UNIVERSITY OF BOTSWANA

DEPARTMENT OF ECONOMICS

FOREIGN AID AND ECONOMIC GROWTH NEXUS: EMPIRICAL EVIDENCE FROM EAST AFRICAN COMMUNITY COUNTRIES

BY

PAMELLA EUNICE AHAIRWE

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APPROVAL

This Dissertation has been examined and approved as meeting the requirements for the partial fulfilment of the Master of Arts Degree in Economics

…… ……

Dr. L. Setlhare Date

(Supervisor)

……. ……

Dr. M. Bakwena Date

(Head of Department)

DECLARATION

I, **Pamella Eunice Ahairwe,** hereby certify that this dissertation, which was undertaken from October 2017 to May 2018, is my original work, except where it is dully acknowledged and has never been published and/or submitted to any other institution of higher learning before for any other award of a degree programme.

Signature……. Date…….

DEDICATION

Dedicated to my father, Enock and mother, Jadress.

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ABSTRACT

This study uses system generalized method of moments (GMM) to examine foreign aid and economic growth nexus in East African Community (EAC) countries for the period 1981 to 2014. It first investigates if foreign aid causes economic growth. It then assesses whether the level of investment in a country matters or not for foreign aid to lead to economic growth. Finally, it tests for the direction of the relationship between foreign aid and economic growth. The results reveal that foreign aid has a positive and significant effect on economic growth; however, this effect decreases in marginal economic growth and is a negative function of the level of investment. They also show that the relationship between foreign aid and economic growth is unidirectional. The above findings suggest that directing foreign aid to EAC countries with considerably lower investment levels will lead to economic growth. The study; therefore, recommends that in order to mitigate the decreasing effect of foreign aid on marginal economic growth, foreign aid should be invested in productive activities such as research and development, provision of new skills, and acquisition of relevant capital to improve both quantity and quality of domestic output.

Key words: Foreign aid, Economic growth, and System GMM

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LIST OF ACRONYMS

ADF	Augmented Dickey Fuller
AFDB	Africa Development Bank
ANOVA	Analysis of Variance
EAC	East African Community
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
ICOR	Increment Capital-Output Ratio
LDCs	Least Developed Countries
LIML	Limited Information Maximum Likelihood
LM	Lagrange Multiplier
N	Number of Observations
MDGs	Millennium Development Goals
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Square
POLS	Pooled Ordinary Least Square
PFGLS	Pooled Feasible Generalized Least Square
SDGs	Sustainable Development Goals
SSA	Sub Saharan Africa
T	Number of Time-Periods
UN	United Nations
UPE	Universal Primary Education
IPWLS	Inverse Probability Weighted Least Squares

CHAPTER ONE: INTRODUCTION AND BACKGROUND OF THE STUDY

1.0 Introduction

Chapter 1 introduces the study. Sections 1.1, 1.2, and 1.3 present the background, the problem statement, and the objectives of the study respectively. Similarly, Sections 1.4, 1.5, and 1.6 discuss the hypothesis, the significance, and organization of the study

1.2 Background of the Study

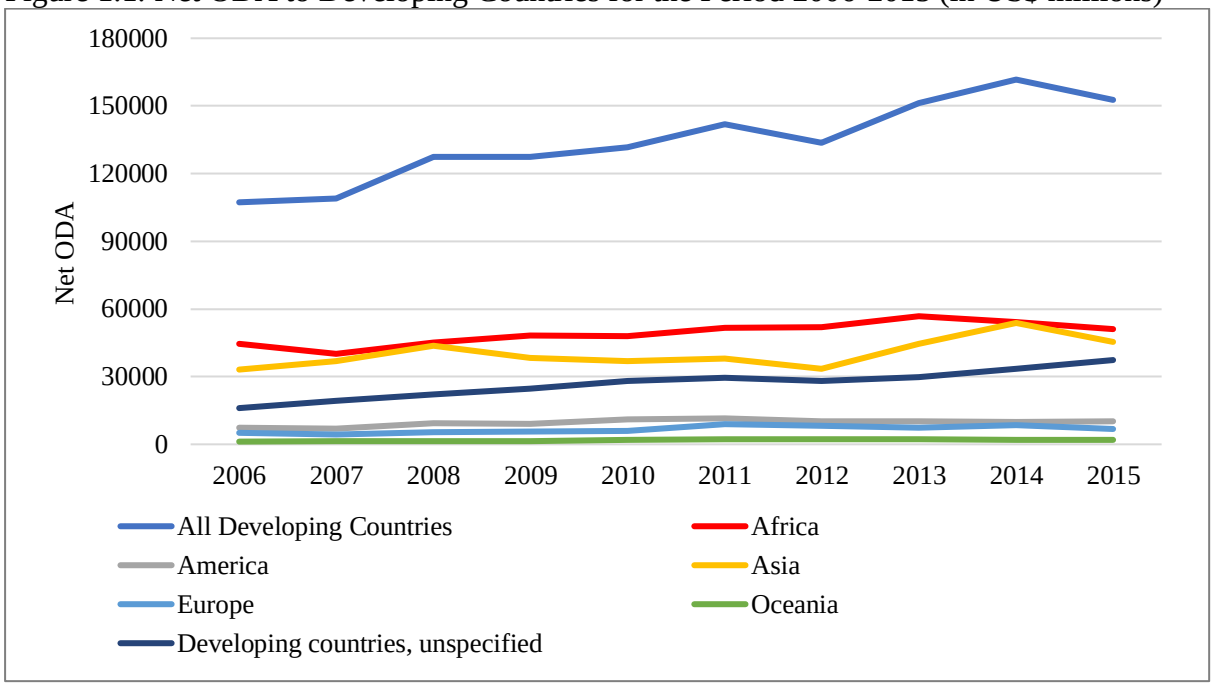
The common adage that the haves should help the have-nots has always driven the wealthy and generous nations to assist the poor and developing countries in the world. This assistance is through foreign aid, which is synonymous with Overseas Development Assistance (ODA). Foreign aid refers to the external government assistance that aims at boosting economic development and welfare of the third world countries (OECD, 2018). According to Organization for Economic Co-operation and Development (OECD), foreign aid, which can be either bilateral or multilateral broadly comprises of grants, concessional loans and technical assistance to developing countries with less than US$12276 per capital income (OECD, 2008).

The United Nations recommends the use of foreign aid to achieve the Sustainable Development Goal (SDG) 8 whose aim is to promote inclusive and sustainable growth in developing countries (Osborn, Cutter, & Ullah, 2015). Aid flows to developing countries have risen by 36-fold from US$6.3 billion in 1965 to US$152.2 billion in 2015 (World Bank, 2017). However, the corresponding economic growth rates have been perplexing in diverse developing countries. Empirical evidence also presents inconclusive findings. For instance, some studies demonstrate that foreign aid induced economic growth among the East Asian countries of Hong Kong, Singapore, South Korea, and Taiwan (Gray, 2014; Shirley, 2014; Soesastro, 2005). Shirley (2014) particularly argues that foreign aid enabled these East Asian tigers to recover

from war and take off with sustainable economic growth. The question then is; has this been the case for Africa?

The ability of foreign aid to lead to economic growth among the African recipient countries is debatable. Though Africa receives a slightly higher portion of foreign aid relative to Asia as demonstrated in Figure 1.1, its Gross Domestic Product (GDP) per capita remains the lowest in the world.

Figure 1.1: Net ODA to Developing Countries for the Period 2006-2015 (in US$ millions)

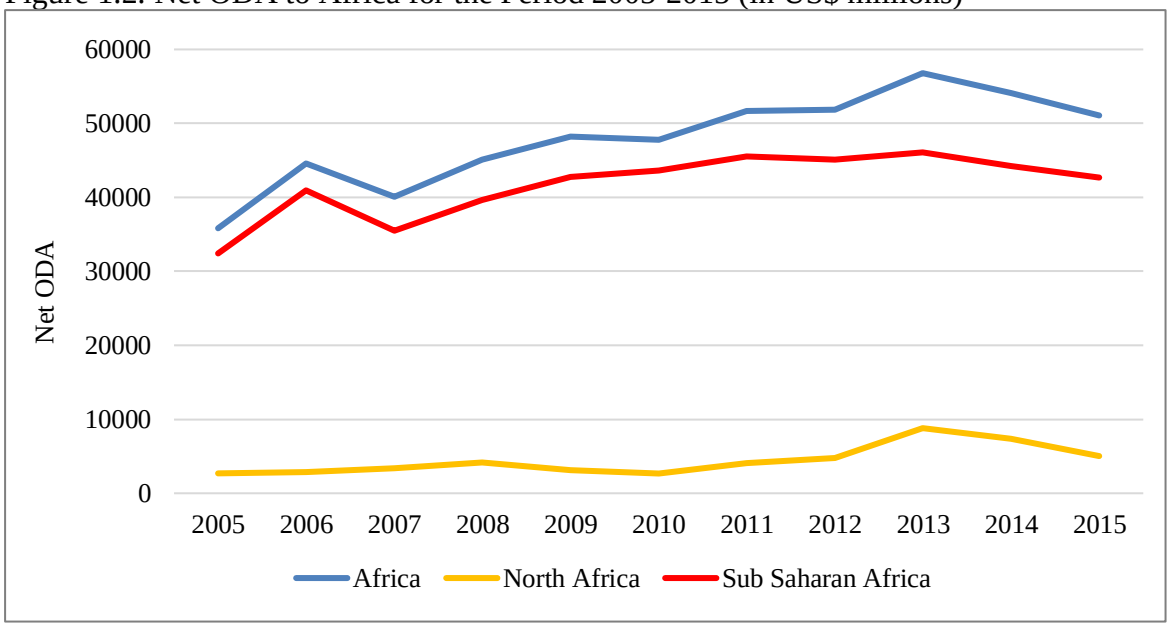


Source: Author's computations using OECD (2017) data

Within Africa, sub-Saharan Africa (SSA) receives the largest portion of the total foreign aid as demonstrated in Figure 1.2, nonetheless, its GDP is the lowest in the world (World Bank, 2017). Empirical evidence on foreign aid and economic growth nexus on developing countries including SSA is also ambiguous. Burnside and Dollar (2000a) demonstrate that foreign aid induces economic growth only in countries with sound monetary, fiscal and trade policies. However, Easterly, Levine, and Roodman (2003) refute the above results on the basis that they are not robust. Easterly *et al.* (2003) show that there is no relationship between foreign aid and

economic growth in developing countries. These findings are in line with the results of the later studies of Eris (2008), Rajan & Subramanian (2008), and Tang & Bundhoo (2017).

Figure 1.2: Net ODA to Africa for the Period 2005-2015 (in US$ millions)



Source: Author's computations using OECD (2017) Data on Net ODA flows

Other studies reveal a long-term positive relationship between foreign aid and economic growth that is not conditional on macroeconomic policies (Armah & Nelson, 2008; Arndt, Jones, & Tarp, 2010, 2015; McGillivray, 2005; Minoiu & Reddy, 2010). Yet others argue that foreign aid leads to negative economic growth rates (Adams & Atsu, 2014; Clemens, Radelet, & Bhavnani, 2004; Mallik, 2008; Sothan, 2018). All these results from empirical literature provide no clear consensus on the relationship between foreign aid and economic growth nexus.

In an attempt to explain these variations, Clemens, Radelet, Bhavnani, and Bazzi (2012) argued that most studies on foreign aid and economic growth nexus used very short time series data and yet the effect of foreign aid on economic growth is long term. This creates a need for new empirical evidence on foreign aid and economic growth nexus that takes into account the long-term aspect. Moreover, most literature on the subject has used large samples consisting of many developing countries across different continents. These countries are diverse in nature with

individual and time specific characteristics that make their results susceptible to aggregation bias (Baltagi, 2008). As such, small panel data studies may be superior because they include few countries with almost similar features that make inferencing relatively more precise.

This study, therefore, investigates the foreign aid and economic growth nexus using a small sample of five (5) East African Community (EAC) countries that are almost homogenous. The sample selection is motivated by the fact that the EAC countries especially Tanzania, Kenya and Uganda have received a substantial share of total foreign aid to Africa (OECD, 2017). By intuition, large amounts of foreign aid are supposed to boost economic growth in the recipient countries; however, it is unclear if this has been the case for the EAC Countries.

1.3 Statement of the Problem

Some researchers and politicians have greatly advocated for foreign aid cuts and removals (Easterly, 2001; Moyo, 2009). These have argued that despite the high and unceasing foreign aid flows, growth rates in most developing countries including EAC countries have continued to decline. Moreover, there are attempts specifically by the USA government to lessen foreign aid flows to least developed countries (LDCs) in order to focus on priority areas that can promote foreign policy (White House, 2017). White House (2017) argues that focusing the aid resource on priority areas such as security in war zone countries, eliminating HIV/AIDS and malaria, loans and humanitarian assistance will ensure effectiveness of the tax payers' investments. Consequently, it proposes a reduction in the overall foreign aid to developing countries by 30.8 percent in the financial year 2017/2018. The EAC countries of Burundi, Kenya, Rwanda, South Sudan, Tanzania, and Uganda will be the most affected as demonstrated in Figure 1.3.[1]

[1] The statistical figures were obtained from "For Uganda and Ethiopia, it is $200m less in US aid, http://www.theeastafrican.co.ke/news/US-spending-in-East-Africa/2558-3912632-c3n6ubz/index.html"

Figure 1.3:Foreign aid cuts as proposed by the White house in 2017 (in US$ millions)

Source: Adapted from the East African (2017)

These anticipated cuts and removals have in turn attracted the attention and traction of foreign aid proponents (researchers, politicians and public discourses), who are hypothesising low developments in the future for the EAC countries whose sectors including infrastructure and human capital development are highly dependent on aid. These also argue that foreign aid cuts will greatly increase budget deficits, lower investments in development projects and thus GDP growth rates.

Theoretically and to the expectations of foreign aid proponents, increases in foreign aid flows should increase economic growth. Nevertheless, the trends of EAC countries' economic growth rates relative to foreign aid growth rates are unclear. Increased foreign aid flows seem not to necessarily correspond with increases in GDP growth rates as illustrated in Table 1.1. For example, foreign aid flows to Burundi increased from -8.40 percent in 2012 to 6.61 percent in 2013 as GDP growth rates increased from 4.02 to 4.59 percent respectively. However, in Kenya, foreign aid growth rates increased from -8.48 percent in 2010 to 51.96 percent in 2011 with GDP growth rates decreasing from 8.40 to 6.11 percent. Furthermore, foreign aid growth rates increased in Rwanda from -30.44 percent in 2012 to 23.63 percent in 2013 while GDP

growth rates decreased from 8.84 to 4.70 percent. Tanzania's GPD growth rates remained constant despite foreign aid flows growth rates increasing from -22.86 percent in 2014 to -2.57 percent in 2015.

Similarly, a fall in foreign aid growth rates has also had debatable trends with GDP growth rates. From Table 1.1 Burundi experienced a decrease in foreign aid growth rates from 6.61 percent in 2013 to -7.77 percent in 2014 as her GDP growth rates increased from 4.59 to 4.66 percent respectively. In Kenya, foreign aid growth rates fell from 30.74 percent in 2009 to -8.48 percent in 2010 while the respective GDP growth rates escalated from 3.31 to 8.40 percent. Furthermore, in Rwanda, a foreign aid growth rate decline from 19.93 percent in 2008 to -0.13 percent in 2009 occurred concurrently with a respective fall in GDP growth rates from 11.16 to 6.29 percent. In Uganda, GDP growth rates remained the same despite a fall in foreign aid growth rates from 9.37 percent in 2007 to -5.45 percent in 2008.

From the above trends, it is moot whether increases in foreign aid flows in EAC countries have caused increases in GDP growth rates. In return, it is also debatable whether increases in GDP growth rates have led to increases in foreign aid flows. Therefore, this study provides an empirical examination of foreign aid and economic growth nexus in EAC countries by answering these research questions:

1) does foreign aid cause economic growth in EAC countries?
2) does the level of investment in the EAC countries matter if foreign aid is to lead to economic growth?
3) is there a two-way causation between foreign aid and economic growth?

