on economic growth. Rodrik (2004) argues that democracy significantly stimulates output growth. However, according to La Porta et al. (1999) developing nations experience robust economic growth under authoritarian regimes and only adopt democracy after achieving economic growth.

The theory of rent-seeking also helps explain how institutions affect economic growth. Rent-seeking is the activity of an interest group in trying to seize an income flow as opposed to creating an income flow. Interest groups with vested interest in government projects will use resources to influence decisions of the governments thereby result in misallocation of the available resources. Rent seeking can be achieved through bribery, threats and lobbying of the institutions to make decisions that go against the will of the majority in the society. The end result of rent-seeking is skewed allocation of resources which may lead to poor economic performance of a country.

4.6.2 Empirical Literature

Literatures that have investigated how institutional quality relates to output growth have faced the challenge of quantifying institutional quality. Most studies have used various subjective indicators of institutional quality that are calculated using perception index while other studies have employed objective proxies. Some studies have used measures of political freedom as an indicator of democracy. Barro (1991) for example measured institutional quality by political violence. The proxies for political stability constituted the frequency of political assassinations on yearly basis and the frequency of revolutions and coups per year.

Some empirical studies have measured institutional quality by using standard deviation of volatile variables like monetary variables and tax rates (Kormedi and Meguire 1985). Other

measures of institutional quality are from the ICRG. ICRG computation of risk is based on three categories of variables: (1) political approach (2) financial approach and (2) economic approach. Political risk assesses the political stability of countries covered by ICRG[2].

Kaufmann and Kraay (2011) constructed two proxies for governance based on the nature of political transition and the capacity of governments' formulation of sound policies. Kaufmann and Kraay (2011) six indicators of institutional quality are: "(a) Voice and accountability (VA), which captures the perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. (b) Political stability and Absence of Violence/Terrorism (PV), which measures the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism. (c) Government effectiveness (GE), which captures the quality of public services, the quality of the civil services and the degree of independence from political pressures, the quality of policy formulation and implementation. (d) Regulatory quality (RQ), which captures the perception of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. (e) Rule of Law (RL), which measures the perception of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, PRs. (f) Control of Corruption (CC), which captures the perception of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption as well as the state capture by elite and private interest."

Since the institutional data that have been used by researchers are mostly subjective, there may be a problem of bias in ratings (Chong et al., 2000). Empirical researchers use indicators rather than actual measure of governance since quality of governance is not measurable

[2]See https://www.prsgroup.com/wp-content/uploads/2012/11/icrgmethodology.pdf on methodology

(Kagundu, 2006). This study therefore employed Kaufmann and Kraay (2011) six indicators of governance. Kaufmann and Kraay (2011) constructed institutional quality by applying the unobserved components methodology (UCM). UCM has some advantage over other measures of governances. UCM's approach constructs institutional quality by placing data in common units which have the advantage of maintaining cardinal information provided in the data. Secondly, UCM approach weighs rescaled indicators instead of unweighted average. This maintains some level of precision in the construction of institutional quality. Lastly, UCM considers the uncertainty associated with indicators of governance (Kaufmann and Kraay , 2011)

Acemoglu and Robinson (2010) analysed the role played by institutions on income growth of a country. The paper concluded that difference in income per capita across countries is as a result of economic institutions. Mauro (1985), on the other hand, showed that corruption impedes economic growth.

Aixalá and Fabro (2008) applied OLS, 2SLS and GMM to study institutional quality and output growth. The study used a sample of rich and poor economies for the years 1996-2000. The result showed that economic growth is explained by the variation in control for corruption. Rule of law significantly explains economic growth in rich countries

Butkiewicz and Yanikkaya (2006) used two large samples of least developed economies and developed economies in examining how institutional quality impacts output growth. The study used five distinct measures of democracy and six composite indexes of rule of law. The model was estimated by seemingly unrelated regression (SUR) technique. The result indicated that democratic institutions enhance growth while rule of law has non significant effect on income level.

Using a sample of 55 countries for the period 1972-1995, Chong and Calderon (2000) examined the causation between institutional quality and output. Institutional quality was proxied by infrastructure quality, nationalization potential, contract enforceability and bureaucratic delay. The finding showed that reverse causality exists between economic growth and institutional quality.

Aidt et al. (2008) sampled 67 to 71 countries to examine how corruption and governance regime relates to a country's income growth. The sampled countries were all drawn from the five continents. The study used GMM to compute parameter estimates. The impact of corruption on output is regime specific. Evidence further showed that corruption slows down output growth for countries with quality political institutions.

Bräutigam and Knack (2004) sampled 32 SSA countries to assess if institutions, foreign aid impact income growth. The author employed OLS and 2SL and the quality of governance was measured by subjective indexes from the ICRG. The result indicated that increases in GDP per capita enhance quality of governance while governance deteriorates in the presence of political strife.

Comeau (2003) investigated whether democracy contributes significantly to economic growth. The author sampled 82 countries for the period 1970-1980. The paper used OLS estimation technique to achieve the estimates. The study projected that democracy significantly and positively impacts economic growth. The result further established a nonlinear link between democracy and growth.

Méon and Sekkat (2005) controlled for corruption and quality of governance on examining income variation across 63 and 71 countries for the period 1970-1998. The study employed OLS estimation technique. The findings showed that corruption impedes both income level and investment.

Djankov et al. (2006) sampled 135 countries for the period 19930-2002. The research aimed at examining whether regulation has a bearingon income growth. Institutional quality was proxied by regulation index. The study analysed the magnitude of business regulatory index on growth by use of OLS. The result showed that government regulation of business significantly improves a country's income level.

Glaeser et al. (2004) estimated impact of institutions on output for sampled 77 countries. The author employed OLS to estimate the parameters for the periods 1960-2000. Result showed that human capital significantly impacts economic growth. However, the study found that institutional quality plays no significant role on economic growth.

Dollar and Kraay (2003) examined the effects of trade and institutions on income growth of 168 countries between the years 1970-1980. The authors used OLS estimation technique. The result showed that both trade and institutions significantly impact income growth. One major drawback of this paper is the use of OLS to estimate panel data. OLS is known to be inconsistent if the unobserved characteristics are correlated with the explanatory variables.

Nawaz et al. (2014) analyzed the link between institutional quality andincome growth. Samples of the countries considered in the study were drawn from Asia. The study period was 1996-2012. Estimation technique involved application of dynamic GMM. Findings showed institutions significantly impact economic growth for Asian economies. The impact of institutional quality on output depends on the income level of countries. For example, the result showed that the impact of intuitional quality on income level is stronger in developed economies of Asian countries than LSD counterparts.

Gwartney et al. (2004) studied the impact of economic freedom and institutional quality on income. The study sampled 100 countries for the period 1980-2000. Institutional quality was measured by Economic Freedom of the World (EFW) index. Evidence showed that countries

with good and consistent institutions have better economic outcomes and higher income levels.

Fayissa and Nsiah (2013) investigated the importance of governance in Africa for the periods 1995-2004. The study employed GMM procedure for a sample of 39 SSA countries. The governance indicators were derived from factor analysis of World Bank governance indicators. The study showed that good governance significantly improve economic growth.

Iheonu et al. (2017) investigated if institutional quality impacts on output variation for 12 West African countries for the periods 1996-2015. The study employed FE, RE and the panel 2SLS technique. Institutional quality index that was used comprised of rule of law, regulatory quality, government effectiveness and control for corruption. The result showed institutional quality positively and significantly impact economic growth.

Daniel et al. (2018) sampled 35 African countries. The study was conducted for the year 2006-2015. The paper investigated if institutional quality contributes to income level. A multi-level modelling technique was used in the estimation process. Result from the study showed that institutional quality significantly enhances firm's performance for African countries.

4.6.3 Summary and Conclusion

Literature that explores institutional quality and income is ambiguous. Additionally, consensus is yet to be reached on what constitutes the correct measure of institutional quality. Different authors have used various approaches to measure institutional quality and this has contributed to divergent results. The study contributes to the debate by using Kaufmann and Kraay (2011) six indicators of governance which has the advantage over other measures. Empirical literature has also used various estimation techniques ranging from pooled OLS, static model (FE and RE) and dynamic panel. These estimation techniques are associated

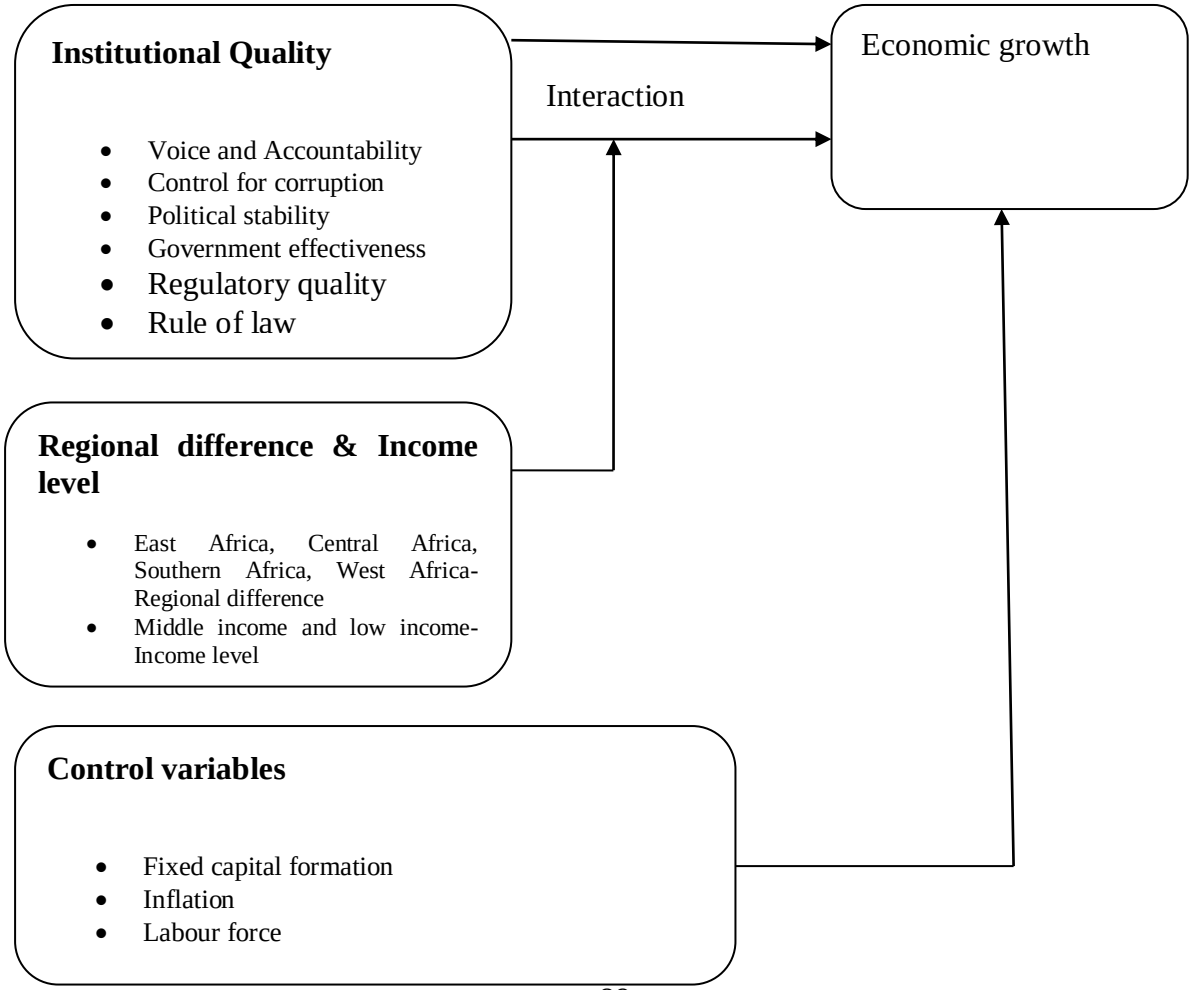
with different estimation problems which this study seeks to solve. The study also provided new evidence on the effect of institutional quality on income while taking into account the regional difference.

