THE EFFECT OF INSTITUTIONS ON TRADE FLOWS IN EAST AFRICAN COMMUNITY

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DECLARATION

This research paper is my original work and has not been presented for the award of a degree in any other university.

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This research paper has been submitted for examination with my approval as a University supervisor.

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DEDICATION

To my late parents: Anthony Ochieng and Mildred Anyango.

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LIST OF ACRONYMS

CC	Control of Corruption
CEI	Contract Enforcement Index
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
CET	Common External Tariff
EAC	East African Community
ECOWAS	Economic Community of West African States
EU	European Union
FE	Fixed Effect
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GE	Government Effectiveness
GMM	Generalized Method of Moments
ISIC	International Standard Industrial Classification
NTB	Non-tariff Barrier
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Square
PV	Political Stability and Absence of Violence
RCA	Reveled Comparative Advantage
RE	Random Effect
RL	Rule of Law
RQ	Regulatory Quality
RTA	Regional Trade Agreement
TII	Trade Intensity Index
TTRI	Trade Restrictiveness Index

UN	United Nations
UNCTAD	United Nations Conference of Trade and Development
USD	United States Dollars
VA	Voice and Accountability
WBES	World Business Environment Survey
WTO	World Trade Organization
2SGLS	Two Stage Generalized Least Square
2SLS	Two Stage Least Square

ABSTRACT

This paperlooks at the effect of institutions on trade flows in East African Community (EAC). More specifically the study seeks to investigate whether institutional quality promotes intra-EAC trade. The analysis uses annual data from the year 2005 to 2014. The study has used panel data analysis of five EAC member countries and their trade partners in the EAC to determine the effect of institutions on intra-EAC trade flows using the augmented gravity model of trade. A random verses fixed effect models were used to estimate the model putting into consideration the time invariant variables. The hausman test has also been used to determine the choice of the model to be estimated. The results showed that institutional variables that are significant, promote trade flows among the partner states. GDP positively and significantly impacted on EAC imports in some of the member states. The language variablepositively and significantly trade flows in Tanzania and Uganda. Policy implications include enhancing policies that are geared towards trade increment and economic growth.

CHAPTER ONE

INTRODUCTION

1.1 Background

Institution and Technology employed, shape economic performanceand therefore determine the cost of transacting and producing (North, 1991).Institutions are the rules of the game in a society, which could be further explainedas the humanly designedrestrictions that shape economic and social interactions (human interactions). These interactions are vital tools for trade, growth and development of countries in a Regional Trade Agreement (RTA). Groot et al (2003) provide clear evidence of the effect of institution member states of RTA in promoting trade within the regional bloc by explaining the logic of removing barriers to trade across regional borders in terms of tariffs and non-tariff measures. Some of the trade objectives institutions deal with, in many regional blocs, include facilitating business activities and promoting investment.

The definition by North (1991) was supported by the three features of institutions that were explained by Acemoglu and Robinson (2008). The first feature is that they are humanly devised restrictions, secondly, they are rules of the game with certain enforcement mechanisms and third, they determine the incentive structures. For these features, institutions are vital for trade development as they tend to provide incentives to invest and means for contract enforcements.

Institutions can also be defined using the six measurements of quality as developed by Kaufmann, Kraay and Mastruzzi (2010). These measurements show the components of institution to include *Voice and Accountability (VA),* which measures freedom of association and expression. It largely reflects the extent of press freedom in the country and the extent to which citizens are involved in selecting their government. Another measure is *Political Stability and*

Absence of Violence (PV), it indicates the likelihood of the government to be overthrown by unconstitutional and violent means. It also captures the political motivated conflict and terrorism effects. Another institutional quality measure is the *Government effectiveness (GE),* which measures the quality of public service that includes the effectiveness of the bureaucracy and the degree of its independence from political intervention, process of policy formulation, implementation and credibility to policy reforms. *Regulatory Quality (RQ)* measures the capacity of the government to impose policies and regulations that facilitates private sector development. Another measure is the *Rule of Law (RL)* that measures the quality of legal system in the country especially in issues relating to contract enforcement, property rights protection and effectiveness and independence of courts. The sixth Kaufmann measure is the *Control of Corruption (CC)* that measures the extent to which public resources and power are used for private benefit. These indicators as explained by Kaufmann et al. (2010) describes institution concept by considering the above six items of a nation.