Table 1.1: ODA and GDP Growth Rates in EAC for the Period 2006-2015

Year	Burundi		Kenya		Rwanda		Tanzania		Uganda	
	ODA growth rate	GDP growth rate	ODA growth rate	GDP growth rate	ODA growth rate	GDP growth rate	ODA growth rate	GDP growth rate	ODA growth rate	GDP growth rate
2006	18.17	5.38	24.46	6.47	5.71	9.23	26.48	4.66	32.95	10.78
2007	16.79	4.79	41.17	6.85	28.85	7.69	49.59	8.46	**9.37**	**8.41**
2008	3.15	5.05	2.56	0.23	**19.93**	**11.16**	-17.45	5.57	**-5.45**	**8.71**
2009	10.63	3.47	**30.74**	**3.31**	**-0.13**	**6.29**	34.15	5.38	8.70	6.74
2010	9.01	3.79	**-8.48**	**8.40**	10.58	7.29	-5.34	6.36	-5.39	5.66
2011	-8.82	4.19	**51.96**	**6.11**	22.27	7.79	-17.51	7.90	-6.94	9.44
2012	**-8.40**	**4.02**	7.05	4.56	**-30.44**	**8.84**	15.58	5.14	4.42	3.85
2013	**6.61**	**4.59**	24.61	5.88	**23.63**	**4.70**	21.65	7.26	3.32	3.57
2014	**-7.77**	**4.66**	-19.68	5.35	-4.72	7.62	**-22.86**	**6.97**	-3.74	5.25
2015	-28.88	-3.90	-6.86	5.71	4.51	8.87	**-2.57**	**6.96**	-0.33	4.99

Source: Author's computations using OECD (2017) and World Bank (2017) Data.

1.4 Objectives of the Study

The major objective of this study is to provide an empirical examination of the foreign aid and economic growth nexus in the EAC countries for the period 1981 to 2014.

1.4.1 Specific Objectives

To following specific objectives have been formulated to help the study achieve its major objective:

1) To investigate if foreign aid causes economic growth in EAC countries.
2) To examine if the effect of foreign aid on economic growth in EAC countries depends on the level of investment.
3) To determine if there is a two-way causation between foreign aid and economic growth in EAC countries.
4) To derive policy implications.

1.5 Hypotheses of the Study

Based on the specific objectives, the study tests the following hypotheses:

1) Foreign aid does not cause economic growth.
2) The effect of foreign aid on economic growth does not depend on the level of investment.
3) There is a two-way causation between foreign aid and economic growth.

1.6 Significance of the Study

The study builds on available literature on foreign aid and economic growth nexus by applying system GMM on a sample of 5 EAC countries over the period 1981-2014. System GMM is an estimation technique for dynamic panel data models, which is the case of all economic growth studies. Earlier studies on foreign aid and economic growth nexus such as Karras (2006) and

Liew, Mohamed, and Mzee (2012) employed random effects and fixed effects estimation techniques. These estimation techniques are for panel data static models and their use in a dynamic panel data setting may yield biased and inconsistent estimates (Baltagi, 2008). Other studies on the foreign aid and economic growth relationship applied ordinary least squares (OLS) estimation method (Burnside & Dollar, 2000a; Frot & Perrotta, 2010; Rajan & Subramanian, 2008). Growth models are dynamic in nature and using OLS estimator may lead to biased and inconsistent estimates (Baltagi, 2008; Wooldridge, 2010). Additionally, these studies applied two-stage least squares (2SLS) as a robustness check. Even though 2SLS estimator provides unbiased estimates, its results depend highly on the choice of the instrumental variables. The dependence on weak instrumental variables results into relatively larger standard errors that make the 2SLS estimates less efficient (Wooldridge, 2010). To, Wooldridge (2010), when instrumental variables are weak, 2SLS estimates may be inconsistent even in large samples.

Therefore, in investigating the foreign aid and economic growth nexus, this study employs Generalized Method of Moments (GMM) suggested by Blundell and Bond (1998). Some studies have applied GMM method in investigating the foreign aid and economic growth nexus; however, in large samples (Frot & Perrotta, 2010; Rajan & Subramanian, 2008). Even though large data panels satisfy several assumptions of the GMM estimator, if the data is not persistent, GMM estimator yields a remarkable upward outlier bias (Andersen & Sørensen, 1996). In such a case, persistent small samples may be superior as they provide better inferential statistics.

Empirical evidence shows that provided there is persistence in the series, GMM estimator is valid even when N (number of observations) is relatively smaller than T (number of time-periods). This is because GMM estimation technique's estimates either have a lower bias or are free from bias in comparison to other estimators' estimates (Alvarez & Arellano, 2003). GMM also accounts for the endogeneity problem in the growth models, providing more

efficient estimates in relation to other estimation techniques like OLS, fixed effects, and random Effects.

Additionally, the studies on the relationship between foreign aid and economic growth that have used large samples have concentrated on various developing countries including countries from Africa, Asia, Europe, America and Oceania. These studies tend to include upper middle-income countries, which are vary greatly from LDCs. According to Kaplan, Chambers, and Glasgow (2014), this makes large sample studies prone to big data problems such as multiple comparison and aggregation errors that increase the bias of estimators. Moreover, unlike small samples, large samples tend to have biased long run coefficients (Pesaran, Shin, & Smith, 1999). Hansen and Tarp (2001) also show that results from large sample studies are susceptible to outlier bias. This study considers these econometric problems and contributes to the existing body of knowledge by using a small sample of the EAC countries that are almost homogeneous.

Furthermore, most literature on the foreign aid and economic growth nexus focuses on effectiveness of foreign aid that is conditional on sound monetary, fiscal and trade policies, institutional quality and political stable environments (Bräutigam & Knack, 2004; Burnside & Dollar, 2000a; Islam, 2005). Some of the available studies have concluded that if invested, foreign aid leads to economic growth (Arndt *et al.*, 2010, 2015; Minoiu & Reddy, 2010). However, these studies fail to provide empirical evidence on the interaction between investment levels and foreign aid. It is not clear whether the effect of foreign aid on economic growth depends on a county's level of investment or not. Therefore, the study further contributes to existing body of knowledge by examining the effect of an interaction between foreign aid and the level of investment on economic growth.

Equally, studies on foreign aid and economic growth nexus have neglected the causality effect (Clemens *et al.*, 2012). It is debatable whether LDCs get foreign aid because of high economic

growth rates or if foreign aid causes high economic growth rates. According to Clemens *et al.* (2012), studies on foreign aid and economic growth nexus are unable to separate correlation from causation. Clemens et al. (2016) attests that the reverse causation between foreign aid and economic growth could have affected the findings of most existing studies. This dissertation also adds to existing body of knowledge by employing the granger causality test to verify the direction of causality between foreign aid and economic growth.

1.7 Organization of the Study

Following Chapter 1, Chapter 2 presents overview of the EAC. Chapter 3 examines both theoretical and empirical literature on the foreign aid and economic growth nexus. Chapter 4 presents the methodology of the study; Chapter 5 discusses data analysis and findings while Chapter 6 provides conclusion and policy implications of the study.

CHAPTER TWO: OVERVIEW OF THE EAC

2.0 Introduction

This Chapter presents overview of the East African Community (EAC). Section 2.1 discusses the background of the EAC. Sections 2.2 and 2.3 give a brief review on foreign aid flows and GDP growth rates in different EAC countries respectively.

2.1 Background of the EAC

EAC is a regional intergovernmental coalition consisting of six-member states with its headquarters in Arusha, Tanzania. Figure 2.1 presents the six-member countries of the EAC, which include the United Republic of Tanzania, the Republics of Burundi, Kenya, Rwanda, South Sudan and Uganda.

The EAC was first established in 1967 but it was dissolved in 1977 due to political challenges among the leaders of its founding member states of Kenya, Rwanda and Uganda. The rise of new EAC countries' leaders led to the re-establishment of EAC in 1999, which commenced operations in 2000 with the founding partner states of Kenya, Tanzania and Uganda. The Republics of Rwanda and Burundi became full members of the treaty in 2007. The Republic of South Sudan was the latest to join the EAC in 2016, following its independence in 2011. Due to data constraints, this study excludes South Sudan from the analysis.

The future of EAC lies in having a political federation that entails a monetary union, a common market and a customs union (EAC Treaty, 2000). The EAC embraced the EAC Customs Union in 2005 and the EAC Common Market in 2009. The EAC also signed the EAC Monetary Union in 2013 with intentions of promoting monetary operations among its member states. However, even though Article 5, Section 2 of the EAC Treaty (2000) provides for a political federation, it is the ultimate goal that is yet to be realised.

Figure 2.1: Map of East African Community Countries

Source: TradeMark East Africa (2017)

The EAC countries have common historical features including a common culture, language, geographical location, road network linkages and political characteristics (McIntyre, 2005; Rwengabo, 2016). This enables the results obtained from analysing the selected sample to provide better inferential statistics. However, EAC countries also slightly defer in terms of nature of governance, level of financial depth, political stability, fiscal, monetary and trade policies and investment levels. These specific country characteristics may account for their different economic growth rates.

Burundi, South Sudan, and some parts of Uganda have experienced relatively high levels of prolonged political instability (Polity IV, 2016). This partly explains why these countries may have lower economic growth rates in comparison to the countries of Kenya, Rwanda and Tanzania. Political unrests limit the smooth running of economic activities and create capacity constraints on the supply side, leading to declines in economic outputs. Following political unrests, there is also a need to ensure economic recovery, which requires increased administration costs and the overall governments spending on rebuilding back. Political

unstable countries may also experience the Dutch disease because they lobby for increments in foreign aid flows amidst several redundant sectors of the economy. The high rates of aid in foreign currency flowing into a country may lead to appreciation of the local currency, resulting into the Dutch disease.

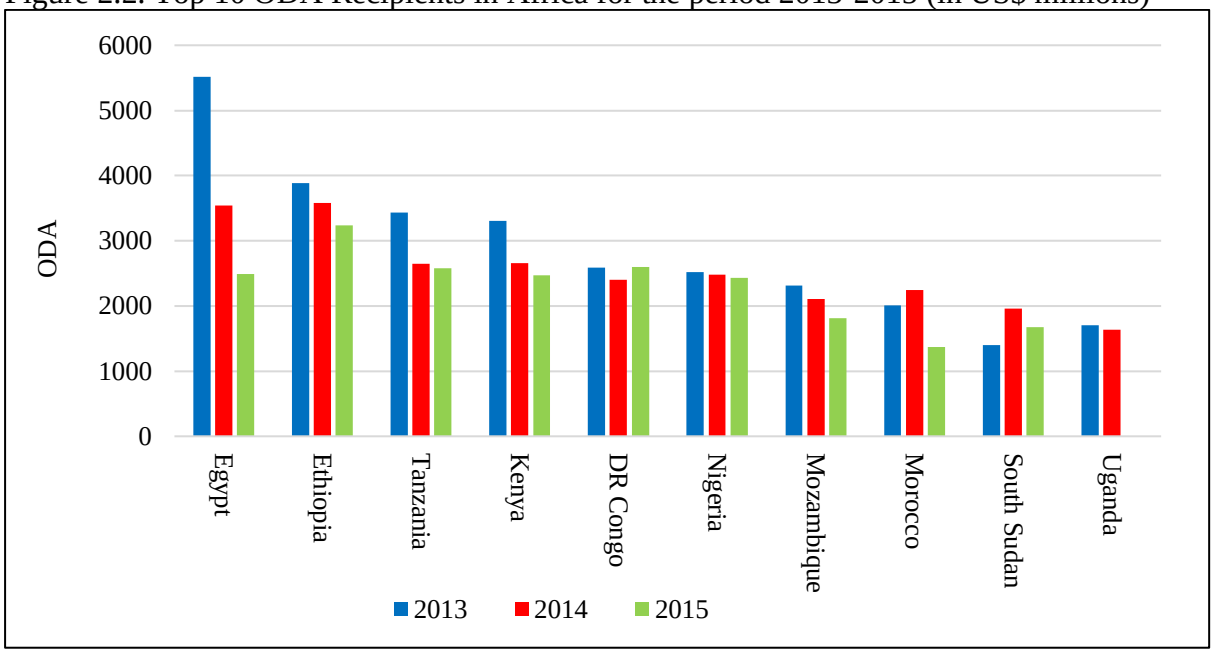
Other factors such as the nature of governance, population size, monetary, fiscal and trade policies among others may also account for the high government spending, low economic output, the Dutch disease, and different economic growth rates in the EAC countries. For example, the EAC countries are amongst top foreign aid recipients, if not used appropriately, aid flows can lead to appreciation of local currency, increase in government spending and administration costs (Djankov, Montalvo, & Reynal-Querol, 2008; Foster & Keith, 2003; Mauro, 1998). Holding foreign aid constant, the study also controls for these other factors that tend to affect economic growth in EAC countries. The choice of these explanatory variables is also informed by the empirical literature as discussed in Chapter 3, Section 3.2.

Amidst these socio-economic and political differences, the EAC countries still work together to achieve common socio-economic and political goals, with the aim of promoting political, economic and social cooperation among her member states, including through liberalizing trade and allowing free capital (physical and human capital) movement (EAC, 2001, 2017; EAC Treaty, 2000). In general, the EAC intends to improve the quality of lives of the people through enhancing competitiveness, value addition in production, and increased trade and investment. The EAC also focuses on eliminating poverty, reducing income inequality, promoting industrialization, innovation, and infrastructure development (EAC Treaty, 2000). These EAC intentions are consistent with the United Nations SDGs, aiming at promoting economic growth rates and improving welfare of the people (EAC Treaty, 2000; Osborn *et al.*, 2015).

2.2 Foreign Aid and the EAC Countries

The EAC countries of Kenya, Tanzania, South Sudan, and Uganda feature amongst the top 10 foreign aid recipient countries in Africa as demonstrated in Figure 2.2. This is mainly due to the large population sizes of Kenya, Tanzania and Uganda, which are associated with high poverty levels and large numbers of vulnerable people (children and women). Donors aim at eradicating poverty and giving a better quality of life to especially marginalized groups of people, which is typical of these countries' populations' characteristics (OECD, 2017; World Bank, 2017).

Figure 2.2: Top 10 ODA Recipients in Africa for the period 2013-2015 (in US$ millions)



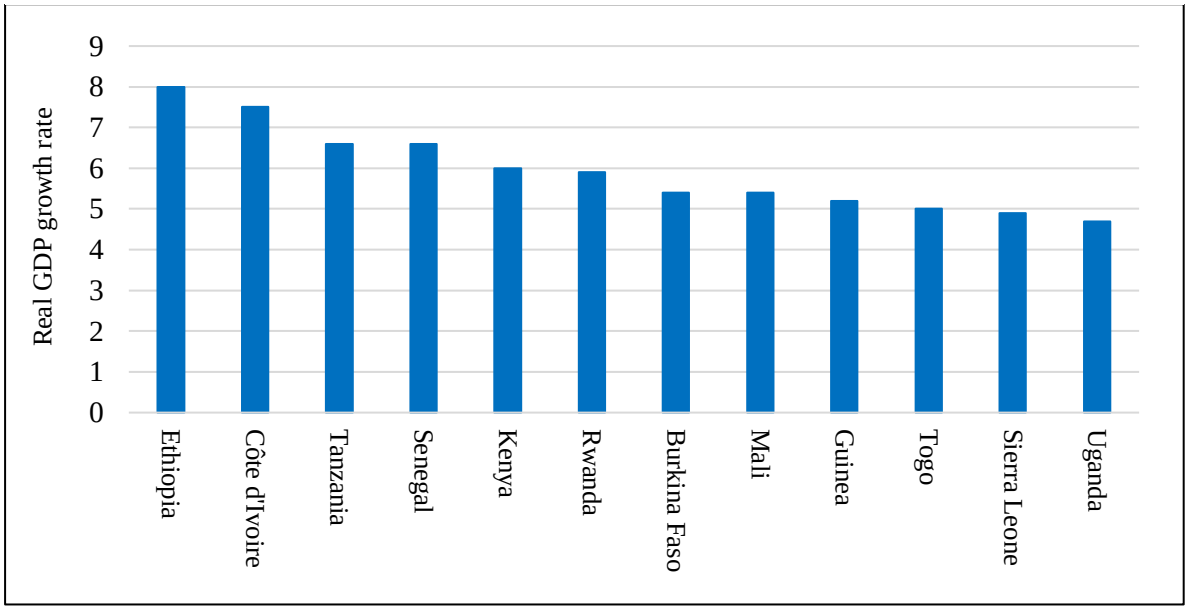
Source: Author's computations using OECD (2017) data

South Sudan may in addition attract high aid flows in form of humanitarian aid to help it deal with persistent political instability that affects innocent civilians especially women and children. The overall bilateral and multilateral foreign aid that is provided to the EAC countries may help them better the quality of lives of the last mile by improving their access to socio-economic and political opportunities.