4.7 Methodology

4.7.1 Conceptual model for institutional quality and growth

Income growth is a function of institutional quality which provides checks on government, secures property rights and therefore enhances economic growth. Institutional reforms that protect property rights, and advocates for democracy and inclusive governance are known to favour sustainable growth and development. The conceptual model is summarised in Figure 7.

Figure 7: Conceptual model for institutional quality and economic growth



Good institutions create conducive environment for economic activity which consequently enhances economic growth. In contrast, bad institutions are associated with economic stagnation (Butkiewicz and Yanikkaya, 2006). Strong property rights and absence of corruption thrive in an environment which observe and maintain rule of law. In the theoretical literature, maintenance of PRs is fundamental for free market economy. According to North (1990), well-defined property rights encourage investment and this consequently impact positively on economic growth. Good institutions enhance economic growth through various channels: reduction in transaction cost, and lowering of manufacturing cost and production cost (North, 1990).

Regional differences influence the effectiveness of institutional quality on output. This is attributed to the differences in institutional reforms, policy reforms and differences in structures of member's economic blocks which might influence institutional quality. SSA countries are classified into different regions as depicted by the conceptual model: Eastern Africa, Western Africa, Southern Africa and Central Africa. This classification is adopted from UN (2013). Difference in income level is likely to influence institutional quality of SSA countries. SSA countries are classified into low-income level and middle-income level. Keefer and Knack (1997) asserts that wealthier countries tend to have stronger institutions than poor countries therefore income level may also influence institutional quality across SSA countries.

4.7.2 Theoretical model

We model endogenous growth model to examine whether institutional quality impacts on output. We further adopt the work of Chong and Gradstein (2007).Cobb Douglas production is specified as:

$$y_{it} = Ak_{it}^{\emptyset} \; and \;\; 0 < \emptyset > 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.1$$

From equation (4.1), y denotes income per worker and k is capital per worker, A>0 is total factor productivity; *it* denotes country *i* at period *t*. Endogenous growth model is modified to include institutional quality. According to Nawaz, et al, (2014), weak institutions diverts resources to unproductive sector hence cause low growth while well-developed institutions enhance growth. Weak institutions promote rent seeking behaviour while strong institutions reduce incidences of rent seeking. Rent seeking behaviour is associated with diversion of resources from productive use to unproductive use.

Gradstein (2007) for example emphasized that resources meant for productive sector are easily diverted to unproductive sector by rent seekers. However, as Chong and Gradstein (2007) observe, strong institutions cushion against rent seeking behaviour and therefore economic growth accelerates in the presence of strong institutions. We therefore redefine the production function to capture the rent-seeking. Rent-seeking activities act as a distortion in the production process. Equation (4.1) is rewritten as:

$$y_{it} = (1 - \tau_{it})Ak_{it}^{\emptyset} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 4.2$$

Where $\tau_{it} \in [0, \tilde{\tau}]$, $\tilde{\tau}$ indicates rent seeking activities. We assume that the proportion of rent seeking for each firm depends on the quantity of rent seeking and the quality of governance. The quantity of rent seeking τ_{it} approaches 0 when we have strong institutions while the quantity of rent seeking τ_{it} approaches 1 with weak institutions. Marginal utility of renting seeking is at maximum when τ_{it} approaches 1. If the marginal utility of $\tau_{it}$is high then this impliesweaker institutions. Weaker institutions are therefore associated with low productivity of factors of production and vice versa. Thus τ_{it} creates economic distortion in the factor productivity. Distortions are as a consequence of weak institutions. We examine consumption and investment decisions by individuals in order to examine the long run cross countries income variation.

We consider a representative agent who maximizes intertemporal utility is constrained by dynamic budget. The preference of representative agents is in the following form:

$$U_{it} = \int_0^{\infty} \frac{c_{it}^{1-\gamma}}{1-\gamma} e^{-\rho t} dt, \qquad \gamma > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.3$$

Where c_{it} represents private consumption in per capita and ρ denotes trade-off between current and future time. If >0thenfuture consumption is preferred to the current consumption. The per capita dynamic budget constraint is given by equation (3.4):

$$\dot{k} = \frac{dk}{dt} = (1-\tau_{it}) A k_{it}^{\emptyset} - c_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.4$$

Equation (4.4) satisfies the transversality condition ie$\lim_{t\to\infty} k\lambda e^{-\rho t} = 0$, i.e marginal change in capital stock equals the total saving. The difference between output and consumption also equals change capital. The capital (k_{it}) is determined by the individual choice of optimal consumption (c_{it}) and investment path. We set up Hamiltonian function as follows to get optimal allocation of resources by the individual;

$$H = \frac{c_{it}^{1-\gamma}}{1-\gamma} e^{-\rho t} + \lambda\left[(1-\tau_{it}) A k_{it}^{\emptyset} - c_{it}\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.5$$

The output growth rate (***See appendix 4 for the derivations***) is given as:

$$\frac{\dot{y_{it}}}{y_{it}} = \frac{\dot{c_{it}}}{c_{it}} = \frac{(1-\tau_{it})(A\emptyset k_{it}^{\emptyset-1})}{\gamma} - \frac{\rho}{\gamma} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.6$$

Equation (4.6) demonstrates that as the quality of institutions improves, the rent seeking behaviour decreases. Decrease in rent seeking activities contributes to an increase in income level. If we take the first derivative of equation (4.6) with respect to τ_{it} then in equation (4.7) we see output decreases as the value of τ_{it} increases as$\gamma > 0$.

$$\frac{d(\frac{\dot{y}_{it}}{y_{it}})}{d\tau_{it}} = -\frac{(A\emptyset k_{it}^{\emptyset-1})}{\Upsilon} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.7$$

The theoretical model has demonstrated that large value of τ_{it} is associated with lower GDP growth. Therefore as the institutional quality improves, there is a reduction in rent seeking activities and hence an improvement in economic growth. For example, when $\tau_{it} = 0$, institutions are strong hence economy grows with $\frac{\emptyset A k_{it}^{\emptyset-1} - \rho}{\Upsilon}$ while when $0 < \tau_{it} < \tilde{\tau}$, institutions are week the output grows with $\frac{\emptyset(1-\tau_{it}) A k_{it}^{\emptyset-1} - \rho}{\Upsilon}$.

Loagarithmic transformation of equation (4.6) can be written as;

$$\dot{y}_{it} = \delta_0 + \xi I_{it} + \phi k_{it} + \mathcal{U} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \mathbf{4.8}$$

Where $\dot{y}_{it}$ defines GDP growth rate while I_{it} is institutional quality both for country *i* at time *t*. Equation 4.8 is our baseline model for estimating institutional quality and GDP growth.

4.7.3 Empirical Models

We specify four models to examine how institutional quality links with output. We capture the effect of persistence of growth by including lagged value of GDP growth rate in the baseline model. The first model contains the six indicators of institutional quality. We also include control variables in our baseline model. This constitutes the baseline model that links institutional quality and economic growth. The model is specified as:

$$GDP_{it} = \delta_0 + \sigma GDP_{it-1} + \delta_1 VA_{it} + \delta_2 PV_{it} + \delta_3 GE_{it} + \delta_4 RQ_{it} + \delta_5 RL_{it} + \delta_6 CC_{it} + \delta_7 Z_{it} + \mathcal{U}_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.9$$

Equation (4.9) relates to the GDP growth rate, PV, VA, GE, RQ, RL, CC and a vector of control variables (Z_{it}) which includes domestic savings, inflation, capital and labour force.

We extend equation (4.9) by including dummy variables of SSA sub regions plus interaction with each indicator of institutional quality. The coefficient of the interaction term estimates the regional differences in the effects of institutional quality on economic growth in SSA.

$$GDP = \delta_0 + \sigma GDP_{it-1} + \delta_1 VA_{it} + \delta_2 EA_i + \delta_3 CA_i + \delta_4 WA_i + \delta_5 (EA_i * VA_{it}) + \delta_6 (CA_i * VA_{it}) + \delta_7 (WA_i * VA_{it}) + \delta_7 Z_{it} + \mathcal{U}_{it} \ldots\ldots\ldots\ldots\ldots\ldots 4.10$$

$$GDP = \delta_0 + \sigma GDP_{it-1} + \delta_1 PA_{it} + \delta_2 EA_i + \delta_3 CA_i + \delta_4 WA_i + \delta_5 (EA_i * PA_{it}) + \delta_6 (CA_i * PA_{it}) + \delta_7 (WA_i * PA_{it}) + \delta_7 Z_{it} + \Omega_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.11$$

$$GDP = \delta_0 + \sigma GDP_{it-1} + \delta_1 GE_{it} + \delta_2 EA_i + \delta_3 CA_i + \delta_4 WA_i + \delta_5 (EA_i * GE_{it}) + \delta_6 (CA_i * GE_{it}) + \delta_7 (WA_i * GE_{it}) + \delta_7 Z_{it} + \upsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots 4.12$$

$$GDP = \delta_0 + \sigma GDP_{it-1} + \delta_1 RQ_{it} + \delta_2 EA_i + \delta_3 CA_i + \delta_4 WA_i + \delta_5 (EA_i * RQ_{it}) + \delta_6 (CA_i * RQ_{it}) + \delta_7 (WA_i * RQ_{it}) + \delta_7 Z_{it} + \xi_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.13$$

$$GDP = \delta_0 + \sigma GDP_{it-1} + \delta_1 RL_{it} + \delta_2 EA_i + \delta_3 CA_i + \delta_4 WA_i + \delta_5 (EA_i * RL_{it}) + \delta_6 (CA_i * RL_{it}) + \delta_7 (WA_i * RL_{it}) + \delta_7 Z_{it} + \chi_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.14$$

$$GDP = \delta_0 + \sigma GDP_{it-1} + \delta_1 CC_{it} + \delta_2 EA_i + \delta_3 CA_i + \delta_4 WA_i + \delta_5 (EA_i * CC_{it}) + \delta_6 (CA_i * CC_{it}) + \delta_7 (WA_i * CC_{it}) + \delta_7 Z_{it} + \varphi_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.15$$

Equations (4.10), (4.11), (4.12), (4.13), (4.14) and (4.15) relate GDP growth rate, regional dummy variables and the interaction term (regional dummy variables interacted with institutional quality). To avoid the problem of dummy variable trap, we drop the Southern

Africa (SA) dummy variable and its interaction. $\mathcal{U}_{it}, \Omega_{it}, \upsilon_{it}, \xi_{it}, \chi_{it}, \varphi_{it}$ are composite error terms for the respective equations.

Equation (4.8) is modified to include dummy variable for low and middle income SSA countries. This establishes whether the effect of institutional quality on growth varies with income level of SSA countries.

Dummy variable is defined as:

$$D = \begin{cases} 1 & if\ the\ country\ is\ middle\ income \\ 0 & if\ the\ country\ is\ \ low\ \ \ income \end{cases}$$

The variable D is a dummy. Variable D measures the difference in the two intercept terms. Therefore equation 3.8 can further be modified to include dummy variable such that;

$$GDP = \delta_0 + \sigma GDP_{it-1} + \delta_1 VA_{it} + \delta_2 PV_{it} + \delta_3 GE_{it} + \delta_4 RQ_{it} + \delta_5 RL_{it} + \delta_6 CC_{it} + \delta_7 Z_{it} + \text{þ}D + \mathcal{U}_{it} \quad \ldots\ldots 4.16$$

Where $\text{þ} = (\delta_{1I} - \delta_{0i})$

We further modify equation 4.16 to include the interactions involving dummy variable. This is to test if the effect of each component of institutional quality on growth is the same for both middle and low income countries. Model in equation 3.16 thus becomes;

$$GDP = \delta_0 + \sigma GDP_{it-1} + \delta_1 VA_{it} + \delta_2 PV_{it} + \delta_3 GE_{it} + \delta_4 RQ_{it} + \delta_5 RL_{it} + \delta_6 CC_{it} + \delta_7 Z_{it} + \text{þ}D + \delta_8 Insti * D + \mathcal{U}_{it} \quad \ldots\ldots 4.17$$

Therefore þ measures the difference in intercept between middle and lower income countries in SSA while δ_8 measures the difference in the effect of institutional quality between middle and lower income countries.