World Bank (2003) has also defined institutions specifically the quality of institutions in a country by using the ten indices of doing business as provided by World Bank Doing Business Dataset. The indices explain the level of business environment of the country by comparing 189 countries in world. The World Bank doing business indices specific explain the regulatory environment of a country in starting and operating a local firm, these regulations includes those dealing with starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting investors, paying tax, trading across borders, enforcing contracts and resolving insolvency. These indicators are ranked from 1 to 189 where a high ranking (number 1) means the regulatory environment for specific indicator is more conducive. Overall Institution has been used by several studies to mean a policy environment and

governmental responsibilities in creating a structure of incentives and economic environment conducive to broad economic growth and deeper regional integration.

Several studies have established that most developing countries have weak institutions (Olayiwola and Yao 2012; Fanta 2011; Dollar and Kraay 2002) with East African Community (EAC) as one of the RTAs where institutions are not performing as expected due to existing challenges in infrastructure, both hard and soft. Several strategies have been developed not only by EAC member states but by most least developed and developing countries to improve trade and investment in the regionhowever,this must be accompanied by additional reforms to ensure better and effective institutions.

Another concept in this paper is the trade performance, where this is defined as the ability for a state or region to trade with the rest of the world. Trade performance according to World Bank (2012) is explained by several indicators such as nation's or regional's export share in world exports and percentage share of export to gross domestic product (GDP), etc. In explaining regional trade performance of member states, the best indicator is the Intra trade value that shows the total value of trade that is traded by member states themselves within a specified period of time. Therefore trade performance can be examined by the trend of intra trade in an RTA where it is said to be good when there is increasing trend and poor performance when there is a decreasing trend. Also performance can be judged by the expected outcome for example if Intra trade was expected to increase by 80% for three years and in reality increased by let say 20% then for this case it can said that trade has been performing poorly for that period.

Some studies on international trade also support this argument, Dollar and Kraay (2002) suggested that, countries with better institution trade more,therefore in order for a country or

group of countries to benefit from openness strategies, thefunctioning of institution is important.Institution factors have to be taken into consideration since their impacts are as significant as other traditional barriers to trade such as tariffs and quotas therefore; institutions if not taken into consideration can impose unnecessary trade costs and therefore act as a barrier to trade. Institutional Quality of countries is a comparative advantage (Levchenko, 2000);developed countries with high quality institutions have comparative advantage in production and exportation of goods.

Institutions facilitate transfer of technology which promotes international trade. Furthermore, institutions are expected to establish an environment that will attract FDI and for domestic investors to engage in profitable export activities. Various studies support the idea that institutional quality is important in promoting trade. (Groot, 2003; Fanta,2011). This study analyses the role of institution in promoting trade performance of East African Community.

1.2 The East African Community:

East African Community was created by the three founding members: Tanzania, Kenya and Uganda as a result of their long history of co-operation. In 1917 Kenya and Uganda formed a custom union, later joined by Tanzania in 1927(EAC Secretariat, 2011). East African countries have continued to cooperate; forming a number of regional co operations before ratifying the East African Community treaty. East African High Commission (1948 — 1961); the East African Common Services Organization (1961 — 1967); the East African Community (1967 — 1977) and the East African Co-operation (1993 — 2000). The East African Community (EAC) is a regional intergovernmental organization that comprised five countries of Tanzania, Kenya, Uganda, Rwanda and Burundi. The main objective of EAC is to widen and deepen co-operation

among the partner states in among others, political, economic and social fields for mutual benefit (EAC, 2009). The EAC currently established a common market in 2010 and intendsto establish a monetary union.

The EAC institutional framework consists of the Summit of Heads of States, Council of Ministers, the East African Legislative Assembly, East African Court of Justice, the Secretariat, the Co-ordination Committee which makes recommendations to the council on the implementation of the treaty and the Sectoral Councils that deal with mailers relating to specific sector i.e. Agriculture; Defense; Education, Culture and Sports; Energy; Environment and Natural Resources; Foreign Policy and Coordination; Gender and Community Development; Health; Interstate Security; Legal and Judicial Affairs; EAC Affairs and Planning; Monetary Affairs; Monetary Union; Trade, Industry, Finance and Investment; Tourism and Wildlife Management; Transport, Communication and Metrology(EAC Secretariat, 2011).