2.3 GDP Growth rates and the EAC Countries

In addition to featuring among top foreign aid recipients, EAC countries of Kenya, Tanzania and Uganda are amongst the fastest growing countries in SSA as demonstrated in Figure 2.3. Figure 2.3 also shows that even though Rwanda is not among the top 10 foreign aid recipients as presented in Figure 2.2, it is amongst the fastest growing countries in SSA. Country specific characteristics as discussed in Section 2.1 may partly explain why Rwanda is growing faster than other EAC countries such as Uganda, Burundi and South Sudan.

Figure 2.3: Top fastest growing economies in SSA in 2016



Source: Author's computations using World Bank (2017) data

EAC countries receive high foreign aid flows to promote economic development and improve welfare of their people through reducing poverty levels and increasing economic growth rates (OECD, 2018). Countries of Burundi and South Sudan do not feature amongst the top fastest growing countries in SSA. Prevalent and continuous political unrests faced by these countries may partly explain why they have low economic growth rates (Polity IV, 2016).

CHAPTER THREE: LITERATURE REVIEW

3.0 Introduction

Chapter 3 discusses the literature on foreign aid and economic growth nexus. Section 3.1 presents the foreign aid and economic growth theories. Sections 3.2 and 3.3 entail the empirical literature review and the synthesis of the literature review respectively.

3.1 Theoretical Literature Review

This study employs Chenery and Strout (1968) two-gap model in understanding the foreign aid and economic growth nexus. The two-gap model is an extension of the basic (Harrod-Domar) AK growth model, which argues that output depends on a constant technology level (A), and capital stock (K) hence the name, AK model. It asserts that the level of savings determine the capital accumulation of a country (Domar, 1947; Harrod, 1939). However, it assumes a closed economy, which does not account for any external funding.

The Chenery and Strout (1968) two-gap model builds on this and accounts for external assistance. This two-gap model argues that poor countries cannot afford the required capital stock; therefore, the wealthy nations can assist them acquire this capital by providing them with foreign aid. Chenery and Strout stress that external assistance (foreign aid) from the wealthy countries helps bridge the export-import and the saving-investment gaps as discussed below.

3.1.1 Import-Export gap theory

According to Chenery and Strout (1968) and McKinnon (1964), developing countries experience an import-export gap due to exportation of mostly primary agricultural outputs. Such outputs are usually in low quantities, of low quality, and with an inelastic demand on the world market. This kind of exports mostly attract lower prices on international markets, earning developing countries relatively lower foreign receipts. Developing countries, in turn, import highly priced finished goods, leading to a foreign payment-receipt gap.

The two-gap model presents that foreign aid enables acquisition of capital and services that improves both the quantity and quality of the developing countries' production. Indeed, foreign aid is at times in the form of highly productive capital goods and technical services (McKinnon, 1964; Pankaj, 2005). Capital goods and technical services enable value addition on the basic agricultural outputs, improving quality, and sometimes quantity of exports from developing countries. This makes them attract higher prices on the world markets which results into increased foreign receipts (McKinnon, 1964; Pankaj, 2005).

Chenery and Strout (1968) and McKinnon (1964) also argue that foreign aid can also promote import substitution strategy which helps in local production of formerly imported goods. To McKinnon (1964), import substitution strategy is simply another form of export expansion strategy because it supplements local production and increases output available for exportation. Lewis (1954) and McKinnon (1964) emphasise that the import-export gap is bridged if the imported capital increases domestic production. Foreign aid enables acquisition of capital and technical services that are efficient enough to increase exports relative to imports. Therefore, foreign aid increases foreign receipts which can be re-invested to further increase output per worker and also boost economic growth (Chenery & Strout, 1968).

3.1.2 Saving-investment Gap Theory

Chenery and Strout (1968) also present that poor countries have little national product that cannot yield substantial amounts of savings. However, to invest, there is a need for expensive physical and human capital, which poor countries cannot afford with their limited savings (Chenery & Strout, 1967; McKinnon, 1964; Van Wijnbergen, 1986). With only external assistance, these countries can acquire the necessary capital to fill the existing saving-investment gap. Chenery and Strout two-gap model argues that capital acquisition leads to

maximum utilization of resources, which in turn increases total output per worker and GDP growth.

However, the two-gap model also presents that even if capital was readily available, poor countries would still not take off. This is because the acquired physical capital is complex and these countries lack the required skills to operate it (Chenery & Strout, 1968; Mikesell, 1970). As such, external assistance should be high enough to facilitate acquisition of both missing capital and the relevant technical skills, which would increase productivity per worker, leading to economic growth in developing countries.

However, McKinnon (1964) argued that foreign aid improves the technical and organization skills of labour only in the short run. Developing countries have labour skill constraints; however, in the short run, the development assistance enables them to equip part of their labour force with the missing skillset. The newly trained labour force then domestically trains the untrained portion of labour without need for further foreign aid flows in the long run. Consequently, this increases output per work, total productivity, and economic growth.

Based on the saving-investment gap model, foreign aid leads to economic growth by supplementing local funds available for investment. Following Easterly (2003);

$$g = \frac{k}{\mu} \qquad (3.1)$$

Here g denotes GDP growth rate, μ denotes incremental capital-output ratio (ICOR), k represents investment-output ratio. Equation (3.1) works under the assumption that GDP growth rate depends on the level of investment and ICOR measures the efficiency of this investment. A higher ICOR indicates inefficiency and thus is not preferred in any production process (Walters, 1966). The investment-output ratio is;

$$k = \frac{I}{Y} \qquad (3.2)$$

Where I denotes investment and Y denotes output. However, investment aggregates domestic savings and external assistance or foreign aid; that is,

$$k = \frac{Foreign\ Aid}{Y} + \frac{Domestic\ Savings}{Y} \qquad (3.3)$$

From Equation (3.3), GDP growth depends on the level of investment and the investment level is a function of the domestic savings and foreign aid. Therefore, basing on the Chenery and Strout (1968) saving-investment gap model, foreign aid leads to economic growth by closing the saving-investment gap.

3.1.3 Endogenous Growth Model

The study further employs the modified AK endogenous growth model in understanding the foreign aid and economic growth nexus. The modified endogenous AK model builds on the Chenery and Strout (1968) two-gap model by extending components of capital stock. This AK model assumes that capital consists of stocks of plant, equipment and knowledge accumulation (Acemoğlu, 2009; Mankiw, Phelps, & Romer, 1995).

The modified AK growth model distinguishes knowledge from human capital. Mankiw *et al.* (1995) defines knowledge as a discernment of how the world works and human capital as the resources used to transfer knowledge to the labour force. It is important to note that knowledge does not depreciate; therefore, this makes it plausible for the modified AK model to hold assumptions of no diminishing returns and constant returns to scale.

The modified AK model proponents further attest that positive externalities and spill over outcomes that boost capital will always lead to economic growth. These positive externalities can be in form of external assistance (foreign aid) from wealthy to poor countries of the world. In agreement with the earlier study of Chenery and Strout (1968), Mikesell (1970) argued that developing countries have no savings. Therefore, any improvements in human and physical

capital are due to externalities in form of external assistance. In this instance, foreign aid is an externality that assists in capital accumulation and provision of knowledge. According to Mikesell (1970), capital (physical and knowledge) accumulation improves marginal productivity of human capital leading to economic growth. Therefore, the modified AK endogenous growth model informs the theoretical framework of the study in Chapter 4, Section 4.2.

3.2 Empirical Literature Review

Empirical literature on foreign aid and economic growth is inconclusive. Some studies have found a positive relationship between foreign aid and economic growth, some a negative relationship, and yet others present no relationship between the two.

Ogundipe, Ojeaga, and Ogundipe (2014) investigated the foreign aid and economic growth nexus on 40 sub-Saharan African countries for the period 1996 to 2010. The authors employed the system GMM estimation technique to account for the problem of endogeneity that exists in economic growth models. The findings of Ogundipe *et al.* (2014) reveal that foreign aid leads to economic growth only in countries with sound monetary, fiscal and trade policies. The authors further show that capital stock, labour force, institutional quality and human capital statistically and positively contribute to economic growth.

The findings of Ogundipe *et al.* (2014) are consistent with noteworthy study of Burnside and Dollar (2000a), which investigated the foreign aid and economic growth nexus on 56 developing countries over a six- four-year average period from 1970-1973 to 1990-1993. After applying OLS and 2SLS, Burnside and Dollar (2000a) found that foreign aid leads to economic growth but only in countries with good quality economic policies (monetary, fiscal and trade policies). The authors also found that, in respective, institutional quality and population are positively and negatively significant in influencing economic growth.

Hudson and Mosley (2001) used the same 56 countries as did Burnside and Dollar (2000a); however, Hudson and Mosley (2001) extended the Burnside and Dollar (2000a) study period from 1969-1982 to 1969-1995. Contrary to the findings of Burnside and Dollar, Hudson and Mosley (2001) found a negative and statistically significant interaction between foreign aid and policies. According to Hudson and Mosley (2001), the negative sign is due to substitutability effect between foreign aid and good policies such as expenditure on agriculture, housing, security and education. Hudson and Mosley (2001) also argued that even though aid leads to economic growth in countries with good economic policies, it is questionable what polices those are.

Easterly *et al.* (2003) also refuted the results of Burnside and Dollar on grounds that they are not robust. To note is that, Easterly *et al.* (2003) extended the Burnside and Dollar (2000a) data to 62 countries over the period 1970 to 1997. Like Burnside and Dollar, Easterly *et al.* (2003) applied OLS and 2SLS estimators but investigated a different definition of policy that includes black market premium, trade openness and broad money. The evidence from Easterly *et al.* shows that the interaction between aid and policies is not significant in influencing economic growth. The authors further demonstrate that aid-policy interaction term is not robust when different policy index definitions are used. This makes the Burnside and Dollar (2000a) findings debatable and calls for further empirical evidence on the foreign aid and growth nexus.

Other studies demonstrate that there is a positive relationship between foreign aid and economic growth irrespective of economic policies in a country (Armah & Nelson, 2008; Arndt *et al.*, 2010, 2015; Islam, 2005; McGillivray, 2005; Minoiu & Reddy, 2010). In examining foreign aid and economic growth nexus, Armah and Nelson (2008) applied fixed effects to 21 sub-Saharan African countries for the period 1995 to 2003. The authors demonstrate that aid, political stability and democracy have a positive and significant influence on economic growth. The above findings are consistent with results of Islam (2005) who applied OLS estimator to

65 developing countries for the period 1968 to 1997. The author demonstrates that foreign aid effectively leads to economic growth in politically stable environments and this is irrespective of monetary, fiscal and trade policies at play. Islam also argues that aid flows are highly dependent on how best they contribute to human development and not on the good policy environment of a country.

Hansen and Tarp (2001) also studied the foreign aid and economic growth nexus in 56 developing countries for the period 1974 to 1993. After applying OLS and GMM to control for endogeneity problem, the authors found that aid positively and significantly influences economic growth. The authors further revealed that this relationship is through investment and is not conditional on any good economic policies. Hansen and Tarp (2001) equally stress that the returns of foreign aid decrease as the level of foreign aid increases thus indicating diminishing marginal returns. Besides foreign aid, the study further shows that human capital and inflation are also statistically significant in influencing growth of developing countries.

Frot and Perrotta (2010) also investigated the link between foreign aid and economic growth in 61 countries on an average of five-year period from 1961-1965 to 2001- 2005. After applying GMM to control for endogeneity, Frot and Perrotta show that aid has a positive effect on economic growth. The authors further show that broad money and trade openness are positive and statistically significant in influencing economic growth. Clemens *et al.* (2012) re-analysed data from three most influential studies of Boone (1996), Burnside and Dollar (2000a) and Rajan and Subramanian (2008) on foreign aid and economic growth. Clemens *et al.* (2012) reveal that on average, aid flows increase with increases in investment and economic growth. However, the authors argue that a sequential increase in growth as foreign aid increases does not imply that foreign aid causes economic growth.

Similarly, some researchers evidence a positive long run relationship between foreign aid and economic growth (Arndt *et al.*, 2010, 2015). Arndt *et al.* (2015) applied instrument variable-inverse probability weighted least squares (IV-IPWLS) and instrument variable-limited information maximum likelihood (IV-LIML) estimation methods to 78 countries for the period 1970 to 2007. The authors show that a positive and significant long-run relationship exists between foreign aid and economic growth. Arndt *et al.* (2015) also assert that foreign aid improves the agriculture sector and value addition mechanisms of developing countries which increase output and thus economic growth. The authors conclude that foreign aid leads to economic growth through enabling acquisition of physical capital and improvements in human capital.

Furthermore, Minoiu and Reddy (2010) studied the aid and economic growth nexus in different income group developing countries for the period 1960 to 2000. The authors demonstrate a positive long run relationship between development assistance (specifically from the Scandinavian countries) and economic growth. Moreover, Minoiu and Reddy (2010) also find that revolutions, government consumption and terms of trade are statistically significant in influencing economic growth. Karras (2006) also employed fixed effects on 71 developing countries from 1960 to 1997 and demonstrated a positive and statistically significant relationship between aid and economic growth. According to Karras (2006), this relationship is permanent such that when foreign aid is increased by US$20 per person, real GDP per capita increases permanently by 0.16 percent.

Contrary to the above studies, available literature also present that a negative long run relationship exists between foreign aid and economic growth (Adams & Atsu, 2014; Mallik, 2008; Mavrotas, 2003; Rajan & Subramanian, 2008; Sothan, 2018). Despite finding a short run relation between aid and growth, Adams and Atsu (2014) and Sothan (2018) further show that a negative long run relationship exists between foreign aid and economic growth. Adams and

Atsu argue that this is partly due to inappropriate use of foreign aid resource in the long run. According to Sothan (2018), aid has a negative effect on investment in the long run, which reduces output level of a country, leading to low economic growth rate.

Liew *et al.* (2012) applied POLS, random effects, and fixed effects in studying the impact of foreign aid on economic growth in EAC countries for the period 1985 to 2010. The findings of Liew *et al.* (2012) show that foreign aid has a negative and significant effect on economic growth in EAC countries. The authors further show that capital is positive and significant in influencing growth. Mallik (2008) also applied GMM to a group of 60 developing countries from 1970 to 2003 and found that foreign aid reduces economic growth in LDCs. The author argued that this could be due to misallocation of aid resources, which deters them from achieving their original objectives.

Other studies demonstrate no relationship between foreign aid and growth (Boone, 1996; Eris, 2008; Tang & Bundhoo, 2017). The study of Boone (1996) applied OLS to 96 countries for the period 1971 to 1990 and found that foreign aid does not significantly increase investment and economic growth. Boone demonstrates that there is no evidence that foreign aid improves quality of life of poor people since it has no impact on human development indicators. Boone further argues that the impact of aid in developing countries does not depend on the governance nature of the country. The author also found that population and lagged growth are significant in influencing economic growth.

Furthermore, Eris (2008) applied Bayesian model averaging techniques to 56 developing countries for the period 1970 to 1993. After controlling for uncertainty, the author finds that aid is not effective in boasting economic growth. Eris also finds no evidence that foreign aid yields economic growth in good economic policy environments. Tang and Bundhoo (2017)

also analysed 10 developing countries from SSA for the period 1990 to 2012. The authors applied POLS and found that foreign aid has no significant influence on economic growth.

3.3 Synthesis of the Literature Review

Studies on foreign aid and economic growth nexus reveal ambiguous results and no clear consensus exists on the subject. Appendix 1 presents a summary of some of the most influential empirical studies that have been reviewed.

Most studies have used large panel data samples, which include developing countries with diverse characteristics. These unique features include different GDP per capita groups, geographical locations and levels of political stabilities among others. Inferential statistics are too general in such big panel data sample studies, which makes inferences less valid. Therefore, studies on small samples of almost homogenous countries may provide better inferential statistics.

A few studies also exist on countries in the same bloc like the EAC. Liew *et al.* (2012) investigated foreign aid and economic growth nexus in EAC countries. However, the authors used random effects and fixed effects estimation techniques, which are panel data static model estimation techniques. The use of these models in a dynamic panel data setting may provide biased and inconsistent estimates (Baltagi, 2008). Therefore, in investigating the foreign aid and economic growth nexus, this study builds on the available literature by employing system GMM estimator, which is a dynamic model estimation technique.