4.7.4 Variables Definition and Data Sources

Table 14 provides the definition of variables and their data sources. Column one in the table captures the name of the variables while column two provides brief description. The data are from World Development indicators (WB, 2017).

VARIABLE	Variable definition and data sources
GDP growth rate	"Is the average annual growth rate of real GDP measured by change in GDP at constant prices as share of GDP" WDI
Voice and Accountability	"Captures the perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media" WDI
Political stability	"Measures the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism" WDI
Government effectiveness	"Captures the quality of public services, the quality of the civil services and the degree of independence from political pressures, the quality of policy formulation and implementation" WDI
Regulatory quality	"Captures the perception of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development" WDI
Rule of law	"Measures the perception of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property right."WDI
Control of Corruption	"Captures the perception of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption as well as the state capture by elite and private interest."WDI
Inflation	"The percentage change in Consumer Price Index (CPI) on a year-on year basis."WDI
Domestic saving	"Gross savings is the gross national income less total consumption, plus net transfers as a percentage of GDP." WDI

Table 14: Data Source and Definition of variable

4.7.5 Estimation

Estimation of the link between institutional quality on income level suffers from potential endogeneity problems. Empirical studies have shown existence of reverse causation between institutional quality and output growth. Equally, lagged value of the dependent variable as a regressor may lead to the problem autocorrelation. Both the RE and the FE estimates are inconsistent in this scenario. In the presence of dynamic and endogenous independent variables,

both system and difference GMM provides consistent estimates (Roodman, 2009). System and difference GMM are designed for small T, large N, dynamic dependent variable, control variables and fixed effects. However, we achieve objectives of the study by estimating the equations using two-step system GMM and taking into account the number of instrument counts. System GMM provides more efficient estimates than difference GMM.

4.8 Empirical result

4.8.1 Descriptive statistics

We present the descriptive statistics in this section. Table 14 provides descriptive statistics in terms of mean and standard deviation for pooled observations for SSA countries, middle-income countries and low-income. GDP growth rate for pooled observation for SSA countries averages 4.53percent with a standard deviation of 4.85percent. Middle income countries reported higher average growth rate of 4.62percent than low income countries. Government effectiveness averaged -0.642 with a standard deviation of 0.614 for the sample for SSA countries, middle income countries averaged -0.247 with a standard deviation of 0.631, and low income countries averaged -0.906 with a standard deviation of 0.436. On the average, political stability was -0.497 with a standard deviation of 0.945 for SAA countries, middle income countries had a mean of -0.138 with a standard deviation of 1.033 while low income countries had a mean of -0.736 with a standard deviation of0.799.

On the average, rule of law for SSA countries is -0.627 with a standard deviation of 0.657, middle income countries is -0.266 with a standard deviation of 0.704 while low income countries averaged -0.867 with a standard deviation of 0.496. The descriptive statistics further revealed that voice and accountability averaged -0.500 with a standard deviation of 0.704 as compared to low income countries with a mean of -0.740 and a standard deviation of 0.532. On average, control for corruption for SSA countries is -0.547 with a standard

deviation of 0.616, the mean for middle income countries is -0.216 with a standard deviation of 0.725 while the mean value for control for corruption for low income countries is -0.768 with a standard deviation of 0.402. Regulatory quality for SSA countries averaged -0.503 with a standard deviation of 0.700, middle income countries has a mean of -0.249 with a standard deviation of 0.606 while low income countries had a mean of -0.673 with a standard deviation of 0.708.

	SSA			Middle-Income SSA countries			Low-Income SSA countries		
Variable	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.
GDP	455	4.535	4.847	182	4.624	3.981	273	4.476	5.354
Government effectiveness	455	-0.642	0.614	182	-0.247	0.631	273	-0.906	0.436
Political stability	455	-0.497	0.945	182	-0.138	1.033	273	-0.736	0.799
Rule of Law	455	-0.627	0.657	182	-0.266	0.704	273	-0.867	0.496
Voice and Accountability	455	-0.500	0.704	182	-0.141	0.776	273	-0.740	0.532
Control for Corruption	455	-0.547	0.616	182	-0.216	0.725	273	-0.768	0.402
Regulatory Quality	455	-0.503	0.700	182	-0.249	0.606	273	-0.673	0.708
Inflation	455	65.702	1145.341	182	7.569	6.889	273	104.457	1478.431
Labor	455	52.106	15.306	182	42.074	12.223	273	58.794	13.394
Capital	455	20.066	8.680	182	22.359	9.286	273	18.537	7.907
Domestic Saving	455	8.433	20.885	182	17.423	17.693	273	2.439	20.727

Table 15: Descriptive statistics

4.8.2 Econometrics results

4.8.2.1 The effect of institutional quality on economic growth in SSA.

The econometrics estimates show that initial value of GDP growth rate, labour and savings significantly impact on the current economic growth ($p<0.001$). The findings in Table 15 indicate that government effectiveness, political stability and absence of violence, rule of law, voice and accountability, control of corruption and regulatory quality positively and significantly impact economic growth in SSA. Government effectiveness positively and significantly impacts economic growth at 1percent level. An improvement in government effectiveness leads to 6.475 units increase in economic performance for SSA. The coefficient of political stability and absence of violence is positive and significance ($p<0.001$). This

implies that an increase in political stability and absence of violence causes 2.95 unit increases in economic growth for SSA.

Regressors	(Model1) GDP	(Model2) GDP	(Model3) GDP	(Model4) GDP	(Model4) GDP	(Model5) GDP
L.GDP	0.112***	0.0905***	0.122***	0.0874***	0.162***	0.217***
	(0.0217)	(0.0181)	(0.0151)	(0.0106)	(0.0166)	(0.0117)
Inflation	4.30e-05***	5.28e-05***	0.000178***	0.000179***	3.29e-05***	2.39e-05**
	(3.53e-06)	(4.20e-06)	(9.38e-06)	(1.57e-05)	(3.76e-06)	(9.04e-06)
Labour	0.141***	0.0977***	0.205***	0.165***	0.0806***	0.0706***
	(0.00907)	(0.00291)	(0.00707)	(0.00643)	(0.00325)	(0.00458)
Savings	-0.00110	0.0226***	-0.0454***	0.0166***	0.0316***	0.0276***
	(0.00391)	(0.00448)	(0.00286)	(0.00169)	(0.00232)	(0.00284)
GE	6.475***					
	(0.844)					
PV		2.956***				
		(0.190)				
RL			11.80***			
			(0.572)			
VA				11.14***		
				(0.840)		
CC					1.760***	
					(0.335)	
RQ						1.010**
						(0.372)
Observations	420	420	420	420	420	420
Number of ID	35	35	35	35	35	35

Table 16: The effect of institutional quality on economic growth

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The econometrics estimates further show that rule of law has a positive and significant effect economic growth in SSA (p<0.001). An improvement in rule of law leads to 11.14 unit increase in economic growth in SSA. Control for corruption is associated with positive and significant effect on economic growth in SSA (p<0.001). An increase in control for corruption will lead to 1.760 unit improvement in economic performance of SSA. The finding further shows that regulator quality is a significant predictor of economic growth in SSA. An improvement on regulatory quality is associated with 1.010 unit increase in

economic performance of SSA. All measures of institutional quality contribute significantly to economic growth. Our finding supports Nawaz et al. (2014) and Iheonu et al. (2017).

Table 16 provides long run effect of institutional quality on economic growth in SSA. All the measures of institutional quality have significant and positive effect on economic growth in SSA in the long run. Compared to short run results, the impact of institutional quality is stronger in the long run than in the short run. This is demonstrated by larger magnitude of coefficients in the long run.

Variable	Coef.	Std.Err.	z	P>|z|
Government effectiveness	7.290	0.813	8.970	0.000
Political stability	3.251	0.218	14.900	0.000
Rule of Law	13.431	0.807	16.650	0.000
Voice and Accountability	12.211	0.919	13.290	0.000
Control for Corruption	2.101	0.375	5.600	0.000
Regulatory Quality	1.290	0.461	2.800	0.005

Table 17: The effect of institutional quality on economic growth in the long-run

4.8.2.2Regional differences in the effect of institutional quality on economic growth in SSA

Equations (4.9), (4.10), (4.11), (4.12), (4.13) and (4.14) estimations are presented in Table 17 and 18. Results are based on two step system GMM. The impact of rule of law on output varies with SSA regions. Specifically, the influence of rule of law on output is statistically significant ($p<0.00$) and positive for the West African countries. Estimated coefficient implies that an improvement on rule of law in West African region leads to 12.15 units increase in economic performance. However, the result indicates that rule of law is not an important driver of GDP growth in East African region.

Voice and accountability insignificantly impacts output of countries in East African region. However, voice and accountability enhances growth in the West African region. An

improvement in voice and accountability is associated with 11.01 unit rise in growth for West African region. Regulatory quality positively determines growth for the West African countries. An improvement in regulatory quality will lead to 13.39 unit increase in growth in West African region. Equally, government effectiveness drives GDP growth for countries in the West African region. The effect of government effectiveness is significant ($p<0.001$). Therefore an improvement in government effectiveness will lead to 15.72 unit rise in output growth in West African region.

The result indicates that an increase in control of corruption in the West African region positively and significantly impacts output ($p<0.001$). An improvement in control of corruption leads to 8.988 unit increase in economic growth. Political stability improves economic performance in West African region. Political stability is statistically significant ($p<0.001$). An improvement in political stability will lead to 4.153 unit increase in economic growth. The result has shown that different components of institutional quality perform differently in each SSA regions.

VARIABLES	(1) GDP	(2) GDP	(3) GDP	(4) GDP	(5) GDP	(6) GDP
L.GDP	0.0865*	0.354***	0.00254	0.0685**	0.252**	0.0838***
	(0.0437)	(0.110)	(0.0488)	(0.0235)	(0.107)	(0.0217)
Inflation	0.135*	-0.351	0.0814**	0.0785*	0.0269	0.130**
	(0.0635)	(0.272)	(0.0313)	(0.0382)	(0.167)	(0.0591)
Labour	-0.00318	-0.151	-0.101	-0.0703	0.205	0.172
	(0.239)	(0.209)	(0.181)	(0.232)	(0.229)	(0.225)
Domestic Saving	-0.0539***	0.175	0.0363***	0.0155	0.264*	-0.0969***
	(0.0110)	(0.220)	(0.0119)	(0.0120)	(0.141)	(0.0173)
WA	12.85		14.88	11.86		1.055
	(12.66)		(9.917)	(11.54)		(12.11)
RL*WA	12.15***					
	(2.397)					
EA		10.83			-9.709	
		(11.51)			(13.77)	
VA_EA		-9.540				
		(11.82)				
VA_WA			11.01***			
			(2.066)			
CC_WA				8.988***		
				(0.625)		
RQ_EA					2.478	
					(3.125)	
RQ_WA						13.39***
						(2.388)
Observations	180	120	180	180	120	180
Number of ID	15	10	15	15	10	15

Table 18: Regional differences in the effect of institutional quality on economic growth in SSA

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	(1) GDP	(2) GDP	(3) GDP	(4) GDP	(5) GDP
L.GDP	0.339***	5.05e-05	0.317***	0.121**	0.335**
	(0.101)	(0.0348)	(0.0962)	(0.0422)	(0.113)
Inflation	0.113	0.0200	-0.154*	0.112*	-0.0298
	(0.187)	(0.0306)	(0.0822)	(0.0629)	(0.195)
Labour	0.0115	-0.352	0.0868	-0.0789	0.0728
	(0.148)	(0.228)	(0.182)	(0.209)	(0.213)
Domestic Saving	0.563**	-0.0281**	0.211	0.00515	0.374*
	(0.230)	(0.0118)	(0.158)	(0.00969)	(0.200)
EA	2.818		-2.788		-1.833
	(8.583)		(10.90)		(12.83)
GE*EA	12.61				
	(8.681)				
WA		35.25**		8.541	
		(12.03)		(11.41)	
GE*WA		15.72***			
		(2.430)			
PA*EA			-2.078		
			(2.029)		
PA*WA				4.153***	
				(0.806)	
RL*EA					3.889
					(6.915)
Observations	120	180	120	180	120
Number of ID	10	15	10	15	10

Table 19: Regional differences in the effect of institutional quality on economic growth in SSA

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.8.2.3 The effect of institutional quality on economic growth in low-income and middle income countries.