Following the formation of EAC, intra-trade has witnessed dramatic increase. For example Kenya exported 382million USD in 2001 and 873million USD in 2011 to Uganda while it imported 8.7 million USD in 2001 and 116.4 million USD in 2011 from Uganda. Kenya also exported 172 million USD in 2001 and 476 million USD in 2011 to Tanzania while imported 7.4million USD in 2001 and 220 million USD in 2011 from Tanzania. It also exported 44.8 million USD in 2001 and 155 million USD to Rwanda and imported 0.0lmillion in 2001 and 53 million USD in 2011 from Rwanda. Also Kenya exported 23.5 million USD in 2001 and 67 million USD in 2011 to Burundi while imported 0.9 million USD in 2001 and 14 million USD in 2011 from Burundi.(World Bank, 2012)

1.2.1 Tariffs in EAC

The EAC under the custom union liberalized trade with the adoption of a three band Common external tariff (CET)on imports from third countries among EAC member countries. This has contributed to increased multilateral trade flows. However, regional trade has been affected by the CU in different ways. According to article 75 of treaty establishing the EAC, the member states agreed to eliminate internal tariffs and other charges of equivalent effect on trade, establish a CET and eliminate NTBs *inter alia*. The level of initial tariff is among what determines the direction of CET effects: the higher the tariff the more positive effects. (Appleyard, et. al, 2006). Although, EAC countries have progressively reduced their tariffs, the EAC CET led to an increased average MFN tariff for Uganda.

1.2.2 Tariff regimes and the Common External Tariff of EAC;

The East African Community protocol of 2004 under article 10 requires that partner states to abolish tariff and non-tariff barriers. During the transition period of *5* years partner states shall eliminate all internal tariffs and apply a common external tariff. During this period it was recognized that there is need to include asymmetry as a principle underpinning the EAC custom union due to different level of economic development of partner states. It was provided that goods to and from Uganda and Tanzania were to be duty free, goods from Uganda and Tanzania into Kenya were to be duty free while goods from Kenya into Tanzania and Uganda were categorized into category A which were eligible for immediate duty free treatment and Category B which were for gradual tariff reduction during five year period. The EAC common external tariff is the agreed set of duties imposed on imported goods that enter in any EAC partner state territory form a non-EAC country. Depending on the type of goods, the EAC common external tariff (CET) takes a very low rate on raw materials and capital goods, moderate rates on

intermediate goods and high rates on consumer goods. This is a characteristic of a "cascading" of tariff structure (Mcylntyre, 2005).

Table 1.1: The Evolution of Tariff Regimes in EAC

Reporter Name	Tariff Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Burundi	Simple Average	23.40	23.45	-	19.22	12.73	12.73	12.73	12.49	12.56	12.44	12.23
	Maximum Rate	40.00	40.00	-	30.00	30.00	30.00	30.00	60.00	75.00	60.00	60.00
	Binding Coverage	22.69	22.69	-	22.01	22.01	22.01	22.01	21.99	21.99	21.99	16.48
Kenya	Simple Average	-	-	16.77	12.76	12.66	12.65	12.52	12.49	12.56	12.46	12.23
	Maximum Rate	-	-	100.00	100.00	100.00	100.00	60.00	60.00	75.00	60.00	60.00
	Binding Coverage	-	-	14.76	14.76	14.76	14.76	14.83	14.83	14.83	14.83	8.06
Rwanda	Simple Average	-	9.87	-	18.74	18.74	-	18.66	12.49	12.56	12.44	12.23
	Maximum Rate	-	25.00	-	30.00	30.00	-	30.00	60.00	75.00	60.00	60.00
	Binding Coverage	-	100.00	-	100.00	100.00	-	100.00	100.00	100.00	100.00	93.45
Tanzania	Simple Average	-	13.55	-	12.76	12.65	12.65	12.52	12.49	12.56	12.46	12.23
	Maximum Rate	-	25.00	-	100.00	100.00	100.00	60.00	60.00	75.00	60.00	60.00
	Binding Coverage	-	13.65	-	13.38	13.38	13.38	13.32	13.32	13.32	13.32	7.65
Uganda	Simple Average	8.95	8.61	7.84	12.76	12.66	12.65	12.52	12.49	12.56	12.44	12.23
	Maximum Rate	15.00	15.00	15.00	100.00	100.00	100.00	60.00	60.00	75.00	60.00	60.00
	Binding Coverage	15.74	15.74	15.70	15.74	15.74	15.74	15.78	15.78	15.78	15.78	9.95

Source: World Integrated Trade Solution (TRAINS)

1.2.3 Overall Trade Restrictiveness Index:

Trade Restrictiveness Index (TTRI) explains the difficulties of doing business in EAC region. These are factors that impact trade activities in EAC that requires improvement which includes but not limited to infrastructure especially that are associated with transport infrastructures, border measures and port inefficiencies.