This study also chooses explanatory variables that are consistent with what available empirical studies have used. Chapter 4, Section 4.2 discusses the intuition behind use of these explanatory variables.

CHAPTER FOUR: METHODOLOGY OF THE STUDY

4.0 Introduction

Chapter 4 presents the methodology used in investigating the relationship between foreign aid and economic growth nexus. Sections 4.1 and 4.2 discuss theoretical framework and econometric methodology of the study respectively. Section 4.3 provides the panel data tests employed while Sections 4.4 and 4.5 give the hypotheses for the model variables and the data sources correspondingly.

4.1 Theoretical Model of the Study

The study bases on the modified AK growth model to construct the theoretical model. Following Mankiw *et al.* (1995), the study assumes that total output is a function of capital accumulation.

$$Y = AK^{1-\alpha} \qquad (4.1)$$

Where *Y* is total output, *K* is Capital, α denotes the output elasticity of capital (returns to scale) and it ranges from 0 to 1. According to Mankiw *et al.* (1995), capital broadly consists of stocks of plant, equipment and knowledge accumulation. In consequence, the capital in the AK model presented in Equation (4.1) includes both physical and human capital. Mankiw *et al.* (1995) stress that the assumption of constant returns to scale holds ($\alpha = 0$) such that production is a linear function of capital. This implies that doubling inputs doubles output. Therefore, re-writing equation (4.1) gives,

$$Y = AK \qquad (4.2)$$

Totally differentiating equation (4.2) yields,

$$\dot{Y} = A\dot{K} \qquad (4.3)$$

Where $\dot{Y}$ represents a change in output and $\dot{K}$ denotes a change in capital employed. A change in capital employed is assumed to be caused by investment and the rate of depreciation

(Mankiw *et al.*, 1995). To account for the investment, the theoretical model first assumes a closed economy in which income is for either saving or consumption.

$$Y = C + S \qquad (4.4)$$

Where, Y denotes total national income, C represents a proportion of total national income that is consumed and S denotes a proportion of total national income that is saved. However, the savings of a country depend on the rate of saving; hence, re-writing equation (4.4) gives,

$$Y = cY + sY \qquad (4.5)$$

Where, c is the marginal propensity to consume (MPC) and s is the marginal propensity to save (MPS). The model assumes that only savings make up the investment. This implies that,

$$I = sY \qquad (4.6)$$

Where, I denotes investment. Since a change in capital depends on the amount of funds invested and depreciation rate (δ) of the already existing capital inputs, Equation (4.6) becomes;

$$\dot{K} = sY - \delta K \qquad (4.7)$$

To obtain the growth rate of capital input, the study divides through equation (4.7) by K.

$$\frac{\dot{K}}{K} = s\frac{Y}{K} - \delta \qquad (4.8)$$

However, from equation (4.2),

$$A = \frac{Y}{K} \qquad (4.9)$$

Therefore, equation (4.8) becomes:

$$\frac{\dot{K}}{K} = sA - \delta \qquad (4.10)$$

Taking logs and derivatives of the linear production function in equation (4.2) gives,

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \frac{\dot{K}}{K} \qquad (4.11)$$

Substituting equation (4.10) in equation (4.11) yields,

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + sA - \delta \qquad (4.12)$$

According to Mankiw *et al.* (1995), a steady state requires that $\frac{\dot{A}}{A} = 0$. Applying this condition on equation (4.12) gives,

$$\frac{\dot{Y}}{Y} = sA - \delta \qquad (4.13)$$

Re-writing equation (4.13) provides,

$$g = sA - \delta \qquad (4.14)$$

Where, $\frac{\dot{Y}}{Y} = g$ and g denotes the output growth rate, s denotes the MPS, A represents technology which is a constant, and δ is the depreciation rate.

From Equation (4.14), economic growth rate in a country will always be positive if $As > \delta$. However, this model further assumes that part of capital is knowledge accumulation which does not depreciate (Acemoğlu, 2009; Mankiw *et al.*, 1995). The model also assumes that invested savings are sufficient to cover all physical depreciation costs. These two assumptions equate depreciation to zero ($\delta = 0$); thus, equation (4.14) becomes,

$$g = As \qquad (4.15)$$

This model also assumes that developing countries have little domestic savings. External assistance (foreign aid) supplements these scarce savings so that developing countries can finance capital acquisition (Chenery & Strout, 1968; Mankiw *et al.*, 1995; Mikesell, 1970). Therefore, this study accounts foreign aid flows and this makes Equation (4.15) become,

$$g = As + Foreign\ Aid \qquad (4.16)$$

From equation (4.16), the theoretical framework of the study postulates that a country's economic growth is a positive function of saving rate and foreign aid.

4.2 Empirical Model of the Study

Based on the theoretical model, the study's empirical model employs GDP growth rate as the dependent variable and foreign aid (aid) as the independent variable of interest. The empirical model further includes a group of other explanatory variables, which include: investment; policy Index; balance of trade; human capital; population growth; total coups; warfare and violence; governance; and financial depth. Inclusion of these variables is important because it allows explicit control of many other factors that concurrently affect economic growth and also helps prevent the omitted variable bias (Wooldridge 2015; Gujarati 2009).

4.2.1 Model Specification

The empirical model assumes that economic growth is function of foreign aid and other explanatory variables. That is,

$$GDPGROWTH = f(AID, INV, POL, BOT, HUM, POP, COP, WAV, GOV, FIN) \quad (4.17)$$

Where AID denotes foreign aid (aid), INV is investment, POL represents the policy Index (policy), BOT is balance of trade, HUM represents human capital, POP denotes population growth, COP represents total coups, WAV denotes warfare and violence, governance is denoted by GOV and FIN denotes financial depth.

Taking logs of the variables in equation (4.17) and accounting for cross-section and time series nature of the panel data employed in the study, Equation (4.17) yields,

$$GDPGROWTH_{i,t} = \beta_0 + \beta_1 AID_{it} + \beta_2 INV_{it} + \beta_3 POL_{it} + \beta_4 BOT_{it} + \beta_5 HUM_{it} + \beta_6 POP_{it} + \beta_7 COP_{it} + \beta_8 WAV_{it} + \beta_9 GOV_{it} + \beta_{10} FIN_{it} + \varepsilon_{it} \quad (4.17.1)$$

Where i denotes countries, which range from 1 to 5, t denotes time (measured in years) and ranges from 1 to 34, β_0 represents the intercept for the growth equation, $\varepsilon_{i,t}$ denotes the disturbance term.

To note is that, the policy index in Equations (4.17) and (4.17.1) is a combination of budget surplus, inflation and trade openness, which are proxies for fiscal, monetary and trade policies respectively. The policy index is constructed following Burnside and Dollar (2000a) by first running a growth regression with budget surplus, inflation and trade openness. That is,

$$\begin{aligned} GDPGROWTH_{i,t} = {} & \beta_0 + \beta_1 AID_{it} + \beta_2 INV_{it} + \beta_3 INF_{it} \\ & = \beta_4 BUD_{it} + \beta_5 TOP_{it} + \beta_6 BOT_{it} + \beta_7 HUM_{it} + \beta_8 POP_{it} + \beta_9 COP_{it} \\ & + \beta_{10} WAV_{it} + \beta_{11} GOV_{it} + \beta_{12} FIN_{it} \\ & + \varepsilon_{it} \end{aligned} \qquad (4.17.2)$$

Where *INF* represents inflation, *BUD* denotes budget surplus and *TOP* represents trade openness. All other variables remain as defined before. The estimated regression equation (4.17.2) is used to construct the policy index and estimation results are presented in Appendix 4. The coefficients obtained from estimating regression equation (4.17.2) are then used to construct the policy index as demonstrated in Equation (A4.1) in Appendix 4.

After obtaining the policy index, the study addresses objective one. It uses aid-squared in the foreign aid and growth regression in equation (4.17.1) to investigate whether there is non-linear relationship between foreign aid and economic growth. Such quadratic term of aid assesses if marginal economic growth effects exist due to increased foreign aid flows. The inclusion of a non-linear term is consistent with existing studies of Burnside and Dollar (2000a), Hansen and Tarp (2001) and Rajan and Subramanian (2008) on foreign aid and economic growth. On accounting for aid-squared, equation (4.17.1) becomes,

$$GDPGROWTH_{it} = \beta_0 + \beta_1 AID_{it} + \beta_2 AID_{it}^2 + \beta_3 INV_{it} + \beta_4 POL_{it} + \beta_5 BOT_{it} + \beta_6 HUM_{it} + \beta_7 POP_{it} + \beta_8 COP_{it} + \beta_9 WAV_{it} + \beta_{10} GOV_{it} + \beta_{11} FIN_{it} + \varepsilon_{it} \quad (4.18)$$

Here AID_{it}^2 represents aid-squared and measures the marginal economic growth effects of increasing foreign aid flows. All other variables remain as defined before. The estimation of equation (4.18) addresses the first objective, which aims at assessing if foreign aid causes economic growth. Chapter 5, Section 5.3 presents the results from this estimation.

To address objective two, the study assesses if the effect of foreign aid on economic growth depends on the levels of investment in a country. This is through estimating another economic growth regression equation that involves an interactive term between foreign aid and investment. Therefore, Equation (4.19) is derived from the main growth regression equation (4.18).

$$GDPGROWTH_{it} = \beta_0 + \beta_1 AID_{it} + \beta_2 AID_{it}^2 + \beta_3 INV_{it} + \beta_4 AID * INV_{it} + \beta_5 AID^2 * INV_{it} + \beta_6 POL_{it} + \beta_7 BOT_{it} + \beta_8 HUM_{it} + \beta_9 POP_{it} + \beta_{10} COP_{it} + \beta_{11} WAV_{it} + \beta_{12} GOV_{it} + \beta_{13} FIN_{it} + \varepsilon_{it} \quad (4.19)$$

Here $AID * INV$ denotes the interaction term between aid and investment and $AID^2 * INV_{it}$ denotes the interaction term between aid-squared and investment. Again, all other variable definitions remain as discussed before. It is important to note that, the interaction term between aid-squared and investment aims at measuring the non-linearity effects of foreign aid on growth given investment levels.

4.2.2 Estimation Technique

The study investigates economic growth, which is a dynamic model. This is because growth in the current period tends to depend partly on growth in the previous period. In such a dynamic panel data setting, GMM estimation technique is preferred since it accounts for implied endogeneity nature of the economic growth models (Baltagi, 2008; Cameron & Trivedi, 2010; Wooldridge, 2010).

Equations (4.18) and (4.19) are dynamic model regression equations that are estimated using system GMM estimator. System GMM estimation technique is preferred due to its flexibility when imposing restrictions (Alonso-Borrego & Arellano, 1999). It is also superior to difference GMM because the latter involves the use of weak instruments which make it inefficient (Baltagi, 2008; Behr, 2003; Blundell & Bond, 2000).

This study uses the number of observations that is smaller than the number of time periods; albeit, Alvarez and Arellano (2003) and Soto (2009) demonstrate that system GMM is valid even when number of observations are smaller than number of time-periods. This is because it is still able to provide a higher level of efficiency and a lower bias relative to other estimation techniques. Based on Blundell and Bond (1998), the study employs system GMM to estimate the autoregressive panel data equation below:

$$y_{it} = \alpha y_{i,t-1} + x'_{it}\beta + u_{it};\ i = 1, \dots, 5, t = 1, \dots, 34 \qquad (4.20)$$

Where y_{it} denotes dependent variable, which is GDP growth, $y_{i,t-1}$ denotes a lagged GDP growth and α represents an unknown parameter of lagged GDP growth. x_{it} denotes a row vector of explanatory variables with k dimension, β represents a column of unknown parameter vector for k explanatory variables and u_{it} is the overall error term.

From equation (4.20),

$$u_{it} = \mu_i + v_{it} \qquad (4.21)$$

Here μ_i denotes unobserved time-invariant heterogeneity and v_{it} presents random noise.

System GMM estimation technique uses estimation Equation (4.20) to estimate model regression equations presented in equations (4.18) and (4.19). Chapter 5, Section 5.3 presents the results from the estimation of the two equations.

Existing studies argue that existence of a relationship between two variables does not demonstrate direction of influence or causation (Clemens *et al.*, 2012; Gujarati, 2009). Indeed, Clemens *et al.* (2012) contend that most studies on foreign aid and economic growth do not differentiate between correlation from causation. The authors stress that reverse causation on foreign aid and economic growth nexus could have led to existing of a relationship between foreign aid and economic growth in several available studies.

Therefore, to address objective three, this study further employs a Granger causality test suggested by Hurlin and Dumitrescu (2012) to check if there is a two-way causation between foreign aid and economic growth. Following Hurlin and Dumitrescu (2012), the study estimates two more model regression equations. Firstly, the study examines if foreign aid Granger-causes economic growth using the regression equation below,

$$GDPGROWTH_{it} = \alpha_i + \sum_{k=1}^{K} \gamma_i^{(k)} GDPGROWTH_{i,t-k} + \sum_{k=1}^{K} \beta_i^{(k)} AID_{i,t-k} + \varepsilon_{it} \quad (4.22)$$

Here $i = 1, \dots, 5$ and $t = 1, \dots, 34$, α_i denotes individual effects and K lag orders are assumed to be identical for all cross-section individuals of a balanced panel, $\gamma_i^{(k)}$ denotes autoregressive parameters while $\beta_i^{(k)}$ represents regression coefficients slopes. According to Hurlin and Dumitrescu, the regression coefficients' slopes differ across individual countries but are constant overtime. The study employs OLS estimator to estimate equation (4.22) under the null hypothesis that foreign aid does not Granger-cause economic growth against the alternative that foreign aid Granger-causes economic growth.

The study further checks for reverse causality, that is, if economic growth Granger-causes foreign aid using the following model regression equation:

$$AID_{it} = \alpha_i + \sum_{k=1}^{K} \gamma_i^{(k)} AID_{i,t-k} + \sum_{k=1}^{K} \beta_i^{(k)} GDPGROWTH_{i,t-k} + \varepsilon_{it} \qquad (4.23)$$

Equation (4.23) is estimated using OLS estimation technique under the null hypothesis that economic growth does not Granger-cause foreign aid against the alternative that economic growth Granger-causes foreign aid. Chapter 5, Section 5.4 presents the results from the Granger causality tests. These results verify the direction of causation which enables the study to conclude whether the relationship that exists between foreign aid and economic growth is bidirectional or unidirectional.

4.3 Panel Data Tests

Besides the estimation technique, the study also carries out different panel data tests including unit root, normality, heteroscedasticity, autocorrelation and structural break tests as discussed below.

4.3.1 Panel Data Unit Root Tests

Macroeconomic panel data with long time series are susceptible to unit root problems (Baltagi, 2008). Since long time-series panel data are used, the study carries out unit root tests for panel data to check for stationarity of the variables. Available studies generally demonstrate that unit root tests for panel data are more powerful than the time series unit root tests (Campbell & Perron, 1991; Levin, Lin, & Chu, 2002; Taylor & Sarno, 1998). Like individual unit root tests, the panel unit root tests aim at avoiding spurious regressions (Baltagi, 2008). The panel unit root tests also aim at ensuring that persistent shocks are not infinite and asymptotic analysis standard assumptions are valid (Levin *et al.*, 2002). The Levin, Lin and Chin (2002), Im, Pesaran, and Shin (2003) and Fisher type-Augmented Dickey Fuller (ADF) tests are adopted to test for panel data unit roots.

Levin, Lin and Chin (LLC) unit root test assumes a common autoregressive parameter across all series in the panel and is preferred because it provides good approximations in small panel data samples with a small number of observations and time-periods. LLC maintains the null hypothesis that a unit root exists against the alternative hypothesis that all individual time series are stationary.

The Im, Pesaran and Shin (IPS) unit root tests is also applied because of its applicability in heterogenous panels of dynamic nature. Unlike LLC, IPS test assumes an individual root in which each series has a different autoregression and its procedure is tested basing on the ADF

averages of individual unit root tests (Im *et al.*, 2003). Similarly, IPS also assumes a more general ADF specification of unit root tests and existence of serial correlation among the error terms. IPS test is applied under the null hypothesis of a unit root against the alternative that some individual time series are stationary.