This section presents estimates on whether the effect of institutional quality on output growth varies with the income level of SSA countries. The parameter estimates for the interaction term between each institutional quality and dummy is given in Table 19. The coefficient of the interaction term for government effectiveness is positive and statistically significant ($p<0.001$). Therefore GDP growth rate in middle income countries will grow by more than

12.04 units as compared to low income countries when there is an improvement in government expenditure.

The coefficients of the interaction term on political stability, rule of law, regulatory quality and control for corruption are statistically insignificant. This implies that an improvement on political stability, control for corruption, regulatory quality and rule of law in middle income countries in SSA have non-significant effect on income compared to the low income economy.

VARIABLES	(1) GDP	(2) GDP	(3) GDP	(4) GDP	(5) GDP	(6) GDP	(7) GDP
L.GDP	0.140***	0.132***	0.166***	0.151***	0.153***	0.145***	0.193***
	(0.0284)	(0.0262)	(0.0273)	(0.0218)	(0.0206)	(0.0254)	(0.0179)
Government effectiveness	0.909	-6.533***	4.285*	0.0877	0.750	1.142	1.863
	(2.409)	(1.795)	(2.474)	(2.184)	(2.034)	(2.199)	(2.204)
Political stability	-0.911*	-0.468	0.605	-0.291	-0.346	0.172	0.333
	(0.490)	(0.560)	(0.764)	(0.506)	(0.474)	(0.833)	(0.533)
Rule of law	1.078	5.438*	1.757	5.871**	0.667	1.003	3.906**
	(1.904)	(2.834)	(2.572)	(2.176)	(1.542)	(2.028)	(1.647)
Voice and accountability	6.176**	2.651	0.441	0.782	5.240**	5.325***	0.0229
	(2.513)	(3.149)	(2.588)	(2.204)	(1.995)	(1.781)	(2.260)
Control of corruption	-1.926	0.822	-0.367	-0.692	-2.130	-0.871	-1.575
	(1.543)	(1.446)	(2.253)	(1.866)	(1.627)	(2.274)	(1.884)
Regulatory quality	-0.330	-1.203	-2.015	-2.255	-0.477	0.620	-1.533
	(1.702)	(1.869)	(1.810)	(1.788)	(1.656)	(2.231)	(1.790)
Inflation	5.24e-05*	8.87e-05**	2.49e-05	2.47e-05	4.27e-05*	4.83e-05	-1.78e-05
	(2.63e-05)	(4.14e-05)	(3.99e-05)	(2.54e-05)	(2.48e-05)	(3.79e-05)	(3.34e-05)
Labour	0.0999**	0.0215	0.0931**	0.0983**	0.0845*	0.149**	0.101**
	(0.0484)	(0.0375)	(0.0413)	(0.0426)	(0.0443)	(0.0555)	(0.0473)
Middle	2.989	10.30***	3.617	1.101	2.177	-2.631	0.101
	(3.927)	(2.531)	(3.868)	(5.158)	(4.023)	(4.513)	(3.489)
GE*middle		12.04***					
		(3.971)					
PS*middle			-1.123				
			(2.550)				
RL*middle				-5.226			
				(4.561)			
VA*middle					1.746		
					(3.879)		
CC*middle						-2.624	
						(2.642)	
RQ-*middle							0.600
							(3.309)
Observations	420	420	420	420	420	420	420
Number of ID	35	35	35	35	35	35	35

Table 20: The effect of institutional quality on economic growth for middle income countries in SSA

4.9 Summary, conclusion and policy implication

4.9.1 Summary

This chapter presented the effect of institutional quality on economic growth in SSA for the period 2006-2018. Compared to other regions, SSA has witnessed poor institutional quality and empirical findings have suggested that dwindling economic performance in SSA is attributed to bad institutions. This study argues policies geared towards improving institutional quality can improve growth. There has been effort to improve institutional quality in SSA but the effort has not been fruitful. Incidences of corruption and political instability in SSA pose a challenge in the realization of sound economic growth.

The main objective was to examine the effect of institutional quality on output in SSA. Additionally, we examined significant regional differences in the effect of institutional quality on output in SSA. Lastly, we analysed if the effect of institutional quality on output varies with income level of SSA countries.

We studied 35 SSA countries and employed two step systems GMM. Two step systems GMM was preferred since it provides consistent estimates when faced with the problem of endogeneity. Various studies have employed both static and dynamic models to estimate the effect of institutional quality and growth in SSA. However, none of these studies dealt with the problem of proliferation of instruments when applying GMM. This study therefore potentially contributes to literature on the effect of institutional quality on growth in SSA by adopting a new estimation technique of remedying problems associated with dynamic GMM.

The findings showed that an improvement on institutional quality positively and significantly improve SSA output. The disaggregated analysis indicates that the six indicators of institutional quality (government effectiveness, political stability, rule of law, voice and

accountability, control of corruption and regulatory quality) have positive and significant effects on economic growth in SSA.

The findings further provide evidence that the effect of institutional quality on output varies with regional location of SSA countries. In particular, institutional qualities are more effective in driving income growth in West African region than the other three regions. Lastly, the findings suggest that the impact of government effectiveness on output growth varies with income level of SSA countries. In particular, government effectiveness contributes more to income growth in middle income countries than in low income SSA countries.

4.9.2 Conclusion

The study concludes that institutional quality plays a significant and positive role on output growth for SSA countries. Additionally, the effect of government effectiveness on income growth is more effective in middle income countries than in low income countries. There exist regional differences on the effect of institutional quality on output across the four regions. Institutional qualities are more effective in driving income growth in West African region than the other three regions

4.9.3 Policy implication

The institutional quality used in this study comprised of six indicators. Beyond the recognition of these measures of institutional quality, there is need forthe implementation and enforcement of policies that strengthen institutional quality. SSA countries should create statutory bodies that determine and prosecute economic crime. This would work towards combating incidences of corruption. Equally, participatory decision-making processes and transparency need to be adopted, and dissemination of information to the citizens. This would improve institutional quality and hence enhance income level.

Understanding the regional difference in the effect of institutional quality output is equally significant to policy makers. This is because different countries require different set of institutions and policies to promote long run income level. Each region should adopt joint strategies that strengthen institutional quality. African regions should support African agendas that are aligning with global development agenda. These policies should widen democratic space, civil liberty and the participation of citizen in the development agenda of a country.

CHAPTER FIVE

SUMMARY AND CONCLUSION

5.1 Introduction

Summary, conclusion and policy suggestions based on empirical findings are presented in this chapter. In particular, we provide brief description of the outcome of the study in general. Proposed policies are deduced from the relevance of three objectives: (1) government spending and economic growth (2) the government spending efficiency and the sources of inefficiencies for SSA countries and (3) institutional quality and economic growth.

5.2 Summary and Conclusion

Governments intervene in the economy because private markets are not efficient. Government expenditure not only aims to improve welfare but also acts to stimulate the economy. SSA countries have over the years adopted fiscal policy as a measure to realize their development agenda. However, literature has established that SSA regions, compared to other regions have lagged behind in economic development. Many factors have been considered to influence output. The growth-effect of these covariates varies with each study. This study therefore investigated the effect of government expenditure on output growth for a sample of SSA countries, the status and the determinant of efficiency of government spending, and the role of institutional quality on income level and the

The thesis used panel data for the period 2006-2018. The models estimated improve upon previous studies in several ways. Previous studies that have employed GMM estimators have not corrected the problem of too many instruments. This study therefore incorporated solutions suggested by Roodman (2009) in handling the problem associated with GMM. The GMM control endogeneity issues and taking into account panel dynamics. This method yields consistent estimates. The study also adopted two-step bootstrap output-oriented DEA

and analysed government spending efficiency for SSA countries and the sources of distortions.

The first objective is addressed in chapter 2. The chapter examined the effect of government expenditure on output for SSA countries and in particular, the study assessed whether the effect of spending on income changes with income level of SSA countries. The study used two-step system GMM. The study established that different components of governments spending have diverse effect on growth for low-income and middle-income countries. Taking SSA as a block, education and health expenditure have significant positive effect output both in the long run period and in the short period. However, military spending is non-significant hence does influence growth. The impact of education spending on cross-country income variation is more effective in low income SSA countries than middle income SSA countries. However, military expenditure on output growth is more effective in improving income level of middle income SSA countries than low income SSA countries.

Chapter 3 analysed the efficiency of government spending for SSA countries and controlled for environmental factors that influence efficiency of government spending. Due to data limitation for some countries, we sampled 23 SSA countries for the periods 2006-2018. We adopted Simar and Wilson (2007) two-stage bootstrap output-oriented DEA approach. We established that SSA countries are technically inefficient in their expenditure and are not operating at optimal level in resource allocation. When we controlled for exogenous variables, the findings established that GDP per capita, rule of law and voice and accountability plays negative and significant role on spending efficiency. However, secondary enrolment rate, political stability and domestic saving positively improve efficiency of spending. Control of corruption positively influences efficiency of government expenditure albeit insignificant.

The third chapter examined institutional quality and income growth in SSA countries. We estimated dynamic panel using two-step system GMM. The study provided evidence that institutional quality plays a significance role on economic performance. In particular, government effectiveness contributes more to income growth in middle income countries than in low income SSA countries. The impact of institutional quality on income varies with each SSA regions. The study established causation between institutional quality and income. The effect of institutional quality on output is more pronounced for the relatively lower and upper income groups than for middle-income countries.

5.3 Policy implication

Education and military expenditure are important drivers of economic growth. Governments need to increase budgetary allocation for education expenditure. Funding in education will enhance provision of quality education infrastructures and better remuneration of teachers which will enhance literacy. Middle income countries should also consider free and compulsory primary and secondary education. This will work towards improved literacy level and consequently impact on growth. Policy makers in the education sector need to introduce skill based courses, technical institutions and the government should invest locally to create employment opportunities. Creation of employment opportunities locally will discourage brain drain. Military expenditure should be expanded but with a caution. The governments in middle income countries should consider external borrowing rather than domestic borrowing in funding military expenditure.

Low income countries should cut on budgetary allocation for military expenditure. Some of the money spent on military should be diverted to productive expenditure like building roads and schools which have multiplier effects on the economy. SSA needs to address health reforms through enhanced social policies which involve improved primary health and

universal health insurance coverage as well as R&D to eliminate tropical diseases like malaria.

The institutional quality used in this study composed of six indicators. Beyond the recognition of these measures of institutional quality, there is need for the implementation and enforcement of policies that improve institutional quality for SSA. Participatory decision-making processes and transparency need to be adopted and dissemination of information to the citizens, implementation of mechanisms aimed at reducing corruption and maintaining accountability. This would improve institutional quality and hence enhance economic growth.

Knowledge on regional difference in the effect of institutional quality is equally important to policy makers. This is because different economic regions require distinct sets of institutions and policies to promote growth. Each region should design and implement institutional policies unique to their economics. For example, West Africa should develop stronger and independent institutions to improve their economic prospects.

SSA countries need to improve on technical efficiency of their expenditure by putting in place measures that reduce wastages of limited resources. These measures may include monitoring units that evaluate government programs and coming up with recommendations on how to improve on the intended outcomes. Reduction in government spending inefficiencies can be realized by SSA countries through strengthening intuitions and enacting laws that protect independence of government bodies that monitor and evaluate government programs.