Table 1.2: Trade Restrictiveness Index

Country	TTRI (MFN applied tariff) –	Ease of doing Business – Rank	Export taxes (as a percent of	TTRI (applied tariff, incl. prefs)

	All Goods		goods exports)	– All Goods
Rwanda	16.34	119.3	..	16.24
Burundi	12.40	175.7	..	12.40
Uganda	11.70	107.7	0.09	7.16
Kenya	8.25	85.67	..	7.79
Tanzania	9.09	127	..	7.48

Source: World Bank, 2010

Table 1.2shows the restrictiveness index for EAC members for the period of 2000 to 2009. On average the TTRI shows high restrictions for Rwanda and Burundi while for the former members the average TTRI was a single digit except for Uganda. It also shows the ranking for easiness of doing business in the region where on average for the period of 2000 to 2009 EAC was ranking number 123.1 which tells that the region still has difficulties in trading.

1.2.4 Overall Trade Patterns of EAC Partner States

Regional trade in East African Community has increased significantly in the period of 2000 and 2014. The major trading partners are European Union (EU), India, United Arab Emirates, China, South Africa, Japan and other regional blocs. EU dominates imports of capital goods and export of soft commodities while India, China and other Asian countries are major sources of petroleum products, electronics and pharmaceutical products.

1.2.5 Commodity composition of Exports and Imports for the EAC

EACprincipal exports are composed of agricultural products which largely reflect its level of development since high developed regions are expected to export advanced manufactured products and highly sophisticated commodities. Other products that dominate EAC exports are mineral products and tourism. Similarly regional imports are dominated by capital equipment, industrial supplies and raw materials, motor vehicles and spare parts, crude oil and refined oil and fertilizers. Share of agricultural sector has been decreasing especially for Kenya due to increase in export of manufactured goods. Other EAC members have shown a slightly increase in manufactured products like Tanzania while others have maintained a large agricultural sector for a longer period of time. Mineral products are also some of the exported commodities and Tanzania takes larger share for their exports. Tourism is also another service that is traded in EAC and contributes much on supplying foreign exchange.

Table 1.3: Sectoral Shares of GDP, 2006-20 10

Agriculture Share of GOP, %

Country/Year	2006	2007	2008	2009	2010
Uganda	22.6	20.7	21.6	23.6	21.1
Tanzania	26.2	25.8	25.7	24.6	24.1
Kenya	23.8	22	22.7	23.9	-
Rwanda	36	32	34		-
Burundi	48.58	48.42	*46.85*	47.04	43.86

Industrial Share of GOP					
Uganda	22.3	23.9	24	23.8	24.9
Tanzania	20.8	21.2	21	22	22.3
Kenya	16.4	16.3	17.4	16.9	17.3
Rwanda	14	14	15	14	-
Burundi	19.37	16.4	16.86	16.29	17.48
Service Share of GDP					
Uganda	49.1	49	48	46.2	47.7
Tanzania	43.3	43.3	43.8	43.6	43.9
Kenya	49.7	50.8	48.8	48.3	48.9
Rwanda	42	45	46	46	-
Burundi	32.05	35.18	36.29	36.87	38.66

Source: East Africa Community Annual Report.

The share of three sectors i.e. agriculture, industrial and services sectors shows the composition of EAC exports and their contribution to national GDP. EAC ability to produce value added and manufactured exports are minimal and remains to be the exporter of primary commodities and small range of manufactured and value added goods. The increase in service share has made the agriculture sector share to decrease for all EAC partner states i.e. Tanzania agricultural share to GDP was 26.2 in 2006 and declined to 24.1 in 2010 while the service share increased from 43.3 to 43.9. Another EAC state that experienced a decrease in the share of agricultural while service share increase is Burundi with a decrease from 48.58 to 43.86 and service share increase from 32.05 to 38.66.

1.2.6 Revealed Comparative advantage Index

The Revealed Comparative Advantage (RCA) is an indicator that shows the export potential of a country. This indicator will give a picture to whether EAC countries have different comparative advantage to have high bilateral trade intensity or the trade depend much of the intra industry.