The study also carries out the Fisher type- ADF test to assess the consistency of the LLC and IPS unit root tests. After comparing both LLC and IPS with Fisher type-ADF unit root tests, Maddala and Wu (1999) concluded that Fisher test even though an old test is a better test than LL and IPS. Maddala and Wu (1999) also assert that LLC is more restrictive while IPS is more general and concludes in favour of Fisher test. Therefore, the study employs the Fisher type-ADF test that assumes a null hypothesis of unit root against the alternative of no unit root test.

The study assumes that asymptotic normal distribution assumptions apply for all the three-unit root tests; therefore, the conventional test statistics are valid in interpretation of the results. Chapter 5, Section 5.2 presents the results from LLC, IPS and Fisher-type ADF tests.

4.3.2 Normality Test

Just like unit root tests, normality tests show if the panel data used exhibits asymptotic properties. This informs the study on whether the conventional test statistics are applicable in interpretation of the results obtained during data analysis. According to Gujarati (2009), OLS estimates are unbiased, consistent and efficient if the assumption of normal distribution holds. Additionally, one of the major assumptions of classical normal linear regression model is that the errors should be normally distributed with a zero mean and a constant variance (Cameron & Trivedi, 2010; Gujarati, 2009). If econometric data is not normally distributed, conventional *t*-statistic, *F*-statistic, *chi*-square statistic and analysis of variance (ANOVA) are invalid (Greene, 2003; Gujarati, 2009; Wooldridge, 2010). Based on this intuition, the study carries out a normality test using the Anderson-Darling normality test. The Anderson-Darling test is

preferred because it accounts for both the specific distribution and the sensitivity in the panel data (Anderson & Darling, 1952; Razali & Wah, 2011). Razali and Wah (2011) demonstrated that Anderson-Darling test is a more powerful test of normality relative to Lilliefors and Kolmogorov-Smirnov tests. Anderson-Darling test assumes a null hypothesis that normality exists against the alternative hypothesis that there is non-normality.

4.3.3 Heteroscedasticity Test

After assessing the normal distribution of the panel data used, the study further tests if the data is homoscedastic. Heteroscedasticity occurs when the variance of the error term varies across different observations. Though the presence of heteroscedasticity does not affect the unbiasedness and consistency of estimators, it biases the standard errors, which results into inefficient estimates (Greene, 2003; Gujarati, 2009). Heteroscedasticity makes the standard *F*-statistic invalid when testing for linear restrictions (Wooldridge, 2010). Therefore, the study tests for presence of heteroscedasticity using the White test and Breusch-Pagan LM panel heteroscedasticity test. Breusch-Pagan LM panel heteroscedasticity test is preferred because it is superior in detecting linear form of heteroscedasticity (Williams, 2015). The study also applies White test which is a special case of Breusch Pagan LM test to account for presence of any form of non-linearity while testing for heteroscedasticity (Greene, 2003). The two tests have a null hypothesis of homoscedasticity. However, the white test has an alternative hypothesis of unrestricted heteroscedasticity while Breusch Pagan LM panel heteroscedasticity test assumes panel heteroscedasticity.

4.3.4 Autocorrelation Test

Besides heteroscedasticity, autocorrelation is a common problem in macro panel data series with long time series (Enders, 2004; Gujarati, 2009; Wooldridge, 2010). In fact, Gujarati (2009) demonstrates that OLS estimates are not efficient in presence of autocorrelation

between the error terms. Furthermore, Gujarati (2009) and Wooldridge (2010) stress that autocorrelation results into unusually high *R*-squared and biased standard errors that make the common *t*-and *F*-test statistics inapplicable. In order to obtain efficient estimates, the study applies the Woodridge test to check for presence of serial correlation in panel data series. Woodridge test is preferred because it has good power properties, is easy to implement and can be applied under general conditions (Drukker, 2003). The Woodridge test assumes the null hypothesis that there is no AR (1) panel autocorrelation against the alternative that AR (1) panel autocorrelation exists.

The study also uses a System GMM estimator, which accounts for autocorrelation. System GMM also employs the Arellano-Bond test for zero autocorrelation in first differenced errors. The test in implemented after the system GMM estimation and assumes a null hypothesis of no autocorrelation against the alternative that autocorrelation exists. Chapter 5, Section 5.3 presents results from the system GMM autocorrelation test.

4.3.5 Structural Break Test

Some studies argue that results from the autocorrelation tests can be misleading in presence of structural breaks (Granger & Hyung, 2004; Mun, Shim, & Kim, 2014). This is due to long memory property in the time series of the panel data used. Clements and Hendry (1996) and Enders (2004) contend that macro panel data with long time series is liable to structural instability which causes model unreliability and forecasting inefficiencies. The structural breaks can be due to both internal such as financial liberalization and monetary policy changes and external factors such as financial crisis due to the contagion effect among others (Gujarati, 2009). Structural breaks in panel data imply that the coefficients vary over time and across individual countries, making inferences on estimates obtained impossible. This study tests for the structural break using the chow test, which is a general test that provides the results for the

Chow, Wald and likelihood ratio tests. This test assumes the null hypothesis that there is no structural change against the alternative hypothesis that a structural change exists.

4.3.6 Panel Data Specification Tests for Robustness Checks

Besides the system GMM, the study also employs the robustness checks to confirm the consistence of the results obtained. Specification tests for the panel data are applied to ensure that the most appropriate robustness checks are used. Firstly, the study employs the Hausman specification test to check for the most appropriate estimation technique between fixed effects and random effects estimators. The random effects estimation technique is the most appropriate model to use when the error term is uncorrelated with the independent variables. However, if the error term is correlated with the regressors, the fixed effects model is the most appropriate (Baltagi, 2008; Greene, 2003; Hausman, 1978). The Hausman (1978) test is implemented under the null hypothesis that random effects estimation technique is more efficient against the alternative that fixed effects model is more efficient.

Following the Hausman test results, the study also implements the Breusch-Pagan LM test to check for the most efficient estimation technique between the random effects and a simple OLS. Breusch-Pagan LM test aims at assessing if the cross-section units exhibit significant differences. This test is applied under the null hypothesis that there is zero variance across individuals against the alternative that variance across individuals is not equal to zero. Existence of zero variance implies that the simple OLS is more efficient relative to the random effects estimation technique

In case of heteroscedasticity and autocorrelation, the simple OLS estimates will no longer be efficient (Baltagi, 2008; Cameron & Trivedi, 2010; Greene, 2003; Gujarati, 2009). In such instances, the pooled ordinary least square (POLS) and pooled feasible generalized least square (PFGLS) estimation techniques are preferred to a simple OLS. The study; therefore, employs

Breusch-Pagan Diagonal Covariance Matrix LM test to carry out a diagnostic test, assessing whether it should specify a simple OLS or POLS and PFGLS. Breusch-Pagan Diagonal Covariance Matrix LM test only works with balanced panel data and this is compatible with the used panel data set. This test assumes a null hypothesis that OLS regression is valid against the alternative that a pooled regression (POLS or PFGLS) is valid. Notably, POLS and PFGLS estimation techniques account for the presence of heteroscedasticity and autocorrelation. Chapter 5, Section 5.2 presents the results from all the panel data tests including panel specification tests for robustness checks.

4.4 Hypothesis for the Model Variables

The study uses data on variables in Table 4.1 to carry out the panel data tests. Table 4.1 discusses the variables used; their proxies, the proxies' definitions, expected signs *a priori* and the intuition behind.

Table 4.1: Variables and their expected signs in the study

Variable	Measurement	Expected Sign	Remarks
Dependent Variable			
GDP per capita growth rate.	Real GDP per capita growth rate (annual percentage) measures GDP per capita growth rate. Real GDP per capital growth rate annual percentage refers to GDP per capita divided by midyear population and adjusted for inflation.		Since the study uses a panel of five EAC countries, GDP per capital growth rate is preferred to GDP growth rate. This is because unlike GDP growth rate, GDP per capital growth rate can show relative performance between countries.
Independent variables			

Foreign aid (AID)	Foreign aid is the independent variable of interest. The proxy for Foreign aid is Net ODA/Official Aid (OA) as percentage of GDP. Net ODA/OA as percentage of GDP refers to both bilateral and multilateral aid to developing countries measured as percentage of GDP.	+/-	Aid is the independent variable of interest. As discussed in Chapter Three, some studies present that aid increases investment and thus economic growth. Yet, other studies argue that aid motivates rent seeking behaviour thus lowering economic growth.
Investment	The proxy for Investment is Gross Capital formation as percentage of GDP. Gross Capital formation as percentage of GDP consists of gross domestic fixed capital formation plus net changes in the level of inventories.	+	As discussed in Chapter Three, increase in capital accumulation increases output per work thus yielding economic growth. Therefore, the expected sign between investment and growth is positive.
Policy Index	Policy Index represents a combination of monetary policy measured by inflation, fiscal policy measured by budget surplus and trade policy measured by trade openness. The study follows Burnside and Dollar (2000a) and constructs a policy index as discussed in Section 4.6.	+	By good policies, the study refers to a stable inflation, a budget surplus and improved trade between nations. Good policies create a favourable environment for investment leading to economic growth. The reverse is true for bad policies.
Human Capital	Human capital index represents Human Capital. Human capital index is a combination of average years of schooling and a return on education (Barro & Lee, 2013; Psacharopoulos, 1994).	+	An increase in human capital implies an increase in total skills and knowledge accumulation. This leads to an improvement in efficiency and effectiveness of labour force, which increases marginal product of labour and thus economic growth.

Population growth	Population growth rate is a proxy for population growth. Population growth rate refers to the yearly increase in number of people in a country measured as percentage of the total population. The population growth rate includes an increase in number of all residents regardless of legal status or citizenship with exception of refugees.	+/-	An increase in population of a country may increase its dependence ratio. This is especially so when most of the population is young and only a few can participate in production process. However, at the same time, an increase in population may increase market for goods and services. This provides profits to the firms in a country encouraging them to produce more; thus, economic growth.
Balance of Trade	Trade Balance as percentage of GDP is a proxy of Balance of Trade. Trade Balance equals to the exports of goods and services minus the imports of goods and services measured as percentage of GDP	+	An increase in exports produced by a country implies that a country sells more of her goods in the world market. This earns her foreign exchange earnings that can be re-invested leading to production of more output and hence economic growth.
Political Instability	Number of total coups and warfare and violence are a measure of political instability in a country. Total coups contain all attempted coups, alleged coups, coup plots and auto-coups while warfare and violence includes number of all societal and interstate violence and warfare (Polity IV, 2016).	-	By intuition, political instability in form of coups, wars and warfare lead to death of people and destruction of property. This puts economic activities at a standstill and discourages investments resulting into a fall in GDP growth rates.
Governance	Governance is measured by Polity Score (Polity IV, 2016). Polity score combines both institutionalized democracy and autocracy. This score ranges from +10 implying that a nation is strongly democratic to -10 which represents strong autocracy (Polity IV, 2016).	+/-	The effect of governance on economic growth is ambiguous. Democracy represents rule of law, institutional quality, free markets and high human capital development, which increases productivity and thus economic growth. However, countries with consolidated democracy tend to embrace modest political rights. These act as a luxury good which substitutes a country's productive capacity with leisure thus, reducing economic growth.

Financial depth	Broad money annual percentage growth rate is a proxy for financial depth. Broad money is the sum of currency outside banks; demand and time deposits, savings, and foreign currency deposits of resident sectors; bank and traveller's checks; and commercial paper.	+	Increased finance depth promotes a county's savings through banking the initially unbanked population. This in turn makes more funds available for investment, leading to more output produced and economic growth.

4.5 Data source

The study covers a panel of five (5) EAC countries, which include Burundi, Kenya, Rwanda, Tanzania, and Uganda for the period 1981 to 2014. The availability of data on all the explanatory variables for the period 1981 to 2014 completely informs the choice of these EAC countries. This justifies why South Sudan was excluded from the sample even though it is part of the EAC. Data on GDP per capita growth rate, foreign aid, investment, and population growth are obtained from the African Development Bank (AFDB) Social Economic Database of 1960-2016. Data on financial depth and trade balance are obtained from the World Bank Development Indicators (World Bank, 2017). Human capital data is obtained from the Penn World Tables 9.0 while Polity IV (2016) provides the data on governance, total coups, and warfare and violence.

CHAPTER FIVE: DATA ANALYSIS AND FINDINGS

5.0 Introduction

Chapter 5 discusses results obtained from panel data tests, estimation of equations using one-step system GMM and robustness checks. Section 5.1 and 5.2 provide descriptive statistics and panel data tests results respectively while Section 5.3 discusses empirical findings of the study.

5.1 Descriptive statistics

The descriptive statistics provide summary characteristics of variables in the panel data of EAC countries for the period 1981-2014. The variables used include: GDP per capita growth rate, foreign aid, investment, policy index, trade balance, human capital, population, total Coups, warfare and violence, governance, and financial depth. The summary detail of these variables entails the mean, median, maximum, minimum, standard deviation, skewness and kurtosis as presented in Table 5.1.

The skewness and kurtosis demonstrate normal distribution of the data used in the study. Skewness and kurtosis are zero (0) and three (3) respectively for a perfect normal distribution. Skewness demonstrates the symmetric of the data while kurtosis shows the flatness or tallness of the data (Gujarati, 2009). A kurtosis of 3 implies that the data is mesokurtic (normally distributed); however, when kurtosis is greater than 3, data is said to be leptokurtic (has extreme outliers). On the other hand, data with a kurtosis of less than 3 is said to be platykurtic (has fewer outliers).

From Table 5.1, governance, human capital, trade balance, and investment are mesokurtic (normally distributed), with skewness that is close to zero. All other variables are leptokurtic (long-tailed than normal distribution). However, using kurtosis to measure peakedness may be misleading, as sometimes kurtosis reveals bimodality instead of normality (Darlington, 1970). Some studies on kurtosis have also recommended the use of skewness and kurtosis alongside

other tests of normality (D'agostino, Belanger, & D'Agostino Jr, 1990; DeCarlo, 1997). Therefore, the study further applies Anderson-Darling normality test to check for normal distribution of the data used as explained in Section 5.2.

Table 5.1: Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std. Deviation	Skewness	Kurtosis	Observations
GDP per capita growth rate	1.3054	1.4175	26.2942	-38.9401	5.1574	-2.2051	26.2822	170
Aid	13.7424	11.5055	59.5403	1.8166	9.5655	1.6917	7.2429	170
Investment	17.6149	16.9995	34.7691	0.9376	6.6603	0.1336	2.9449	170
Policy Index	-1.7907	-1.2412	0.9200	-15.9813	2.5197	-3.2012	16.3640	170
Trade Balance	-8.7748	-8.3794	5.7670	-31.0775	5.6698	-0.6434	4.9530	170
Human capital	151.0030	145.2682	224.4481	110.0579	29.2324	0.7404	2.6794	170
Population growth	2.8623	3.0840	7.9179	-6.1849	1.4898	-2.9731	20.1516	170
Total Coups	0.1294	0.0000	4.0000	0.0000	0.4689	4.9058	33.0201	170
Warfare and violence	1.1235	0.0000	10.0000	0.0000	1.7413	1.5904	5.9418	170
Governance	-2.3706	-4.0000	9.0000	-7.0000	4.6241	0.9902	2.9694	170
Financial depth	22.7072	17.1652	174.4278	-7.9707	24.7642	3.4458	17.7822	170

Source: Author’s computations from the study data

5.2 Panel Data Tests Results

Like descriptive statistics, panel data tests also provide the characteristics of the data and are used here to inform the choice and specification of the estimation techniques as discussed below.

5.2.1 Panel Unit Root Tests Results

The unit root tests for panel data provide an understanding on whether there is persistence of shocks or if the conventional test statistics are valid. As discussed in Chapter 4, the study applies LLC, IPS and Fisher type-ADF unit root tests to check if the series have no unit roots. These unit root tests assume a null hypothesis that a unit root exists against the alternative that there is no unit root.

Table 5.2 presents results from the LLC unit root test. These results imply that with exception of human capital and warfare and violence, all other variables are stationary at levels. Human capital is stationary at second difference while the variable warfare and violence is stationary at first difference.