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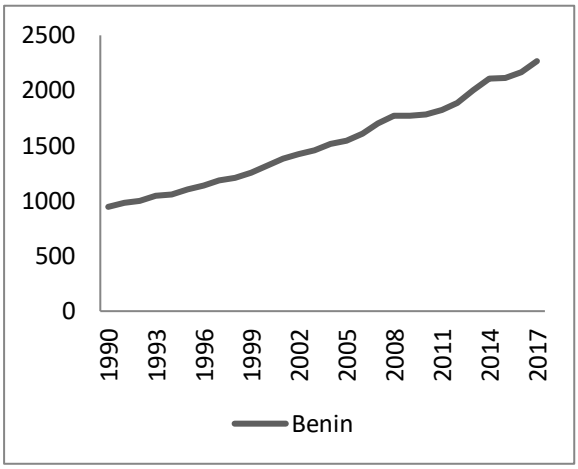
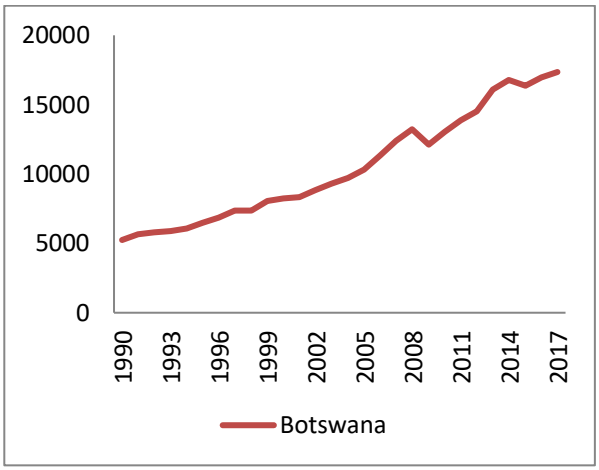
PPENDICES

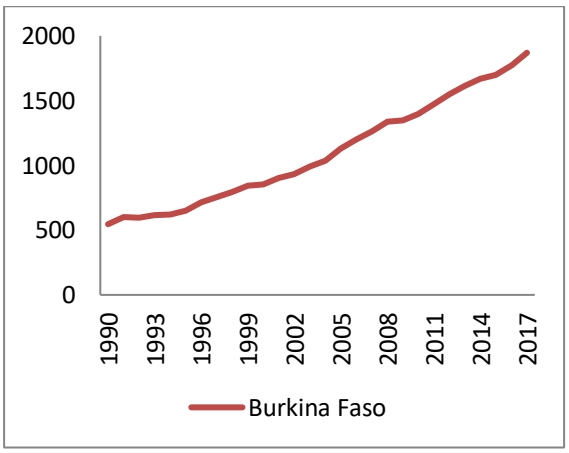
Appendix1: Average growth rate for SSA countries

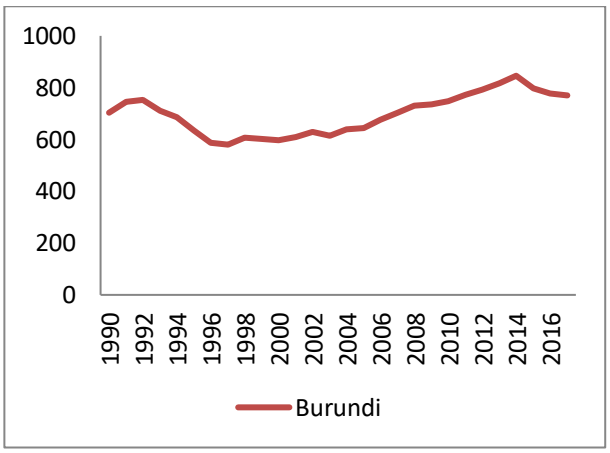
Country	Average Growth rate 1961-1969	Average Growth rate 1969-1979	Average Growth rate 1980-1990	Average Growth rate 1991-2000	Average Growth rate 2001-2010	Average Growth rate 2011-2017	Average Growth rate 1961-2017
Burundi	2.93	2.34	4.22	-1.87	3.35	1.93	2.56
Benin	3.08	3.16	3.66	4.63	3.88	4.71	3.67
Burkina Faso	3.27	15.65	3.34	5.37	5.94	5.68	4.42
Botswana	7.73	2.47	11.03	4.92	4.20	4.42	8.25
Central African Republic	1.93	7.79	0.65	1.26	2.58	-2.09	1.20
Cote d'Ivoire	8.71	7.07	-0.31	2.35	1.11	7.00	4.12
Cameroon	2.05	1.10	3.08	1.27	3.94	4.75	3.70
Congo, Dem. Rep.	3.73	5.66	1.05	-5.50	4.71	6.42	1.49
Congo, Rep.	3.96		6.29	1.49	4.69	1.81	4.11
Cabo Verde			5.28	11.49	5.88	2.17	6.53
Ethiopia		9.70	2.39	3.00	8.75	9.84	5.77
Gabon	6.71	1.86	2.18	1.77	1.46	4.19	4.29
Ghana	2.30		2.11	4.30	5.78	7.24	3.68
Guinea		4.73	4.48	3.91	3.13	6.59	4.34
Gambia, The	4.00	3.21	3.90	3.31	3.90	2.43	3.80
Guinea-Bissau			3.20	1.24	2.56	4.13	2.78
Equatorial Guinea		7.23	2.87	36.31	18.48	-1.40	15.32
Kenya	5.72	3.36	4.22	1.88	4.35	5.48	4.74
Lesotho	5.54	5.61	3.49	4.19	3.80	4.05	4.94
Madagascar	2.78		0.62	1.78	2.76	3.07	2.00
Mozambique		2.52	0.50	7.59	8.17	6.14	5.56
Mauritania	8.15	4.63	1.85	2.81	4.99	4.15	3.99
Mauritius		6.22	4.58	5.34	4.27	3.68	4.54
Malawi	5.30		2.08	3.72	4.83	3.85	4.31
Namibia		1.46	1.20	3.70	4.77	4.02	3.37
Niger	2.88	8.56	-0.08	1.87	4.62	5.87	2.68
Nigeria	2.85	5.79	-0.13	1.88	9.18	3.25	3.99
Rwanda	2.63	4.02	2.71	2.84	8.23	7.13	4.68
Senegal	1.26	3.22	2.11	3.10	4.11	4.81	2.99
Swaziland		8.33	9.71	2.96	3.55	2.73	5.15
Seychelles	4.50	-0.31	2.56	4.32	2.17	4.76	4.53
Chad	0.96	3.90	4.51	2.55	11.06	2.16	3.49
Togo	9.05	6.96	2.36	2.57	2.18	5.13	3.91
Tanzania			5.40	3.06	6.65	6.90	5.38
Uganda		3.39	3.44	6.55	7.39	5.10	5.79
South Africa	5.77	1.44	2.00	1.84	3.48	1.86	3.03
Zambia	3.80	4.88	1.26	1.75	7.46	4.81	3.34
Zimbabwe	4.68		5.38	1.90	-3.62	6.23	2.97

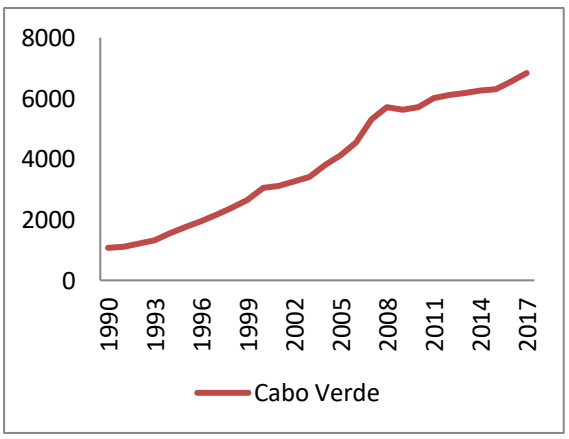
Appendix 2: Trend in GDP growth rate for SAA countries