Table 1.4:Revealed Comparative Advantage

Reporter Name	Product Description	RCA -2003	RCA- 2013
Burundi	Animal and vegetable oils and fats	0.37	-
Kenya	Animal and vegetable oils and fats	1.17	-
Rwanda	Animal and vegetable oils and fats	-	-
Tanzania	Animal and vegetable oils and fats	0.05	0.22
Uganda	Animal and vegetable oils and fats	1.08	2.35
Burundi	Beverages and tobacco	21.48	-
Kenya	Beverages and tobacco	0.35	-
Rwanda	Beverages and tobacco	0.38	0.06
Tanzania	Beverages and tobacco	1.22	0.46
Uganda	Beverages and tobacco	5.11	2.12
Burundi	Crude materials, inedible, except f	0.66	-
Kenya	Crude materials, inedible, except f	0.61	-
Rwanda	Crude materials, inedible, except f	5.96	2.99
Tanzania	Crude materials, inedible, except f	1.68	0.28
Uganda	Crude materials, inedible, except f	1.47	0.13
Burundi	Food and live animals	2.22	-

Kenya	Food and live animals	0.30	-
Rwanda	Food and live animals	3.52	1.09
Tanzania	Food and live animals	3.65	0.76
Uganda	Food and live animals	2.68	1.13
Burundi	Manufact goods classified chiefly b	0.03	-
Kenya	Manufact goods classified chiefly b	1.15	-
Rwanda	Manufact goods classified chieflyb	0.14	0.33
Tanzania	Manufact goods classified chieflyb	0.62	1.27
Uganda	Manufact goods classified chieflyb	0.61	1.27
Burundi	Mineral fuels, lubricants and relat	0.14	-
Kenya	Mineral fuels, lubricants and relat	1.27	-
Rwanda	Mineral fuels, lubricants and relat	-	**0.01**
Tanzania	Mineral fuels, lubricants and relat	0.01	1.95
Uganda	Mineral fuels, lubricants and relat	0.36	0.96

Source: Author's Calculation of Data from WITS COMTRADE

Table 1.4 shows comparative advantage indicators for EAC partner states on specific products for the period of 2003 and 2013. This table clearly shows that the EAC trade is based on comparative advantage of each partner state despite of having intra — EAC trade that is based on manufactured goods. For example in 2003, Kenya Animal and vegetable oils and fats with RCA of 1.17 and 1.08 comparative advantage on manufactured goods with RCA of 1.15 while Kenya also had a comparative is advantage on beverages and tobacco with RCA of 0.35 and .038 respectively, Kenya and Burundi had comparative disadvantage on crude materials with RCA of 0.61 and 0.66 respectively, also Kenya had comparative disadvantage on food and live animals

with RCA of 0.30. Therefore from the table 4, the RCA tells us that each EAC partner states has a comparative advantage of at least one commodity that it can be trade to other partner states and hence making the region to trade on comparative advantage of partner states.

1.3 Problem Statement

Scholars and policy makers have echoedthat international trade is a means of improving welfare of people in a country. Based on this assumption, many countries have enhanced their participation in international trade by eliminating traditional barriers to trade. Elimination of tariffs, quotas and other formal and informal barriers to trade has been given much attention by scholars and policy makers in intensified efforts to establish deep regional integrations to improve gains from trade allowing free movements of trade, capital and labour(Krueger 1999).

Barriers to trade are more than justtariffs and quota. Quotas and tariffs have been gradually removed but the proportion of trade increase is lower than that of tariff and quota reduction. EAC partner states have zero tariffs to substantial trade among partner states and the number of non-tariff barriers is minimal but still this does not reflect the performance of intra trade in the regional. Anderson (2000) showed that formal trade barriers fail to account for the low international trade because changes in tariff and non-tariff barriers over the last several years had little impact on international trade performance. This has also been evident by the gradual reduction of tariffs and non-tariff barriers at the multilateral level championed by World Trade Organization (WTO), but this has had little impact on trade performance of many countries.

Following the formation of EAC, there has been an increase in intra-trade. The growth rate has seen an increase as a result of removal of substantially all trade barriers which are tariffs and non-tariff barriers among member states though there still other NTBs and inadequate national

capacities to domesticate regional trade policies. All these tend to hinder trade flow between member states and constrain the private sector supply capacity. Most studies have argued that weak institutions can negatively impact trade by imposing additional costs of doing trade (transaction cost). This study tries to investigatethe effect of institutions in EAC member states trade flows in achieving and promoting objectives of EAC regional trade agreement.