Table 5.2: LLC Unit Root Test Results

Variables	Levels		First Difference	Second Difference	Conclusion
	Constant, no trend	Constant, with trend	Constant, no trend	Constant, no trend	
GDP growth rate	-5.8676***	-	-	-	I(0)
Aid	-2.6853***	-	-	-	I(0)
Investment	-1.8692**	-	-	-	I(0)
Policy Index	-2.4106***	-	-	-	I(0)
Trade Balance	-0.3342	-2.3542***	-	-	I(0)
Human capital	2.4635	2.3125	1.3775	-4.6263***	I(2)
Population growth	-15.3950***	-	-	-	I(0)
Total coups	-6.7874***	-	-	-	I(0)
Warfare and violence	-0.8179	-0.5899	-8.0703***	-	I(1)
Governance	-2.0266**	-	-	-	I(0)
Financial depth	-1.7847**	-	-	-	I(0)

Note: *The table values are the adjusted t-statistic values produced by LLC unit root test. The asterisk *** and ** denotes significance levels of 1% and 5% respectively. I(0), I(1) and I(2) denote integrated of order zero, one and two respectively.*

The study equally employs the IPS unit root test to test for stationarity of the variables used as presented in Table 5.3. With IPS unit root test, trade balance becomes stationary at first difference. Like with the LLC unit root test, human capital is stationary at second difference while all other variables are stationary at levels.

Table 5.3: IPS Unit Root Test Results

Variables	Levels		First Difference	Second Difference	Conclusion
	Constant, no trend	Constant, with trend	Constant, no trend	Constant, no trend	
GDP growth rate	-6.4847***	-	-	-	I(0)
Aid	-2.7508***	-	-	-	I(0)
Investment	-1.8985**	-	-	-	I(0)
Policy	-2.4959***	-	-	-	I(0)
Trade Balance	-0.4047	-1.0019	-7.4230***	-	I(1)
Human capital	3.7918	5.6447	3.6495	-5.0444***	I(2)
Population growth	-13.5766***	-	-	-	I(0)
Total coups	-7.0008***	-	-	-	I(0)
Warfare and violence	-0.5666	0.7262	-8.9591***	-	I(1)
Governance	-0.3210	-2.0588**	-	-	I(0)
Financial depth	-1.3902	-2.1590**	-	-	I(0)

Note: *The table values are the w-t-bar statistic values produced by IPS unit root test. The asterisk ***and ** denotes significance levels of 1% and 5% respectively. And I(0), I(1) and I(2) denote integrated of order zero, one and two respectively.*

The study further employs the Fisher type-ADF unit root tests as presented in Table 5.4. As with the findings of IPS unit root test, this test results also show that human capital is stationary at second difference, trade balance, and warfare and violence are stationary at first difference while all other variables are stationary at levels. The IPS and Fisher type (ADF) unit root tests provide similar results, which the study bases on to make a conclusion on unit root tests.

From Tables 5.2, 5.3, and 5.4, the study concludes that human capital is integrated of order 2; 1(2); and thus, it is estimated at second difference. The balance of trade, and warfare and violence are estimated at first difference because both are integrated of order 1; 1(1) while all other variables are integrated of order 0; 1(0) and are estimated at levels.

Table 5.4: Fisher ADF Unit Root Test Results

Variables	Levels		First Difference	Second Difference	Conclusion
	Constant, no trend	Constant, with trend	Constant, no trend	Constant, no trend	
GDP growth rate	-6.9946***	-	-	-	I(0)
Aid	-3.0081***	-	-	-	I(0)
Investment	-2.0586**	-	-	-	I(0)
Policy	-2.7076***	-	-	-	I(0)
Trade Balance	-0.4127	-1.1501	-8.8997***	-	I(1)
Human capital	2.6106	2.8317	2.4555	-6.0069***	I(2)
Population growth	-13.4726***	-	-	-	I(0)
Total coups	-7.5449***	-	-	-	I(0)
Warfare and violence	-0.5560	0.8746	-9.4587***	-	I(1)
Governance	-0.2793	0.0104**	-	-	I(0)
Financial depth	-1.4834	-2.4636***	-	-	I(0)

Note: *The table values are the inverse normal z statistic values produced by Fisher Type (ADF) unit root test. The asterisk *** and ** denotes significance levels of 1% and 5% respectively. And I(0), I(1) and I(2) denote integrated of order zero, one and two respectively.*

5.2.2 Normality Test Results

In addition to the unit root tests, the study also carries out the normality test as presented in Table 5.5. Both unit root tests and the normality tests ensure that the conventional test statistics are applicable in interpreting the results obtained from the used estimation techniques. The Anderson-Darling normality test is applied under the null hypothesis that there is normal distribution in the panel data used against the alternative that the panel data is not normally distributed.

Table 5.5: Anderson-Darling Normality Test Results

Panel Data Test	*Z*-statistic	*P*-value
Anderson-Darling Z Test	4.0602	1.0000

From Table 5.5, the *p*-value of the Anderson-Darling *Z*-statistic is highly statistically insignificant at 10 percent level of significance. The study does not reject the null hypothesis and concludes that data is normally distributed. This implies that the convention *t*-statistic, *F*-statistic, Chi^2-statistic and analysis of variance (ANOVA) are valid.

5.2.3 Heteroscedasticity Test Results

Even though the long-time series panel data used in the study is normally distributed, it is prone to heteroscedasticity and autocorrelation. The study equally tests for heteroscedasticity by

applying the White and Breusch-Pagan Lagrange Multiplier (LM) tests as presented in Table 5.6. Both White and Breusch-Pagan Lagrange Multiplier tests have the null hypothesis of homoscedasticity against the alternative of unrestricted and panel heteroscedasticity respectively.

Table 5.6: Breusch-Pagan Lagrange Multiplier Panel and White Tests Results

Panel Data Test	Chi^2-statistic	P-value
Lagrange Multiplier Test	81.3508	0.0000
White test	139.46	0.0005

From Table 5.6, the *p*-values of the Chi^2-statistics for both Breusch-Pagan Lagrange Multiplier and White tests are highly statistically significant at 1 percent level of significance. The study rejects the null hypothesis that there is homoscedasticity and concludes that heteroscedasticity exists. The study then accounts for the problem of heteroscedasticity by employing a one-step system GMM (the main model) that provides robust standard errors. The study also uses POLS with Panel Corrected Standard Errors (PCSE) as suggested by Beck and Katz (1995) and the PFGLS as robustness checks that account for the presence of heteroscedasticity.

5.2.4 Autocorrelation Test Results

The study further tests for presence of autocorrelation by using Woodridge autocorrelation test for panel data as presented in Table 5.7. This Woodridge autocorrelation test provides both Woodridge *F* and Woodridge LM test results. This test assumes the null hypothesis of no AR(1) panel autocorrelation against the alternative that there is AR(1) panel autocorrelation.

Table 5.7: Wooldridge Panel Data Autocorrelation Test Results

Panel Data Test	F / Chi^2-statistic	*P*-value
Woodridge *F* Test	8.1300	0.0463
Wooldridge LM Test	7.7478	0.0054

The results in Table 5.7 indicate that the *p*-values of the Chi^2-statistic and *F*-statistic for Woodridge LM and *F*-tests respectively are statistically significant at least at 5 percent level of significance. The null hypothesis of no AR(1) panel autocorrelation is rejected it is concluded that there is AR(1) panel autocorrelation. Therefore, the study employs system GMM

estimation technique that accounts for autocorrelation. System GMM is a dynamic estimation technique, which accounts for the relationship between the current dependent variable and the dependent variable in the previous period as demonstrated in Section 4.2, Equation (4.20). The system GMM also tests for autocorrelation by using the Arellano and Bond test of no autocorrelation as presented in Section 5.3.

5.2.5 Structural Break Test Results

Autocorrelation test results can be misleading in presence of structural change. The study; therefore, also tests for structural break using the Chow test. The Chow test assumes the null hypothesis that there is no structural change against the alternative that a structural change exists as presented in Table 5.8.

Table 5.8: Structural Break Chow Test Results

Panel Data Test	*F*-statistic	*P*-value
Chow Test	0.1847	0.9989
Wald Test	2.5932	0.9951
Likelihood Ratio Test	2.5731	0.9953
Lagrange Multiplier Test	2.5531	0.9954

From Table 5.8, the *p*-values of the *F*-statistics for all the tests including Chow test, Wald test, Likelihood Ratio test and Lagrange Multiplier test are statistically insignificant at 10 percent level of significance. The study does not reject the null hypothesis and concludes that there is no structural break.

5.2.6 Panel Data Specification Tests for Robustness Checks Results

The specification tests for robustness checks aim at ensuring that the study employs the best estimation techniques. The study applies the Hausman, Breusch and Pagan Lagrangian multiplier, and Breusch-Pagan diagnostic covariance matrix specification tests to help achieve this objective.

5.2.6.1 Hausman Specification Test

The Hausman specification test helps in checking the best estimation technique between fixed effects and random effects as presented in Table 5.9. This test assumes the null hypothesis that

random effects model is more efficient against the alternative that fixed effects model is more efficient.

Table 5.9: Hausman Specification Test

Specification Test	Chi^2-statistic	*P*-value
Hausman fixed random	3.03	0.9954

From Table 5.9, the *p*-value of the Chi^2-statistic is statistically insignificant at 10 percent level of significance. The study does not reject the null hypothesis and concludes that random effects model is more efficient than fixed effects.

5.2.6.2 Breusch and Pagan Lagrangian multiplier Test for Random Effects

The Hausman specification test results into preference of the random effects over the fixed effects estimation technique. The study; therefore, employs the Breusch and Pagan LM test for random effects to check for the most efficient estimation technique between the random effects and a simple OLS. This test holds the null hypothesis that a simple OLS estimator is the more efficient against the alternative that random effects estimator is more efficient. Table 5.10 presents results obtained from the Breusch and Pagan LM test for random effects.

Table 5.10: Breusch and Pagan Lagrangian multiplier Test for Random Effects

Panel Data Test	Chi^2-statistic	*P*-value
Breusch and Pagan LM Test	0.00	1.0000

The results in Table 5.10 imply that the Chi^2-statistic is highly statistically insignificant at 10 percent level of significance. The study does not reject the null hypothesis and concludes that simple OLS is more efficient.

5.2.6.3 Breusch-Pagan Diagnostic Covariance Matrix LM Test

Though the above Breusch and Pagan LM test for random effects leads to the preference of a simple OLS over the random effects estimation technique, in case of heteroscedasticity and autocorrelation, which is the case of this study, the simple OLS estimates will no longer be efficient. Therefore, the study further carries out the Breusch-Pagan diagonal covariance matrix LM test to check whether it should specify an estimation equation as a simple OLS or as a

pooled OLS as presented in Table 5.11. The Breusch-Pagan diagonal covariance matrix LM test maintains the null hypothesis that the study should apply a simple OLS regression against the alternative that it should employ a pooled regression.

Table 5.11: Breusch-Pagan Diagonal Covariance Matrix LM Test Results

Panel Data Test	Chi^2-statistic	*P*-value
Lagrange Multiplier Test	1253.5405	0.0000

From Table 5.11, the *p*-value of the Chi^2 statistic is highly statistically significant at 1 percent level of significance. The study rejects the null hypothesis and concludes that a pooled regression is more appropriate.

From the panel data tests above, the study concludes that there is heteroscedasticity and autocorrelation problems in the panel data used. Therefore, it employs:

1) one-step system GMM as the main estimation technique;
2) pooled ordinary least square (POLS) with panel corrected standard errors (PCSE); and
3) pooled feasible generalized least square (PFGLS) as the robustness checks.

POLS and PFGLS allow for presence of heteroscedasticity and autocorrelation of AR(1) in the series while providing efficient estimates (Cameron & Trivedi, 2010).

5.3 Discussion of Empirical Results

This section presents results obtained from estimation of equations specified in Chapter 4, Section 4.2. These include the growth model regression equations (4.18) and (4.19), and Granger causality test equations (4.22) and (4.23).

5.3.1 Main Growth Regression Results

To address objective one, the study estimates the regression equation (4.18) as illustrated in Table 5.12. Column 1 presents results from the one-step system GMM, a dynamic model estimation technique, which considers the lagged dependent variable as part of the explanatory variables as demonstrated earlier in equation (4.20). The coefficient of the lagged GDP growth

rate variable is positively and statistically significant at 5 percent level of significance. This indicates that GDP growth in the current period depends on GDP growth in the previous period.

The system GMM estimator also provides results of the Arellano and Bond test of zero autocorrelation of first difference errors. This test is employed under the null hypothesis of no autocorrelation against the alternative that autocorrelation exists. The *p*-value of 0.0671 indicates that the *Z*-statistic of the Arellano and Bond test is statistically insignificant at 5 percent level of significance; thus, study does not reject the null hypothesis and concludes that there is no autocorrelation.

Besides, the study also tests for the validity of instrumental variables used by the system GMM estimator. Appendix 2 presents the instruments variables used in this analysis. The Sargan test is employed to check the validity of these instruments under the null hypothesis that over identifying restrictions are valid against the alternative that over identifying restrictions are not valid. The *p*-value of 0.2734 implies that the Sargan test Chi^2-statistic is not statistically significant at even at 10 percent level of significance; hence, the study does not reject the null hypothesis and concludes that over identifying restrictions are valid.

Table 5.12: Results from the Main Growth Regression Model

Estimation Method	GMM	POLS	PFGLS
Aid	0.1459**	0.2032*	0.2132**
	(0.0682)	(0 .1149)	(0.0982)
Aid^2	-0.0041***	-0.0054**	-0.0064***
	(0.0009)	(0.0027)	(0.0024)
Investment	0.1390***	0.1740***	0.1297**
	(0.0358)	(0.0583)	(0.0501)
Policy Index	0.8646***	0.8383***	0.4861***
	(0.2509)	(0.2066)	(0.1738)
D(Balance of trade)	0.2993*	0.2625***	0.1257**
	(0.1559)	(0.0665)	(0.0554)
D2(Human capital)	0.0136	0.0786	-0.1914
	(0.8850)	(0.9560)	(0.7617)
Population growth	-0.4365**	-0.3598	-0.2197
	(0.2048)	(0.3503)	(0.3251)
Total Coups	-1.1676***	-1.5199**	-1.6086***
	(0.4491	(0.6730)	(0.6146)
D(Warfare and violence)	-1.7254***	-1.4408***	-0.8664***
	(0.3427)	(0.3010)	(0.2473)
Governance	-0.0650	-0.1047	-0.0083
	(0.0908)	(0.0865)	(0.0746)
Financial depth	0.0891**	0.0893***	0.0537***
	(0.0359)	(0.0208)	(0.0178)
L.GDP per capita growth rate	0.0861**	-	-
	(0.0421	-	-
Constant	-1.4028	-2.5647	-1.6653
	(1.1282)	(1.6322)	(1.4460)
Observations	160	160	160
R-Squared	-	0.4973	-
Sargan Test[a]	0.2734	-	-
Arellano and Bond test[b]	0.0671	-	-

Note: *The dependent variable is GDP per capita growth rate. The asterisks ***, **, and * denote the 1%, 5% and 10% level of significances respectively. The values in parentheses are the heteroscedasticity consistent standard errors.* [a] *indicates the p-value of the Sargan test of over identifying restrictions.* [b] *indicates the p-value of Arrellano and Bond test of zero autocorrelation in first difference errors. D(.) implies that a variable is estimated at first difference and D2(.) means a variable is estimated at second difference*

System GMM results also show that the signs of the coefficients of all the variables are as expected *a priori*. The statistically significant variables include aid, aid^2, investment, policy index, balance of trade, population growth, total Coups, warfare and violence and financial depth as discussed henceforth.

Aid is positively and statistically significant at 5 percent level of significance in influencing economic growth. This is as expected and is consistent with both economic theory and empirical findings of Armah and Nelson (2008), Hansen and Tarp (2001), Frot and Perrotta

(2010), Arndt *et al.* (2010) and Arndt *et al.* (2015). Hansen and Tarp (2001) and Arndt *et al.* (2010) particularly argue that aid leads to economic growth through raising investment. Clemens *et al.* (2004) also demonstrates that an increase in foreign aid is consistently followed by an increase in investment and economic growth. To Arndt *et al.* (2015), foreign aid leads to economic growth by enabling acquisition of physical capital as well as improvements in human capital. Acquisition of physical capital helps in value addition especially for the agriculture products, increases quality and quantity of output and boosting economic growth. By intuition, while holding all other factors constant, foreign aid flows are used for accumulation of the required capital (physical and human) which increases output per worker, improving economic growth rates.