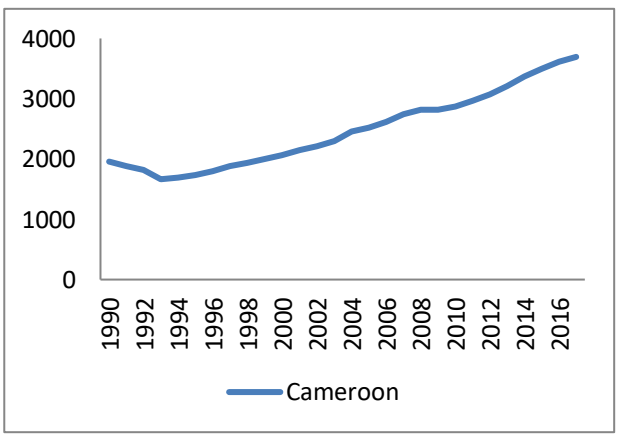


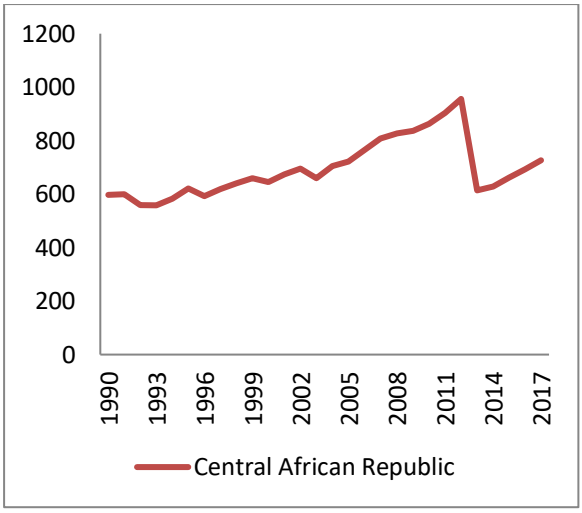








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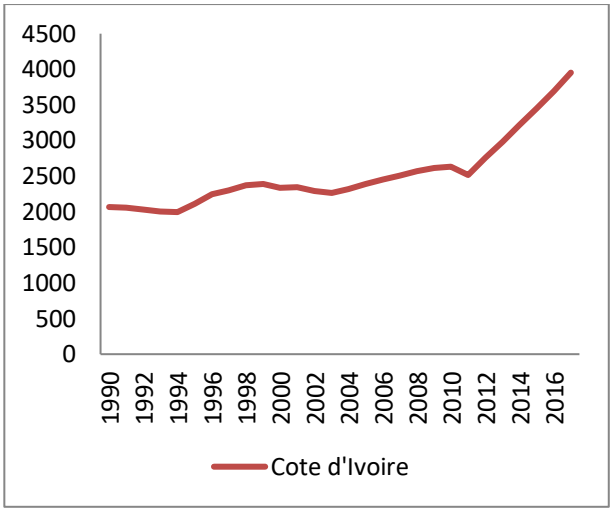
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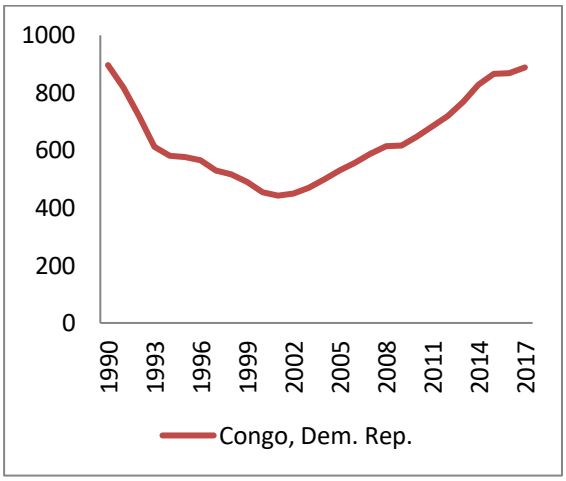
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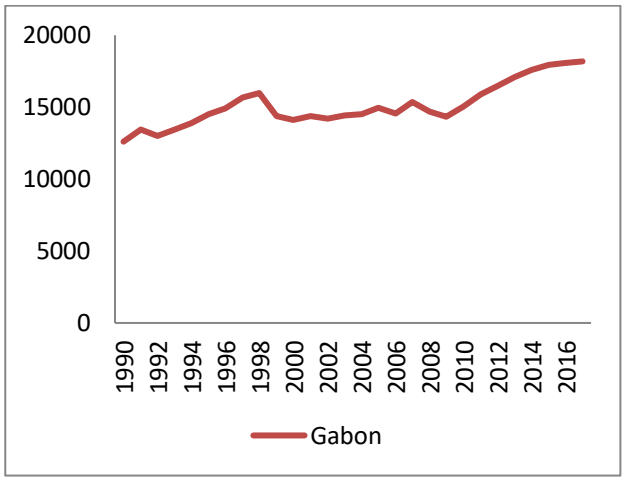
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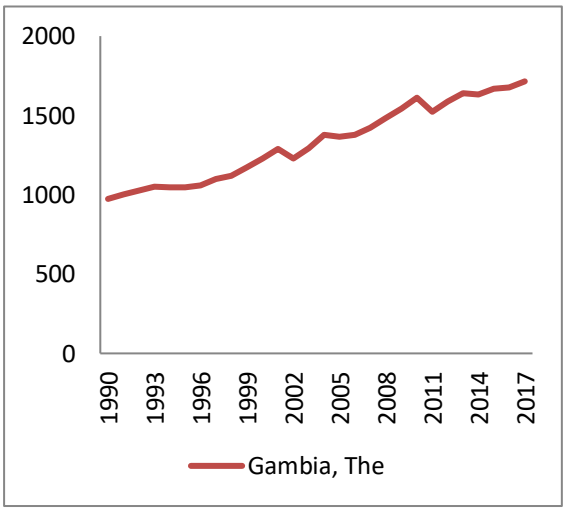
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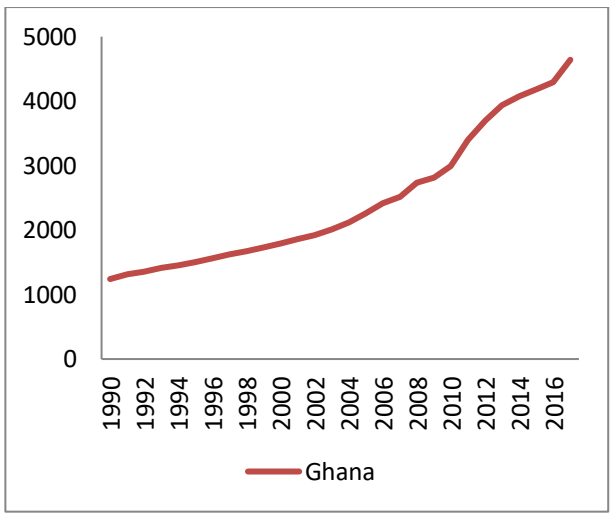
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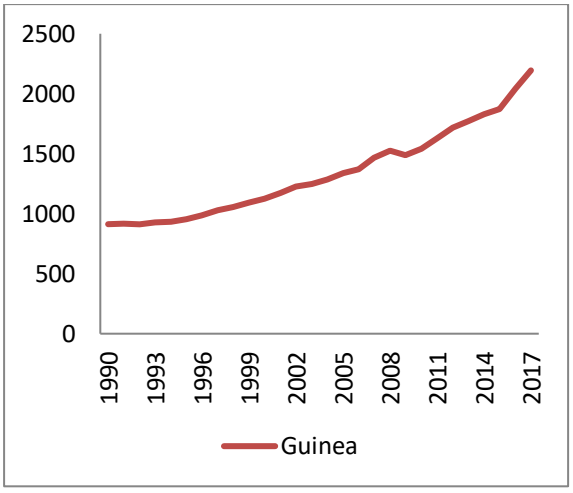
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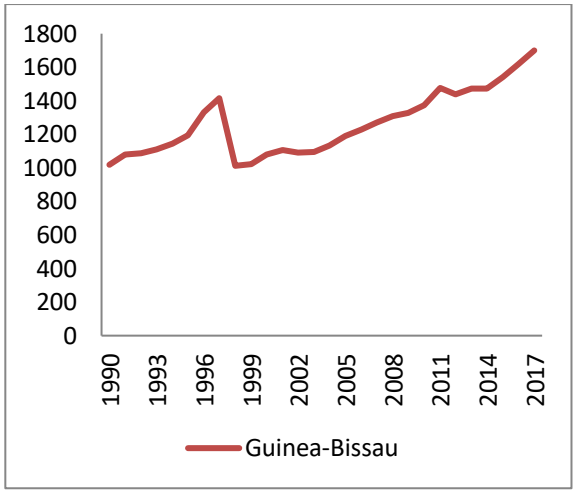
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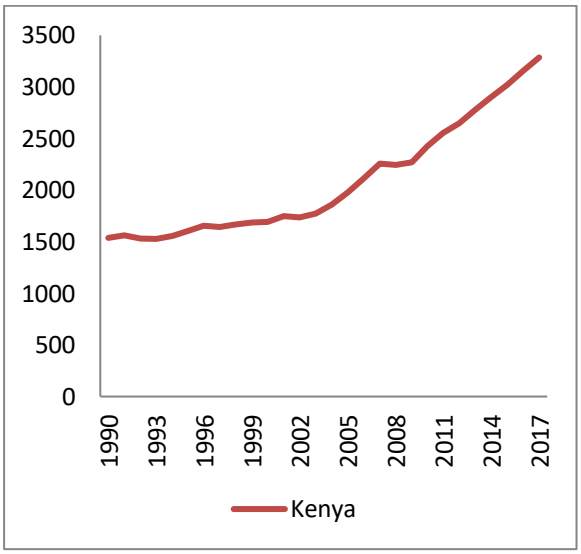
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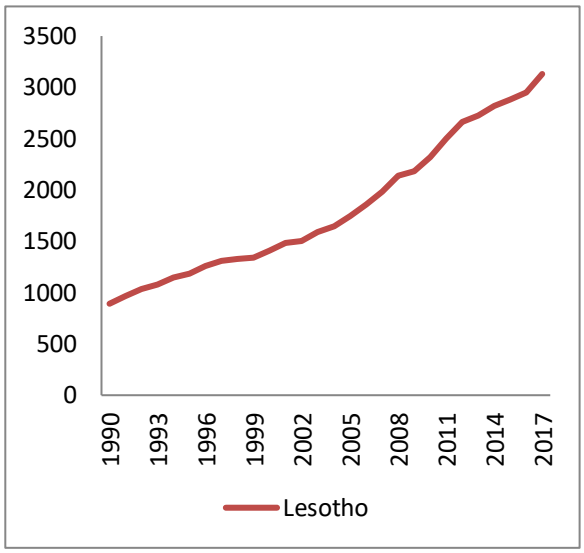
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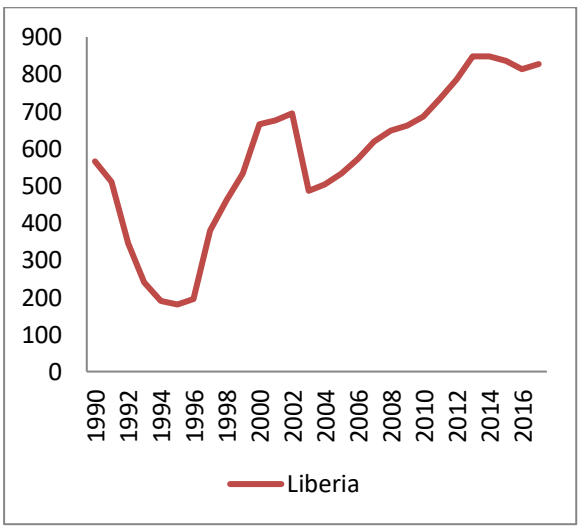
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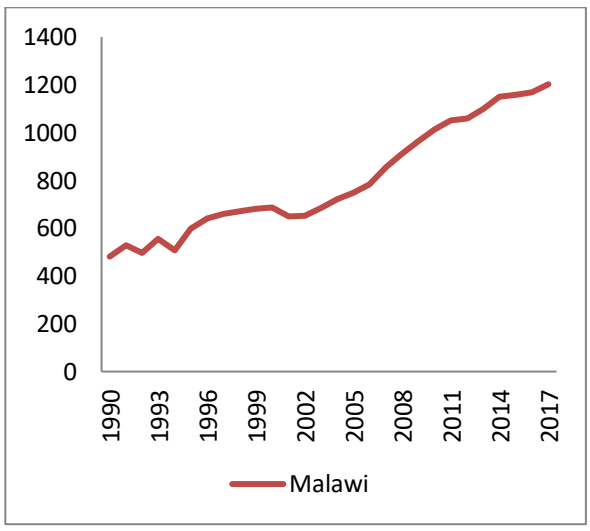
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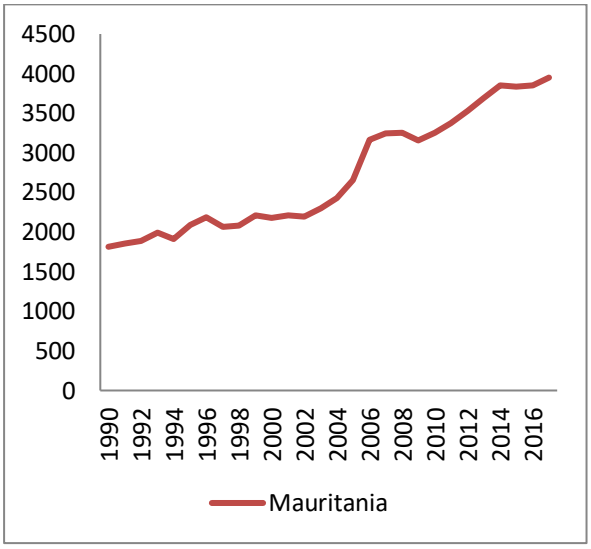
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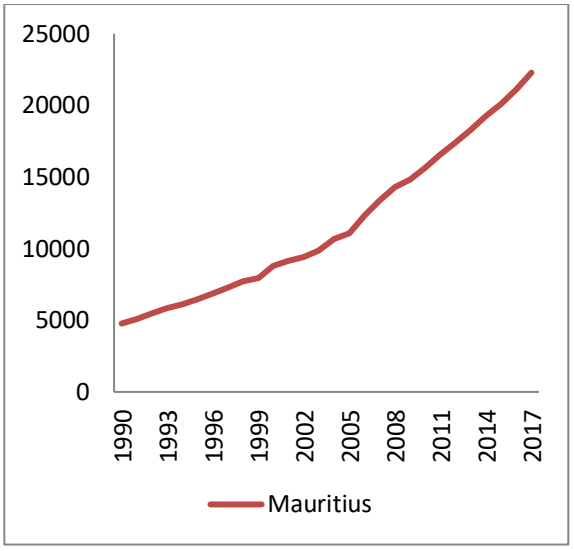
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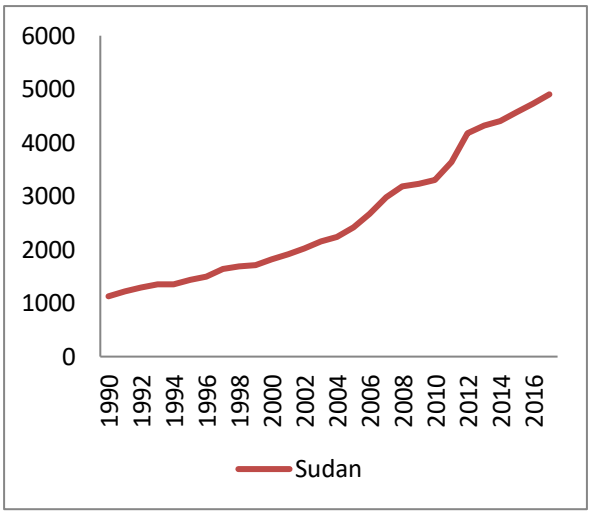