1.4 Research Questions

This study on the effect of institution on trade flow in East African Community partner states addresses the following questions:

- How much of trade volume increase was a result of institutional change?
- What implications do the results in the above four questions suggest for policy?

1.5 Objective of the Study:

The general objective of the study is to investigate the effect of institutional quality on trade performance of East African Community within the context of regional trade agreement. The specific objectives are:

- To analyze the effects of institution indicators on trade flows in the East African Community
- To provide appropriate policy recommendation based on study findings

1.6 Justification of the Study:

Formation of EAC aimed at boosting trade and sustaining economic growth while major expectations of facilitating trade, capital movement and reducing the cost of doing trade have not been well realized despite of the removal of tariff and non-tariff barriers. This raises the need to

find other impediments to EAC trade apart from the normal formal and informal tariffs and non-tariff measures. The assessments of the impact of institution quality in facilitating trade in RTAs where almost all formal and informal tariffs and non-tariff barrier to trade are zero provide the justification for this study. The study analyzes all EAC partner states institutions to see the state of institutional quality in the region and their impact on EAC trade flow.

1.7 Scope of the Study

The analysis of the study focuses on the effectof institutionquality on trade flows in EAC intra-trade. The study uses institutional indicators of each EAC partner states to explain the trade flows of each partner state in the regional arrangement. It uses a gravity model to establish the relationship between institutions and trade flows in EAC for the period of 2005 to 2014.

1.8 Organization of the Study:

The study is structured into chapters. The second chapter consists of theoretical as well as empirical literatures that are relevant to the study. It also has an overview of literature review. Chapter three covers the methodology which has an introduction with a theoretical framework, the model specification, type of data and the choice of estimation. The empirical analysis and presentation of results are undertaken in chapter four. Chapter five providessummary, conclusions and policy implications of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

Studies relating to trade and development have been given much attention by scholars but few have investigated the impact of institutions on tradeperformance of a regional trade agreement. This section reviews the related literature of analysis of institutions on trade performance including the theoretical and empirical literature review. The review will set out the issues, methods and conclusion appeared from previous studies related to institution concept and trade performance. Studies on institutions and trade development have been recognized for a number of years. Adam Smith (1776) pointed that private contracting explained as a form of quality institution is an important condition for the mutually beneficial exchanges which promote specialization, innovation and growth. Rodrick (2008) and Khawaja (2009) also recognized the importance of institutions and concluded that no society can exist without some forms of institutions and the different level of growth is largely explained by the quality of institution in a society.

2.2. Theoretical Literature Review

2.2.1. Trade Theories

The classical school and its trade theory including Adam Smith's theory of *absolute advantage* in his publication; *The Wealth of Nations* (1776) and David Ricardo's work on *Comparative advantage* (1817), evolved as a thorough critique to the theories of early mercantilism in which taxing imports was used as argument for creating jobs in a country according to the mercantilist

(Geda, 2009). Other theories included The Heckscher-Ohlin Theory, Leontief Paradox among others

2.2.1.1. Absolute Advantage

Smith emphasized the significance of the division of labor in increasing output, and considered international trade as a specific case of specialization, i.e. international specialization among nations. In his work, Smith explains thatin a world of scarce resources and unlimited wants, every country is bound to specialize in the production of those goods that can be produced at a lower absolute cost, i.e. fewer hours of labor. These goods, in turn, will be exchanged for the goods for which other countries have an absolute advantage in production. (Viner, 1937).

2.2.1.2. Comparative Advantage

In this principle Ricardo (1817) said that countries should specialize in producing those goods that require relatively less hours of labor rather than in absolute terms; which was a development of Smith's idea (Viner, 1937).Comparative advantage occurs when a country cannot produce a product more efficiently than the other country; however, it can produce that product better and more efficiently than it does other goods. A study by Redding and Venable (2004a, 2004b) represented the Ricardo idea of comparative advantage to institution quality where countries with better institutions are likely to have comparative advantage on institutional based exports.

2.2.1.3. Heckscher-Ohlin Theory (Factor Proportions Theory)

The classical theories of Smith and Ricardo didn't help countries determine which products would be an advantage because they assumed that free and open markets would lead countries

and producers to determine goods that they could produce more efficiently. This theory focused on how a country could gain comparative advantage by producing products that utilized factors that were in abundance in the country; based on a country's production factors like land, labor and capital (Geda, 2009).