However, system GMM results present that the coefficient of aid^2 is negative and statistically significant at 1 percent level of significance. This implies that increased foreign aid flows decrease marginal economic growth. These results are consistent with the findings of existing studies such as Burnside and Dollar (2000a), Hansen and Tarp (2001) and Foster and Keith (2003). *Ceteris paribus,* foreign aid has a diminishing marginal effect on economic growth; that is, as foreign aid flows increase more and more, the effect of aid on economic growth will eventually decrease. Foster and Keith (2003) argue that diminishing returns of aid on economic growth may be caused by the Dutch disease, reduced government expenditure, raising administration costs, and capacity constraints.

System GMM findings also reveal that investment is positive and statistically significant in determining economic growth. This is also consistent with existing literature and economic theory which argue that increases in investment increase a firm's output and so economic growth (Adams & Atsu, 2014; Dalgaard & Hansen, 2017; Hansen & Tarp, 2001; Karras, 2006; Mallik, 2008; Qian, 2015). Holding all other factors constant, increase in investment levels leads to increase in capital (physical and human capital) accumulation that increases marginal

product of labour, yielding increased economic growth rate (Chenery & Strout, 1968; Mankiw *et al.*, 1995; Rebelo, 1991).

As expected, the study also finds that policy index which is a combination of proxies for monetary, fiscal and trade policies is positive and statistically significant in influencing economic growth. These findings are consistent with both economic theory and the findings of Burnside and Dollar (2000a), Rajan and Subramanian (2008), Ogundipe *et al.* (2014), Arndt *et al.* (2010) and Arndt *et al.* (2015). All other things being equal, good policies create a favourable environment for investment, which increases output and thus economic growth.

Good monetary policies are associated with stable prices that encourage investment. The general prices including prices of factor inputs such as capital and labour are affordable, encouraging firms to employ more, which results into more output production. Good fiscal policies are also associated with budget surpluses, which indicate that countries have more than enough savings to invest. Equally so, countries with good trade policies are most likely to attract high inflows of goods and services including capital goods that can be used to boost output per worker leading to economic growth.

Table 5.12, Column 1 also indicates that as hypothesised, trade balance is statistically significant in influencing economic growth. Economic theory argues that trade expansion will only lead to economic growth if it increases a country's exports (Higgins & Prowse, 2010). According to Higgins and Prowse, increasing a country's exports will encourage especially less developed countries to earn more foreign receipts on the international markets that can be re-invested leading to more output and economic growth.

System GMM results also present that population growth is negative and statistically significant at 5 percent level of significance in affecting economic growth. This sign is consistent with the expected sign and is in line with the findings of some studies on foreign aid and economic growth nexus (Arndt *et al.*, 2010, 2015; Boone, 1996; Burnside & Dollar, 2000a;

Collier & Dollar, 2002; Karras, 2006). The EAC countries such as Kenya, Uganda and Tanzania have a high percentage of young people (mostly 15 years and below) that increase the dependence burden (World Bank, 2017). This reduces the amount of savings as these countries spend more on consumption to support the young than on investment. Reduced investment implies low capital accumulation that leads to low output per worker, lowering economic growth.

Political instability proxies of total coups, and warfare and violence also negatively, and statistically significantly influence economic growth. Though different proxies are used, these findings are still consistent with the findings of some studies that used political instability as one of the explanatory variables (Armah & Nelson, 2008; Burnside & Dollar, 2000a; Easterly *et al.*, 2003; Hansen & Tarp, 2001; Islam, 2005). Islam (2005) particularly demonstrates that foreign aid effectively leads to economic growth in politically stable environments irrespective of economic policies at play. All other factors being equal, political instability leads to destruction of property and loss of lives of the people. This discourages investment, reduces output levels leading to declines in economic growth.

Furthermore, system GMM results show that financial depth is positively statistically significant in influencing economic growth. This is consistent with theory and the findings of Frot and Perrotta (2010). Holding all other factors constant, financial deepening leads to an increase in the rate of savings through banking the formerly unbanked population, making more funds available for investment and enhancing capital accumulation, which increases output per worker resulting into high economic growth rates.

However, the study also finds that even though human capital and governance have expected signs, they are statistically insignificant in influencing economic growth. The positive sign of human capital is consistent with economic theory that argues that increased capital accumulation increases output per worker. The findings also present that governance, which

represents a score of democracy, also has a negative sign. In an attempt to explain this negative sign, some studies have argued that democracy promotes substitution of working hours with leisure which results into low productivity and thus low economic growth rates (Acemoglu & Robinson, 2005; Barro, 1999; Glaeser, La Porta, Lopez-de-Silanes, & Shleifer, 2004).

5.3.1.1 Discussion of Results from Robustness Analysis

Besides Colum 1, Column 2 and 3 of Table 5.12 present results from the POLS and PFGLS robustness analysis respectively. Following Cameron and Trivedi (2010), the robustness analysis used in the study estimate the following pooled model regression equation:

$$y_{it} = x_{it}'\beta + u_{it};\ \ i = 1, \dots, 5, t = 1, \dots, 34 \qquad (5.1)$$

Where X_{it} represent regressors of *k* dimension that include an intercept and y_{it} is the dependent variable (GDP growth rate). The model in equation (5.1) allows for the correlation of the error terms in u_{it} across individual countries (i). This means that the model accounts for heteroscedasticity and this is consistent with the characteristics of the panel data used in this study. Furthermore, Cameron and Trivedi (2010) recommend specification of an AR (1) for u_{it} to account for autocorrelation.

$$u_{it} = \rho_i u_{i,t-1} + \varepsilon_{it} \qquad (5.2)$$

As long as the above conditions hold, the authors stress that POLS and PFGLS will provide the best precise estimates relative to other estimation techniques. Therefore, the study further employs POLS and PFGLS to estimate equations (4.18) and (4.19) and the results are as presented in columns 2 and 3 of Table 5.12 respectively.

POLS estimator provides the *R*-squared (goodness of fit) of 0.4973, which implies that all other factors being equal, the regressors used in the POLS estimation technique jointly explain about 50% of variations in economic growth. Notably, with exception of population growth, the

significance of all other variables are consistent across columns 1, 2 and 3. The ability of all the three estimation techniques; System GMM, POLS, and PFGLS to provide almost similar results signifies that the system GMM estimator provides robust findings that can be relied on to make econometric conclusions.

5.3.2 Growth Regression Results with Aid and Investment Interaction Terms

After finding that foreign aid positively and significantly influences economic growth, the study carries out further analysis that addresses objective two; that is, estimates the regression equation (4.19) as demonstrated in Table 5.13.

From Table 5.13, Column 1, the study also tests for validity of the instrumental variables used in system GMM by applying the Sargan test and Appendix 2 presents these instrument variables used. The *P*-value of 0.2405 indicates that the Chi^2-statistic is statistically insignificant at 10 percent level of significance; therefore, the study does not reject the null hypothesis and concludes that the over identifying restrictions are valid. Additionally, the Arellano and Bond test of zero autocorrelation provides a *P*-value of 0.0821. This means that the *Z*-statistic is statistically insignificant at 5% level of significance. The study does not reject the null hypothesis and concludes that there is no autocorrelation in first difference errors

Table 5.13: Results from the Growth Regression Model with Aid X Investment

Estimation Method	GMM	POLS	PFGLS
Aid	0.9071**	0.7592**	0.7740***
	(0.4088)	(0.2975)	(0.2644)
Aid2	-0.0261***	-0.0244***	-0.0243***
	(0.0095)	(0.0070)	(0.0063)
Investment	0.5156**	0.4388***	0.3790***
	(0.2133)	(0.1533)	(0.1364)
Aid X Investment	-0.0608**	-0.0489**	-0.0446***
	(0.0269)	(0.0189)	(0.0166)
Aid^2 X Investment	0.0017**	0.0016***	0.0014***
	(0.0007)	(0.0005)	(0.0004)
D (Balance of trade)	0.2706**	0.2707***	0.1484
	(0.1315)	(0.0652)	(0.0567)
D2 (Human capital)	-0.0976	0.0597	0.0210
	(0.6763)	(1.0058)	(0.8193)
Policy Index	0.8771***	0.8591***	0.5273***
	(0.2576)	(0.2047)	(0.1703)
Population growth	-0.5229***	-0.4816	-0.3344
	(0.1630)	(0.3452)	(0.3235)
Total Coups	-1.2961***	-1.4004**	-1.7233***
	(0.4910)	(0.6846)	(0.6257)
D (Warfare and violence)	-1.2358***	-1.0742***	-0.6241***
	(0.2858)	(0.2786)	(0.2265)
Governance	-0.0570	-0.1566*	0.0256
	(0.0831)	(0.0860)	(0.0726)
Financial depth	0.0925**	0.0875***	0.0613***
	(0.0360)	(0.0207)	(0.0178)
Lag of Real GDP growth per capita	0.0949***	-	-
	(0.0337)		
Observations	160	160	160
R-Squared	-	0.5440	-
Sargan Test[a]	0.2405	-	-
Arellano and Bond test[b]	0.0821	-	-

Note: *The dependent variable is GDP per capita growth rate. The asterisks ***, **, and * denote the 1%, 5% and 10% level of significances respectively. The values in parentheses are the heteroscedasticity consistent standard errors.* [a] *indicates the p-value of the Sargan test of over identifying restrictions.* [b] *indicates the p-value of Arrellano and Bond test of zero autocorrelation in first difference errors. D(.) implies that a variable is estimated at first difference and D2(.) means a variable is estimated at second difference*

From Table 5.12, Column 1, the interaction term between foreign aid and investment (Aid X Investment) is negative and statistically significant at 5 percent level of significance while the interaction between foreign aid-squared and investment (Aid^2 X Investment) is positively and statistically significant at 5 percent level of significance. These results imply that *ceteris paribus*, the impact of foreign aid on economic growth is a negative function of the level of investment and a positive function of the level of foreign aid (increasing foreign aid flows). Foreign aid is most likely to lead to economic growth in countries with substantially lower

levels of investment. These findings are consistent with economic theory which argues that foreign aid leads to economic growth by filling the saving-investment gap (Chenery & Strout, 1968). However, the study findings also show that there is a certain level of investment above which foreign aid will not lead to economic growth. All other things being equal, foreign aid has a greater chance of increasing economic growth if a country has a substantial shortage in investments levels.

Table 5.13 also shows that aid, aid^2, investment, balance of trade, policy, total coups and warfare and violence are statistically significant. Notably, all variables have expected signs and these results are consistent with those presented in Table 5.12. The magnitudes of the coefficients of variables in Table 5.13 also do not vary significantly from those presented in Table 5.12.

5.3.2.1 Discussion of Results from Robustness Analysis

From Table 5.13, Column 2, the *R*-squared of 0.5440 from the POLS indicates that holding all other factors constant, the model variables jointly explain 54.4 percent of total variations in economic growth. With an exception of population growth variable, the significance of all the variables is consistent across GMM, POLS and PFGLS. This is similar to the findings presented in Table 5.12 in which the population variable is significant only with the system GMM estimation technique.

5.3.3 Granger Causality Test

To address objective three, the study further employs the Granger causality test to estimate Equations (4.22) and (4.23). The Granger causality test estimates these equations by using the OLS estimation techniques. It checks whether there is a two-way causation between foreign aid and economic growth. This helps to verify if the results obtained from Sub-Sections 5.3.1 and 5.3.2 are conclusive. Firstly, the test estimates Equation (4.22) under the null hypothesis

that foreign aid does not Granger-cause economic growth against the alternative that foreign aid Granger-causes economic growth as presented in Table 5.14.

Table 5.14: Granger Causality Test Results on Foreign Aid Causing growth

Granger Causality Test	*Z*-statistic	*P*-value
Z-bar	3.5827	0.0003
Z-bar tilde	2.9088	0.0036

Table 5.14 results show that the *Z*-statistics are highly statistically significant at 1 percent level of significance. The study rejects the null hypothesis and concludes that foreign aid Granger-causes economic growth.

Secondly, the study estimates equation (4.23) under the null hypothesis that economic growth does not Granger-cause foreign aid against the alternative that economic growth Granger-causes foreign aid. Table 5.15 presents the results from estimation of equation (4.23).

Table 5.15: Granger Causality Test of Growth Causing Foreign Aid

Granger Causality Test	*Z*-statistic	*P*-value
Z-bar	-0.2158	0.8291
Z-bar tilde	-0.3373	0.7359

From Table 5.15, both *Z*-statistics are not statistically significant at 10 percent level of significance. The study does not reject the null hypothesis and concludes that economic growth does not granger cause foreign aid.

From Tables 5.14 and 5.15, the study deduces that there is a one-way causation between foreign aid and economic growth. Foreign aid Granger-causes economic growth; however, economic growth does not Granger-cause foreign aid. Therefore, the results obtained in Sub-Sections 5.3.1 and 5.3.2 are conclusive; that is, foreign aid causes economic growth and this relationship is unidirectional.

CHAPTER SIX: CONCLUSION AND POLICY IMPLICATIONS

6.0 Introduction

Chapter 6 presents the conclusion, policy implications and recommendations of the study. Section 6.1 provides the summary and conclusion of the study. Section 6.2 provides policy recommendations of the study. Section 6.3 discusses limitations of the study and Section 6.4 outlines areas recommended for further research.

6.1 Conclusion

The study investigated the foreign aid and economic growth nexus on a sample of five (5) EAC countries for the yearly period 1981 to 2014. This involved addressing the three objectives of the study:

1) to investigate if foreign aid causes economic growth in EAC countries;
2) to examine if the effect of foreign aid on economic growth in EAC countries depends on the level of investment; and
3) to determine if there is a two-way causation between foreign aid and economic growth.

The findings of the study reveal that foreign aid positively and significantly influences economic growth in EAC countries; however, increasing foreign aid flows decrease the marginal economic growth. The results further show that the impact of foreign aid on economic growth negatively depends on the level of investment in a country and positively depends on amount of foreign aid flows. Finally, the results of the study demonstrate that foreign aid causes economic growth in EAC countries and this relationship is unidirectional.

As noted in Chapter 2, Section 2.1, the EAC countries share common features including a common language, geographical location, road network linkages, culture and political history among others. This makes the EAC countries of Burundi, Kenya, Rwanda, Tanzania, South

Sudan and Uganda almost homogenous; thus, the results obtained provide reliable inferential statistics.

In conclusion, despite endless critics of foreign aid, empirical evidence shows that foreign aid causes growth in EAC countries. As expected, the study also finds that the policy index, which is a combination of proxies for monetary, fiscal and trade policies is positive and statistically significant in influencing economic growth. The results also demonstrate that investment, balance of trade, and financial depth positively and significantly affect economic growth in the EAC countries. On the other hand, the findings of the study also indicate that political instability proxies of total coups and warfare and violence negatively and significantly affect economic growth.

The findings of the study are consistent with the findings of Hansen and Tarp (2001), McGillivray (2005), Islam (2005), Armah and Nelson (2008), Arndt *et al.* (2010), Minoiu and Reddy (2010) and Arndt *et al.* (2015). However, these results refute the findings of the famous studies of Burnside and Dollar (2000a) and Rajan and Subramanian (2008) who demonstrate that aid leads to economic growth; however, in countries with good policies. The study further contradicts with the findings of Adams and Atsu (2014), Tang and Bundhoo (2017) and Sothan (2018) who evidenced that foreign aid negatively affects growth.

6.2 Policy Recommendations

From results of the study, it is evident that aid positively influences economic growth. However, there is an inflection point above which increases in foreign aid flows lead to decreases in marginal economic growth rates. This is because increased foreign aid flows may lead to high government expenditure, administration costs, and also appreciation of the local currency that may result into the Dutch disease (Djankov *et al.*, 2008; Foster & Keith, 2003; Mauro, 1998). Moreover, some donors condition foreign aid on buying complex capital from

the donor countries, which may sometimes require high level technical skills for operation. In case such skills are unavailable, the EAC countries may experience production capacity constraints causing foreign aid flows to have diminishing marginal effects on economic growth It is; therefore, necessary that both the EAC countries and respective donor countries formulate and implement policies that deter increasing foreign aid flows from having diminishing marginal growth effects.