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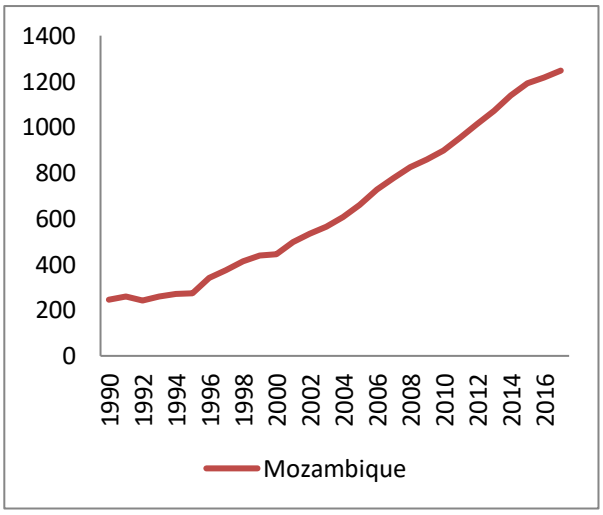
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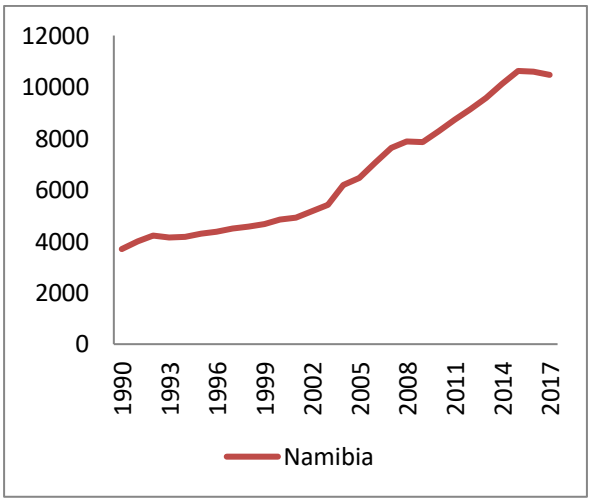
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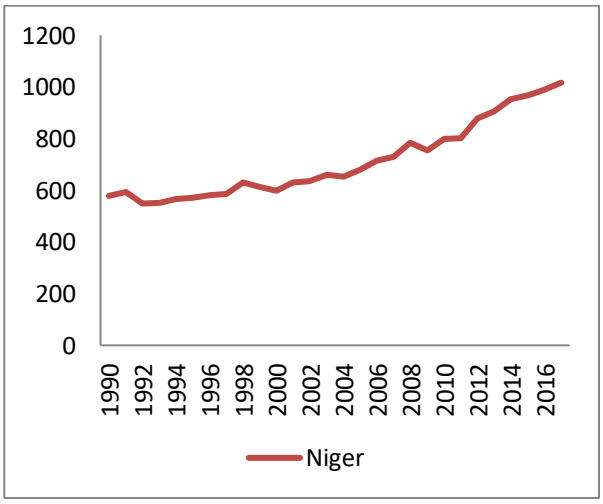
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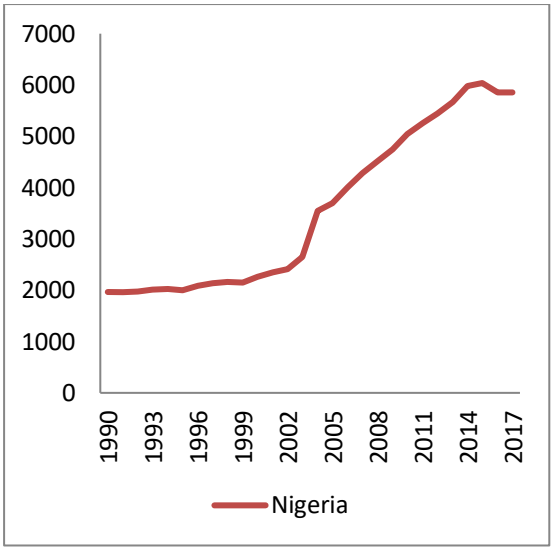
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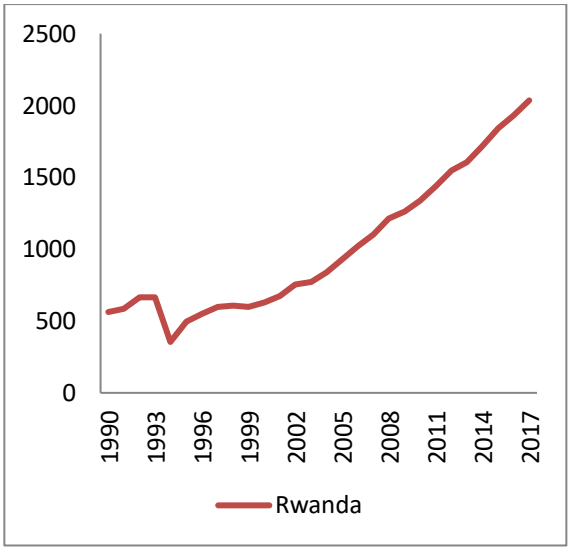
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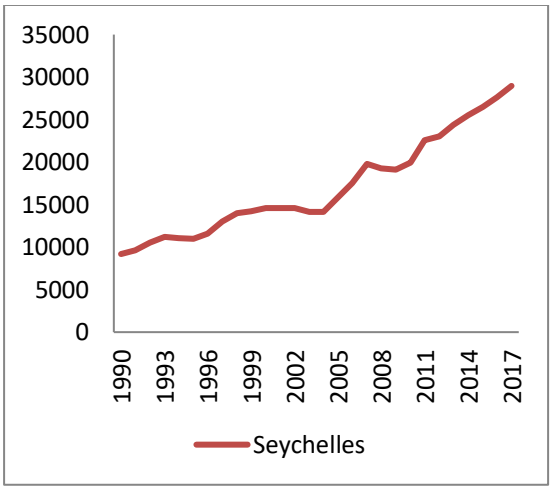
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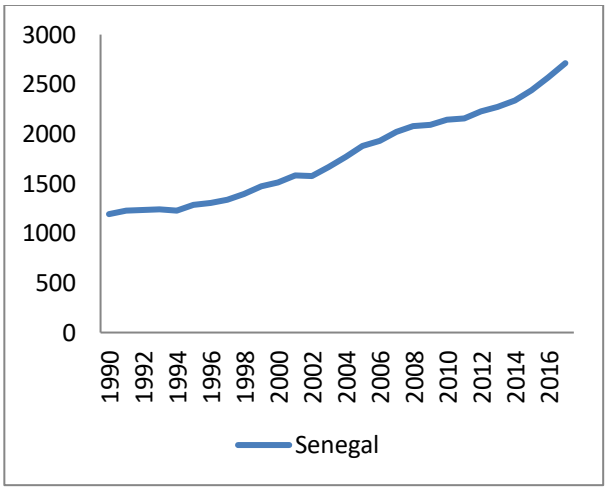
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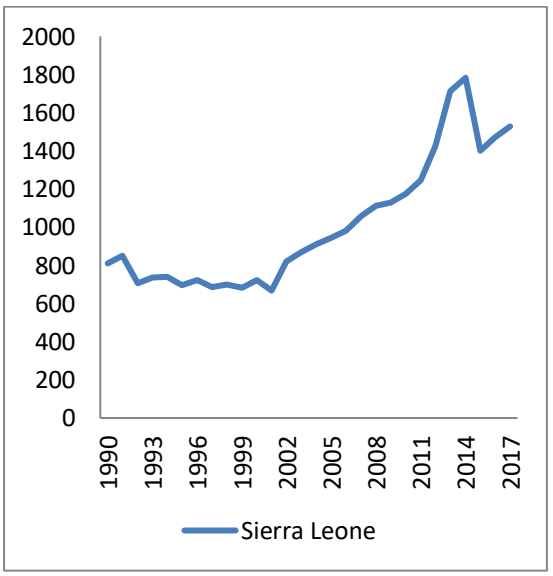
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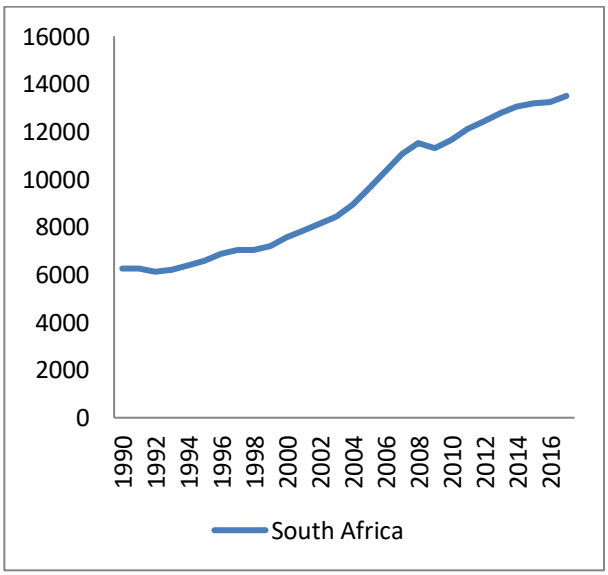
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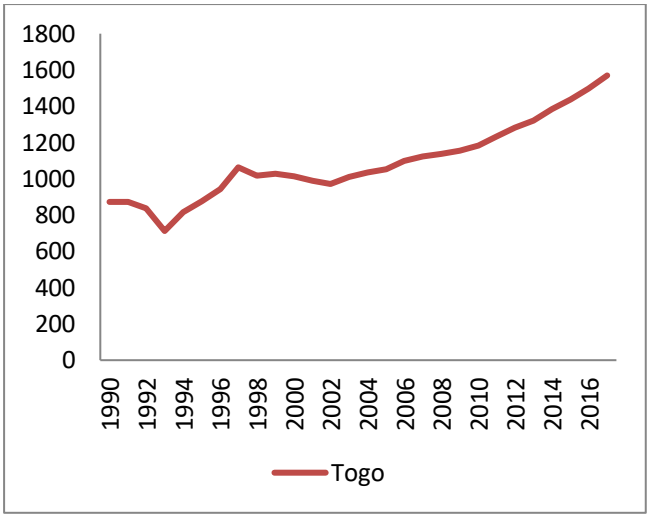
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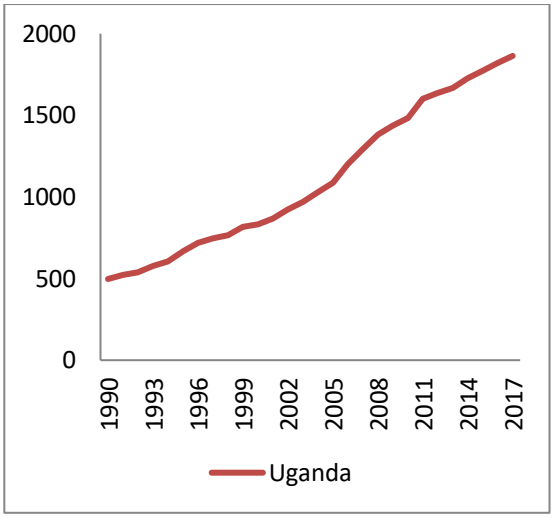
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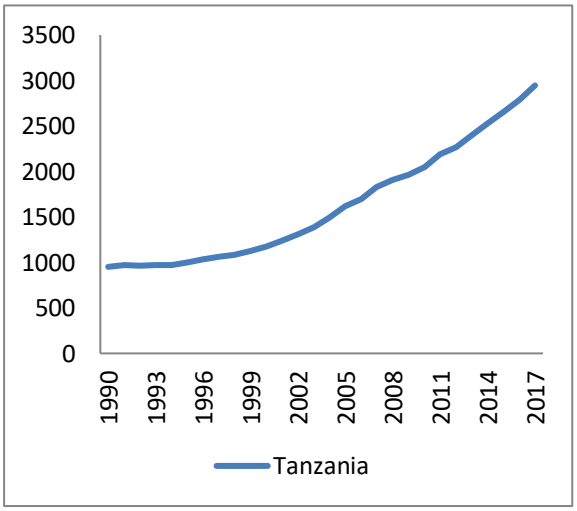
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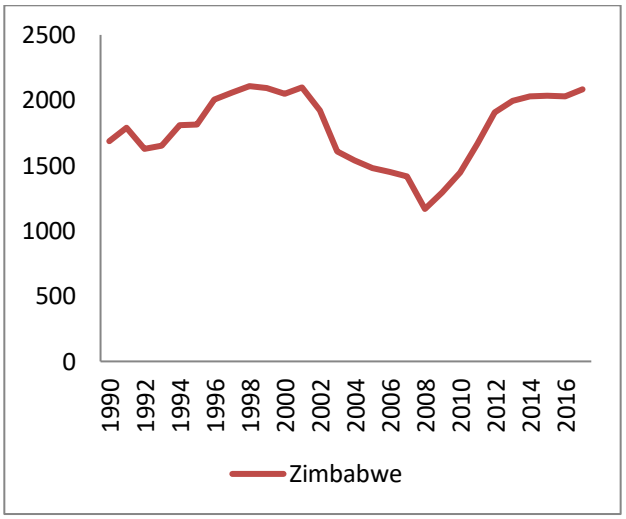
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Appendix 3: World Bank Country Classifications