2.2.1.4. Leontief Paradox

According to this theory, countries that were abundant in capital should export more capital-intensive goods. In his research, Leontief found the opposite in the United States of America; where it was instead importing more capital-intensive goods which is the reverse of the factor proportions theory hence the Leontief paradox.

The evolution of trade as explained by Krugman and Obstfed (2003) started within a small community and expands beyond this community to the regional level and eventually to the rest of the world. They also explained that at each developmental stage, economies tend to adopt elements of specialization, division of labour, and more efficient technological usage. The evolution is known as the gradual evolution from autarky to specialization and division of labour. (Krugman and Obstfed, 2003).

Similar to Krugman and Obsfted (2003), the UNCTAD report (2012) noted an increasing interest of forming regional trade agreements (RTAs), by January 2012, 319 RTAs were notified to World Trade Organization (WTO). Current RTAs have become deeper and expanding their scope beyond those covered by the WTO. Due to expansion of trade, the likelihood for conflicts over the exchange of values becomes a source of concern and more resources have to be employed in order to enforce rules and orders for effective trade to take place (Olayiwola and Osabuohien, 2008).

Growth economists view institution as a tool for improving trade gains of developing countries, also means of facilitating technology transfer from developed countries. Basically institutions help to channel available resources in the nation to be used in activities that has a comparative advantage on it and helps to provide environment which improve the capacity for domestic firms to absorb technology from developed nations. This reflects the general view of economists that trade takes place at lower transaction costs when trading countries' institutions are perfect. The indirect effect of institutions to trade arises as a result of direct effects of institutions to variables that determine trade flow. Investments and productivity are part of determinants of trade flow of a country or region (Rodrik, 1995 and Elbadawi, 1998). Institutions affect investments by altering investor's perception and then the flow of foreign direct investments(FDI)to countries. Hall and Jones (1999) explained that low productivity in a country is largely a result of weak institutions.

A theoretical model designed by Anderson and Marcouiller (2002) relates corruption and inadequate contract enforcement in importing countries with low trade performance. The model foresees the effects of thieves and corrupt officials to impose transaction costs that are equal to unseen tariff. This can constrain trade in countries where transparence and contract enforcement is low while theft and corruption is high (Fanta 2011). Redding and Venable (2004a, 2004b) represented the Ricardo idea of comparative advantage to institution quality where countries with better institutions are likely to have comparative advantage on institutional based exports. Fanta (2011) added theoretical ideas on this which explore the effect of institutions on supply side of trade by pointing that difficult customs procedures might have less motives to exportation similar

to poor contract enforcement may discourage foreign direct investments (FDI) that engage in export business.

Anderson and Marcouiller (2002) showed how institutions affect trade by relating low institution quality to hidden transaction cost of trading across nations which arise from insecure exchange in international trade, difficultness of enforcing contracts across boundaries, bribes from custom officials and lack of security that may lead to hijacking of shipments. Likewise, Lavallee (2005) noted that institutional proximity tends to increase trade and added that corruption in both importing and exporting countries acts as barrier to bilateral exports, which is harmful to trade especially in a situation of weak bureaucratic quality. Anderson and Young (1999) also suggested that lack of contract enforcement may act as a tariff on risk-neutral traders and hence reduce trade. Overall institutions matter in trade relation because they provide the incentives/disincentives in economies create structures that shape the direction of economic outcomes (North, 1991; Williamson, 2000).

Groot et al (2003) provided an economic rationale for having quality institutional framework as it reduces uncertainty about contract enforcement and general economic governance. They concluded that this helps to reduce transaction costs directly, by increasing security of property, as well as indirectly by increasing the level of trust in the process of economic transactions.

2.3. Empirical Literature Review

Several methodological approaches have been used in examining the impacts of institution and institutional quality on trade flows; most of which have used the gravity model analytical tool

amongst other methods. These methods have been employed with different types of data including cross-sectional data, time series, and panel data either at an aggregate or sectorial level. Studies have pointed the overall trade performance of African countries to be low for a long period of time (Yang and Gupta, 2007). The reason for poor performance have been small size of markets, poor transport facilities and high trading costs, double taxation, which have made them benefit marginally the potential fruits of trade. Institutions affects directly trade activities by acting as an incentive to invest and trade also affect indirectly by imposing transaction costs to trade that may arise from corrupt custom officials.