From the study, the EAC countries should employ foreign aid in bridging the saving-investment gap (Chenery & Strout, 1968; Mankiw *et al.*, 1995). The EAC countries' GDP largely depends on the agriculture sector. Using foreign aid to eliminate most of the supply bottlenecks by acquiring relevant capital and providing local labour force with the required skills that can boost value addition on the primary agriculture outputs may increase both quantity and quality of production for both local and export markets. Promoting agribusinesses may subsequently enhance other sectors of the economy including the industrial sector through providing the necessary raw materials, increasing the sector's total productivity and economic growth.

Furthermore, implementing good fiscal policies could enable the EAC countries to lessen the government expenditure. This is through using foreign aid to reduce the budget deficit, government borrowing, and taxation. Foster and Keith (2003) stress that governments should spend foreign aid on skill provision, improving infrastructures such as roads, and reducing the burden of interest rates on private sector. This will encourage investment and increase output per worker, which consequently will increase a country's output. This kind of productive government spending will enable increasing foreign aid flows to increase marginal economic growth rates.

Empirical evidence from the study also portrays that foreign aid leads to economic growth in countries with substantially lower levels of investment. The results signify that foreign aid flows will result into economic growth in countries with considerably lower levels of investment, and that a certain level of investment exists above which foreign aid flows into a country will not lead to economic growth. Therefore, donors should ensure that foreign aid flows lead to economic growth by strictly earmarking it to countries with significant saving-investment gaps.

Besides, almost every EAC country has experienced a certain level of political instability (Polity IV, 2016). Political instabilities create supply bottlenecks, increase administration costs and government spending and limit the smooth running of socio-economic activities in a country. EAC countries should ensure political stability by promoting cooperation among different political parties. Countries such as Burundi and South Sudan should hold peace talks among conflicting parties to ensure that peace prevails as well. Donor countries can also help in this endeavour by financing projects that have the potential to promoting political stability. Ensuring a politically stable environment will promote smooth running of economic activities including production of goods and services, leading to the re-allocation of the foreign aid formerly spent on curbing down wars and conflicts for use in other productive sectors.

Overall, the study concludes that conditional on the above policy recommendations, donors should either maintain the current or increase foreign aid flows to the EAC countries.

6.3 Limitations of the Study

The most limiting factor of the study was data unavailability. Most datasets have shorter time series data especially for African countries. This explains why the data used in this study is from different sources. The process of obtaining data from different sources was time consuming making the time allocated for the study inevitably inefficient

6.4 Areas for Further Research

The study limited its sample to the EAC countries that feature amongst the top ten (10) foreign aid recipients in SSA. Therefore, it is recommended that future studies consider countries in other economic blocs in their analysis. This is because since EAC countries receive high foreign aid flows, the study results may not provide better inferences for countries receiving relatively lower amounts of foreign aid flows.

APPENDICES

Appendix 1: Summary of Some the Reviewed Empirical Studies

Author	Title	Sample	Key Variables	Estimator	Results
Boone (1996)	Politics and the effectiveness of foreign aid.	Panel data, 96 countries for five-year time average from 1971-1975 to 1986-1990	Dependent variable Aid/GNP Independent Variables Log of relative GNP/capita, Log(population), Twice-lagged aid/GNP, Per capita GNP growth rate, Terms of trade, Debt rescheduling Sub-Saharan Africa, Log of infant mortality and Log of Life Expectancy	OLS and FE	Aid does not significantly increase investment and growth, nor benefit the poor as measured by improvements in human development indicators, but it does increase the size of government models of elitist political regimes best predict the impact of foreign aid
Burnside and Dollar (2000b)	Aid, Policies and Growth	Panel Data, 56 developing countries and six	Dependent variable Real growth rate Independent Variables	OLS and 2SLS	Aid has a positive impact on growth in developing countries with good policies.

	56 countries and six four-year time periods from 1970-1973 until 1990-1993	four-year time periods; from 1970-1973 to 1990-1993	Aid/GDP, Aid/GDP-squared, Aid/GDP X Policy, Aid/GDP X Policy-squared, Institutional quality, Dummy for Sub Saharan Africa, Dummy for Egypt, Policy index, Initial Income, Population, Assassinations variable, Assassinations variable X Ethnolinguistic fractionalization and Broad money (M2) over GDP.		
Hansen and Tarp (2001)	Aid and growth regressions.	Panel data, 56 countries and five periods, covering the years 1974–1993	Dependent variable Annual growth rate in GDP per capita Independent Variables Aid, Aid^2, Aid X policy, $Policy^2$, Budget surplus, Inflation, Openness, Financial depth, Assassinations variable, Assassinations variable X Ethnolinguistic fractionalization, institutional quality, Initial GDP per capita and Effect of aid at median	OLS and GMM	Aid increases the growth rate, and this result is not conditional on 'good' policy but via investment. There are, however, decreasing returns to aid
Easterly (2003)	Can Foreign Aid Buy Growth?	Panel Data, 88 aid recipient countries	Dependent variable Real growth rate Independent Variables	OLS and a 2SLS	Aid does not lead to growth even in countries with good policies.

		for the period 1965-1995	Aid/GDP, Aid/GDP X Policy, log initial GDP, Assassinations variable X Ethnolinguistic fractionalization, Dummy for Sub- Saharan Africa, Dummy for Fast Growing Asia, Institutional quality, Policy, M2/GDP lagged.		
Rajan and Subramanian (2008)	Aid and Growth: What does the Cross-Country Evidence Really Show?	Panel data, 83 developing countries for the period 1960-2000.	Dependent variable Average annual growth of per capita GDP Independent variables Initial level of policy (Sachs-Warner), Aid/GDP, Aid/GDP-squared, Aid/GDP X Policy, Aid/GDP X geography, initial per capita GDP, Initial level of life expectancy, Institutional quality, Revolutions, Log inflation, M2/GDP and Budget Balance/GDP.	System GMM and OLS	There's no robust relationship between aid and growth in cross section data and no evidence of aid working in better policy environment, or geographical environment)
Arndt *et al.* (2015)	Assessing Foreign Aid's Long-Run	78 developing countries from 1970–2007.	Dependent variable Real GDP growth Independent variables	LIML and IPWLS	Aid has contributed to economic growth by stimulating its physical capital accumulation and improving

	Contribution to Growth and Development.		Aid/GDP, Trade policy index. GDP per capita (PPP), Life expectancy, Coastal population density, Malaria prevalence, Air distance, Oil producer, GDP per capita (PPP), Air distance, Oil producer, Civil liberties, Geography, Trade policy index and Primary schooling		human capital, particularly education and health
Arndt *et al.* (2010)	Aid, Growth, and Development. Have We Come Full Circle?	Panel data, 83 developing countries from 1970-2000	Dependent variable Mean real growth rate Independent variable Aid/GDP, Initial per capita GDP, Geography, Coastal pop. density, Primary schooling, Malaria risk, Civil liberties, Institutional quality, Revolutions, Initial Life expectancy, price of investment goods and air distance	2SLS, IV-LIML, IV-IPWLS and GMM-CU	Aid has a positive and statistically significant causal effect on growth over the long run, with confidence
Frot and Perrotta (2010)	Aid Effectiveness: New Instrument, New Results?	Panel data, 61 countries for five-year average period from 1961-1965 to 2001-2005	Dependent Variable Growth rate Independent Variable Lagged log GDP, Lagged Log aid, Log population, Inflation, Lagged Money, Schooling, Institutional Quality, Openness, Ethnic. Fractionalization, Dummies for East Asia and Sub Saharan Africa	GMM	A positive effect of aid on GDP, with an elasticity of GDP with respect to aid of 0.10

Bräutigam and Knack (2004)	Foreign Aid, Institutions, and Governance in Sub-Saharan Africa	Panel Data, 32 Sub Saharan African countries for the period 1982 to 1997	Dependent Variable ICRG quality-of-governance index Independent Variable Initial tax share value, Political violence, Aid, Population change, Mean Dependent Variable and Initial ICRG quality-of-governance index	OLS and 2SLS	There is a robust statistical relationship between high aid levels in Africa and deterioration in governance
Clemens *et al.* (2004)	Aid and Growth: The Current Debate and Some New Evidence	Panel data, 67 countries between 1974 and 2001.	Dependent Variable GDP per capita growth Independent Variables Net ODA. Net ODA-Squared, Short-impact aid, Short-impact aid squared, Long-impact aid, Long-impact aid squared, Humanitarian aid, Humanitarian aid squared, Log repayments, Log initial GDP per capita, Dummy for East Asia, Institutional quality, Inflation, Openness, Budget surplus	2SLS and GMM	Increases in aid have been followed on average by increases in investment and growth

Appendix 2: Instruments Used in GMM estimation for Table 5.15 and 5.16

Instrumental Variable	Table 5.15	Table 5.16
GDP growth rate	G(0,1)	G(0,1)
Aid	G(1,2)	G(1,2)
Lag od Aid	-	D(1)
Aid^2	G(1,2)	G(1,2)
Lag of Aid^2	-	D(1)
Investment	D(1)	G(1,2),
Lag of Investment	-	D(1)
Aid X Investment	-	G(1,2),
Lag of Aid X Investment	-	D(1)
Aid^2 X Investment	-	G(1,2)
Lag of Aid^2 X Investment	-	-
Policy	D(1)	-
Balance of Trade	D(2)	-
Human Capital	D(3)	-
Population	G(1,2)	D(1)
Total coups	D(1)	-
Warfare and Violence	D(2)	-
Governance	D(1)	-
Financial Depth	D(1)	-

Note: *$G(k_1, k_2)$ denotes instruments for differenced equation lagged k periods and D(k) denotes that the k difference of the variable is used as instrumental variable.*

Appendix 3: Unit Root Tests for Policy Index Variables

LLC Unit Root Test Results for Policy Index Variables					
Variables	Levels		First Difference	Second Difference	Conclusion
	Constant, no trend	Constant, with trend	Constant, no trend	Constant, no trend	
Inflation	-2.2759**	-		-	I(0)
Budget surplus	-2.8428***	-		-	I(0)
Trade openness	-1.0420	-1.2343	-8.5856***	-	I(1)
IPS Unit Root Test Results for Policy Index Variables					
Variables	Levels		First Difference	Second Difference	Conclusion
	Constant, no trend	Constant, with trend	Constant, no trend	Constant, no trend	
Inflation	-2.6831 ***	-		-	I(0)
Budget surplus	-2.8758***	-		-	I(0)
Trade openness	_0.1484	-1.2345	-9.4935***	-	I(0)
Fisher-ADF Unit Root Test Results for Policy Index Variables					
Variables	Levels		First Difference	Second Difference	Conclusion
	Constant, no trend	Constant, with trend	Constant, no trend	Constant, no trend	
Inflation	-2.9272***	-		-	I(0)
Budget surplus	-3.1542***	-		-	I(0)
Trade openness	0.2436	-1.3761	-9.9550***	-	I(0)

Appendix 4: Growth regression with policy index variables

Estimation Method	SGMM	POLS	PFGLS
Aid	-0.0329***	-0.0447	-0.0469
	(0.0125)	(0.0425)	(0.0339)
Budget Surplus	0.3682**	0.3739***	0.2447**
	(0.1750)	(0.0735)	(0.1030)
Inflation	-0.0667**	-0.0778***	-0.0452***
	(0.0297)	(0.0213)	(0.0171)
D(Trade Openness)	0.0192	0.0136	0.0283
	(0.0309)	(0.0477)	(0.0365)
Investment	0.3162 ***	0.1389***	0.1184**
	(0.1555)	(0.0319)	(0.0510)
D(Balance of trade)	0.1250 **	0.2525*	0.1430**
	(0.0418)	(0.1471)	(0.0650)
D2(Human capital)	0.1447	0.3407	-0.0610
	(0.9057)	(0.9624)	(0.8170)
Population growth	-0.3608	-0.2849	0.0133
	(0.2556)	(0.1849)	(0.3277)
Total Coups	-0.9902**	-1.4269***	-1.4682**
	(0.4374)	(0.4188)	(0.6312)
D(Warfare and violence)	-1.8654***	-1.4760***	-0.7877***
	(0.3863)	(0.5122)	(0.2503)
Governance	-0.1046	-0.0568	-0.0595
	(0.0846)	(0.0612)	(.0749)
Financial depth	0.0862*	0.0918***	0.05253***
	(0.0475)	(0.0222)	(0.0199)
Lag of GDP per capita growth	0.1432	-	-
Rate	(0.0333)		
Constant	0.7767	0.9143	0.3441
	(1.4588)	(1.3181)	(1.5265)
Observations	160	160	160
R-Squared[2]	-	0.4533	-
Sargan test[a]	0.2046	-	-
Arellano and Bond test[b]	0.0763	-	-

Note: *The dependent variable is GDP per capita growth rate. The asterisks ***, **, and * denote the 1%, 5% and 10% level of significances respectively. The values in parentheses are the heteroscedasticity consistent standard errors. [a] indicates the p-value of the Sargan test of over identifying restrictions. [b] indicates the p-value of Arellano and Bond test of zero autocorrelation in first difference errors. D(.) implies that a variable is estimated at first difference and D2(.) means a variable is estimated at second difference.*

Appendix 4 presents results obtained from growth regression using system GMM, POLS and PFGLS estimation techniques. From Appendix 4, column 1 presents results obtained by employing the system GMM estimation technique. Column 2 shows the results from the POLS estimation method by Driscoll and Kraay (1998). The Driscoll and Kraay (1998) POLS

[2] The study carried out unit root tests on all the variables including budget surplus, inflation and trade openness, which are components of the policy index variable. However, since budget surplus, inflation and trade openness as individual variables are not of interest to the study, Appendix 3 presents their unit root tests. Chapter 5, Section 5.2 presents the unit root tests of all other variables including the policy index,

estimation technique allows for a general autocorrelation between errors and provides the Driscoll and Kray standard errors which are in the Newey West type form. Finally, column 3 provides results from the estimation technique of the PFGLS which allows for both heteroscedasticity and panel specific autocorrelation of AR (1).

From Column 1 of Appendix, the system GMM (SGMM) provides results from the Arellano and Bond test of zero autocorrelation. The *P*-value of 0.0763 indicates that the *Z*-statistic is statistically insignificant at 5 percent level of significance. The study does not reject the null hypothesis and concludes that the there is no autocorrelation. Additionally, the system GMM results present the findings of the Sargan test of over identifying restrictions. The *P*-value of 0.2046 shows that the *Z*-statistic is statistically insignificant at 10 percent level of significance. Therefore, study does not reject the null hypothesis that the over identifying restrictions are valid

Appendix 4, Column 2 also presents an *R*-squared of 0.4533. *Ceteris paribus,* this *R*-squared implies that variables used in model regression Equation (4.17.2) jointly explain 45.3 percent of variations in economic growth. From Appendix 4, all variables have expected signs. Notably, the coefficient of aid (foreign aid) has a negative sign; however, this is statistically significant only with the system GMM estimator. Appendix 4 presents the results from the growth regression Equation (4.17.2), which has no the foreign aid non-linear term (aid-squared). Therefore, this negative sign could be due to the non-linearities in the foreign aid term. The coefficients of investment, balance of trade, total coups, and warfare and violence are also statistically significance across all the three estimation techniques. Chapter 5, Section 5.3 presents a deeper discussion on all these variables.

As regards the policy index variables that are the variables of interest in Appendix 4, budget surplus coefficient is positive and statistically significant in influencing GDP growth. This is

as expected *a priori* and implies that a country has enough resources for investment, which increases output and thus economic growth. As expected, inflation also has a negative and statically significant coefficient. An increase in general prices usually involves increases in all the prices including price of factor inputs, which discourages investment, lowering output and hence economic growth. Even though the coefficient of trade openness is positive as expected, it is statistically insignificant in influencing economic growth.

Therefore, the study uses the coefficients of the variables of the budget surplus, inflation and trade openness in Appendix to construct the policy index. Notably, the sizes of these coefficients do not vary significantly across different estimation techniques. However, the coefficients from the POLS estimation technique are preferred in the construction of the policy index. This is because POLS coefficients have the least standard errors, which makes them more efficient in relation to the system GMM and PFGLS. Therefore, the study constructs the policy index from the coefficients of budget surplus, inflation and trade openness in Appendix 4, Column 2 as follows.

$$Policy\ Index = 0.9143 + 0.3739 * Budget\ surplus - 0.0778 * inflation + 0.0136 * D(Trade\ Openness) \quad (A4.1)$$

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