Table 21: Low Income Sub-Saharan Africa Countries

Benin	Gambia	Senegal
Burkina Faso	Guinea	Sierra Leone
Burundi	Guinea-Bisau	Somali
Central Africa Republic	Liberia	South Sudan
Chad	Malawi	Tanzania
Comoros	Mozambique	Togo
Congo Democratic Republic	Niger	Uganda
Ertrea	Rwanda	Zimbabwe

Source: The World Bank Classification 2018.

Table 22: Middle-income Sub-Saharan Africa Countries

Angola	Kenya	Sudan
Botswana	Lesotho	Zambia
Cabo Verde	Mauritania	
Cameroon	Mauritius	
Djibouti	Namibia	
Gabon	Nigeria	
Ghana	South Africa	

Source: The World Bank Classification 2018.

Appendix 4: Hamiltonia derivation

Hamiltonia function

$$H = \frac{c_{it}^{1-\gamma}}{1-\gamma} e^{-\rho t} + \lambda\left[(1-\tau_{it})Ak_{it}^{\emptyset} - c_{it}\right] (1)$$

First order condition of equation 1 with respect to c_{it}, k_{it} and λ

$$\frac{dH}{dc} = -\gamma c_{it} e^{-\rho t} - \lambda = 0 \quad (2)$$

$$\dot{\lambda} = -\frac{dH}{dk} = -\lambda\emptyset(1-\tau_{it})Ak_{it}^{\emptyset-1} \quad (3)$$

$$\dot{k} = \frac{dH}{d\lambda} = (1-\tau_{it})Ak_{it}^{\emptyset} - c_{it} \quad (4)$$

Taking the natural log of equation (2)

$$-\gamma ln c_{it} - \rho t = ln\lambda \quad (5)$$

Taking FOC of equation (5) wrt time (t)

$$-\gamma \frac{\dot{c_{it}}}{c_{it}} - \rho = \frac{\dot{\lambda}}{\lambda} \quad (6)$$

Equating equation (3) with equation (6)

$$\frac{\dot{c_{it}}}{c_{it}} = \frac{\emptyset(1-\tau_{it})Ak_{it}^{\emptyset-1} - \rho}{\gamma} \quad (7)$$

Equation (7) can be simplified as;

$$\frac{\dot{y_{it}}}{y_{it}} = \frac{\dot{c_{it}}}{c_{it}} = \frac{(1-\tau_{it})(A\emptyset k_{it}^{\emptyset-1})}{\gamma} - \frac{\rho}{\gamma} \quad (8)$$

Taking FOC of equation (8) wrt τ_{it};

$$\frac{d(\frac{\dot{y_{it}}}{y_{it}})}{d\tau_{it}} = -\frac{(A\emptyset k_{it}^{\emptyset-1})}{\gamma} > 0 \quad (9)$$

Appendix 5: Nonparametric test of independence

Radial (Debreu-Farrell) output-based measures of technical efficiency under
assumption of CRS, NIRS, and VRS technology are computed for the following
data:
p-value of the Ho that T4n = 0 (Ho that radial (Debreu-Farrell) output-based
measure of technical efficiency under assumption of CRS technology and mix of
outputs are independent) = 0.5185:
hat{T4n} = 0.0021 is not statistically greater than 0 at the 5percent significance
level
Heterogeneous bootstrap should be used when performing output-based technical
efficiency measurement under assumption of CRS technology

Appendix 6: Two-step test for CRS

Radial (Debreu-Farrell) output-based measures of technical efficiency under
assumption of CRS, NIRS, and VRS technology are computed for the following
p-value of the Ho that mean(F_i^CRS)/mean(F_i^VRS) = 1 (Ho that the global
technology is CRS) = 0.0000:
mean(hat{F_i^CRS})/mean(hat{F_i^VRS}) = 1.0776 is statistically greater than 1
at the 5percent significance level

Test #2
p-value of the Ho that mean(F_i^NiRS)/mean(F_i^VRS) = 1 (Ho that the global
technology is NiRS) = 0.0000:
mean(hat{F_i^NiRS})/mean(hat{F_i^VRS}) = 1.0753 is statistically greater than
1 at the 5percent significance level

Appendix 7: Simar and Wilson two-step output

Tobit regression — Number of obs = 299
LR chi2(14) = 212.06
Prob > chi2 = 0.0000
Log likelihood = -315.7636 — Pseudo R2 = 0.2514

te_vrs_1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
linGDP_cap~a	-.3490542	.1492328	-2.34	0.020	-.6427925	-.055316
Capital	-.0394367	.0069341	-5.69	0.000	-.0530852	-.0257882
Inflation	-.0016628	.0065458	-0.25	0.800	-.014547	.0112215
Millitary	-.0492389	.0522701	-0.94	0.347	-.1521234	.0536456
Labor	-.0049532	.0048592	-1.02	0.309	-.0145176	.0046112
DomesticSa~g	.0165064	.0046679	3.54	0.000	.0073186	.0256942
Primary_En~t	-.0020066	.0028967	-0.69	0.489	-.0077082	.0036949
Secondary_~t	.0303754	.0055707	5.45	0.000	.0194105	.0413403
GovEff	.1669812	.2945696	0.57	0.571	-.4128268	.7467891
PoltStb	.80134	.0987577	8.11	0.000	.6069531	.995727
RuleofLaw	-1.474954	.2358125	-6.25	0.000	-1.939109	-1.010799
VoiceandAcct	-.421699	.164322	-2.57	0.011	-.7451377	-.0982604
Corruption	-.0487624	.1950561	-0.25	0.803	-.4326958	.335171
Regulatory	-.2483927	.2360284	-1.05	0.294	-.7129727	.2161874
_cons	3.378109	1.217045	2.78	0.006	.982572	5.773645
/sigma	.737344	.0336873			.6710365	.8036514

50 left-censored observations at te_vrs_1 <= 1
249 uncensored observations
0 right-censored observations

```
Fitting full model:

Iteration 0:   log likelihood = -183.62007
Iteration 1:   log likelihood = -139.40908
Iteration 2:   log likelihood = -108.43019
Iteration 3:   log likelihood = -106.42519
Iteration 4:   log likelihood = -106.33542
Iteration 5:   log likelihood = -106.33527
Iteration 6:   log likelihood = -106.33527

Truncated regression
Limit:   lower =          1                     Number of obs     =        249
         upper =       +inf                     Wald chi2(14)     =     101.66
Log likelihood = -106.33527                     Prob > chi2       =     0.0000
```

te_vrs_1	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
linGDP_cap~a	-.9973126	.3381411	-2.95	0.003	-1.660057	-.3345682
Capital	-.0803032	.0192681	-4.17	0.000	-.1180679	-.0425384
Inflation	.0094721	.0138861	0.68	0.495	-.0177442	.0366884
Millitary	-.1135453	.1291567	-0.88	0.379	-.3666878	.1395972
linGDP_cap~a	0	(omitted)				
Labor	-.0201664	.012322	-1.64	0.102	-.044317	.0039842
Primary_En~t	-.0092138	.0077551	-1.19	0.235	-.0244136	.005986
Secondary_~t	.0706063	.0130772	5.40	0.000	.0449755	.0962371
DomesticSa~g	.0377946	.0142378	2.65	0.008	.0098889	.0657002
GovEff	-.0221765	.6741282	-0.03	0.974	-1.343444	1.29909
PoltStb	2.011675	.2766397	7.27	0.000	1.469471	2.553879
RuleofLaw	-3.641623	.7500932	-4.85	0.000	-5.111779	-2.171468
VoiceandAcct	-.8854531	.3654189	-2.42	0.015	-1.601661	-.1692452
Corruption	.5969932	.5261639	1.13	0.257	-.434269	1.628255
Regulatory	-1.089684	.5593842	-1.95	0.051	-2.186057	.0066886
_cons	6.108046	2.815755	2.17	0.030	.5892672	11.62683
/sigma	.9168747	.0785764	11.67	0.000	.7628678	1.070882

```
Simar & Wilson (2007) eff. analysis      Number of obs            =       299
(algorithm #2)                           Number of efficient DMUs =         0
                                         Number of bootstr. reps  =      2000
                                         Wald chi2(14)            =    133.06
inefficient if tebc_vrs_1 > 1            Prob > chi2(14)          =    0.0000

------------------------------------------------------------------------------
Data Envelopment Analysis:               Number of DMUs           =       299
                                         Number of ref. DMUs      =       299
output oriented (Farrell)                Number of outputs        =         2
variable returns to scale                Number of inputs         =         4
bias corrected efficiency measure        Number of reps (bc)      =      1000

------------------------------------------------------------------------------
             |  Observed   Bootstrap                         Percentile
inefficiency |     Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
tebc_vrs_1   |
     Capital |  -.0851109    .017326    -4.91   0.000    -.1188138   -.0510983
   Inflation |   .0083865   .0132187     0.63   0.526    -.0193952     .032249
   Millitary |  -.0608541   .1167595    -0.52   0.602    -.3067634    .1605277
linGDP_cap~a |   -1.01348   .3192075    -3.17   0.001    -1.618413   -.3735071
       Labor |   -.015882   .0110196    -1.44   0.150    -.0378169    .0056291
DomesticSa~g |   .0482318     .01201     4.02   0.000     .0252414     .071791
Primary_En~t |  -.0057722   .0062919    -0.92   0.359    -.0176927    .0067212
Secondary_~t |   .0749347    .012343     6.07   0.000     .0504859    .0979195
      GovEff |   .1736773   .6341966     0.27   0.784    -1.071528    1.377714
     PoltStb |   2.020765   .2566385     7.87   0.000     1.506586    2.537359
   RuleofLaw |  -4.219857   .6838702    -6.17   0.000     -5.51824   -2.908856
VoiceandAcct |  -.8449582   .3417957    -2.47   0.013    -1.467635   -.1175042
  Corruption |   .6029116   .4798061     1.26   0.209    -.3021544    1.553512
  Regulatory |  -.9648681   .5292183    -1.82   0.068    -1.989983    .0584449
       _cons |    5.34201   2.606417     2.05   0.040     .1856462     10.4997
-------------+----------------------------------------------------------------
      /sigma |   .9728276   .0734061    13.25   0.000     .8014025    1.091967
------------------------------------------------------------------------------

. outreg2 using deafinal.doc, append
```