Anderson and Young (1999) suggested that lack of contract enforcement may act as a tariff on risk-neutral traders and hence reduce trade. The World Bank Survey of 3685 firms in 69 countries report (1996) found that corruption indicator to rank as the second most important obstacle for doing business. Crimes and theft were also rankedfifth while terrorism fifteenth (Brunetti, Kisunko and Weder, 1997).

Similar to Yang and Gupta (2007) who studied the overall performance of African countries, Acemoglu and Robinson (2008) have shown the reason for rapid economic development in South Korea to outweigh North Korea in their study to be a result of institutions that support inducement of investment in South Korea. Similar conclusion was observed on Parsons and Robinson (2006) study on economic growth of Botswana and Zambia where Botswana outgrewZambia chiefly on the accounts of having better institutions.

Using structural model of import demand, Anderson and Marcouiller (2000) investigated the relationship of insecurity (institutional indicator) and pattern of trade where they observed that corruption and imperfect contract enforcement to dramatically reduce international trade. In their study, the authors assumed insecurity to act as a hidden tax on trade and found that inadequate institutions constrain trade as much as tariffs do. They also showed that by omitting the institutional quality variables biases typical the gravity model estimates.

Some studies have linked institutional quality with infrastructure quality. Limao and Venables (2000) linked infrastructure to transportation costs and showing that transportation contributes to 40% and 60% of trade cost for coastal and landlocked countries respectively. Levchenko (2004) taking into consideration that country's specific infrastructural provisions to reflect institutions, found that differences in institution quality were a source of comparative advantage and institutions had strong effect on trade patterns. Similar study was done by Bougheas et al (1999) using the DSF Richardian trade model to investigate the impact of institutions on trade. The study used transport cost and infrastructure to explain institution and found a positive relationship between infrastructure and trade volumes in countries that had better infrastructure.

Studies that relate institutions and trade in regions have gained much attention in the current periods. Institutions plays a role of reducing difficulties in doing business in regions, Ogundipe and Ojeanga (2013) studied the relationship between trade and institutions in regions using the generalized method of moments (GMM) estimation technique and other instrumental variable estimation technique such as two stage least square (2SLS) and two stage generalized least square (2SGLS). They found institutions to have significant effect on trade. They also found that

domestic institutions to have more significant effect on trade than international institutions. Institution effect on export has also been studied by Olayiwola and Yao (2012) using the system of generalized method of moments (GMM) for 12 ECOWAS countries and established that institution measured by climate adaptation ability exerts positive and significant influence agricultural export. Also they added that institutions have the potential of improving the effect of environmental challenges on ECOWAS' agricultural exports and therefore they called for institutional strengthening in the sub-region to address the impeding climate change indicators. Such institutions includes those aiming at preventing and mitigating adverse environmental hazards and provision of timely and reliable environmental hazards forecast where it will helps farmers to prepare and protect their productive capacities against adverse environmental challenges (Olayiwola and Yao, 2012).

Institutional quality and bilateral trade flow relationship has also been investigated by Jansen and Kyvik (2004) on their work *"Institutions, Trade Policy and Trade Flows"* where they used Kaufmann et al (2002) institutional data of several countries including Somalia, Congo, Madagascar, Chad, Hungary, Dominican, Switzerland, Singapore, Peru, Finland and Hong Kong. The result of their study was that domestic institutions have a positive and significant impact on bilateral trade flows.

Anderson and Marcouiller (2002) used the gravity model and provided an empirical support to the impact of the quality of institutions on bilateral trade. Related study to this was also done by Groot et al (2003) using gravity model, both studies found that improved institutions quality cause higher trade volume, this is supported by the observation from developed countries where

intra trade is higher than for developing countries where it is assumed that developed countries have better institutions than developing countries.

Redding and Venables (2004a and 2004b) identified the determinants of export performance using the gravity model. The model proposed several determinants of export performance of a country including institutions. The results were that poor external geography, poor internal geography and poor institutional quality have equal contribution to poor export performance of Sub Saharan African countries.

Fanta (2011) also used the gravity equation to analyze the impact of institutional quality on export performance. He found that high institutional quality of the north significantly increases export. His conclusion explains the reason for having massive intra trade for developed countries than when developing countries trade themselves.

Iwanow (2008) assessed the impact of institution quality on trade performance using a sectoral gravity model approach by augmenting the standard gravity model with a measure of institution quality which is assumed to impact on trade cost. His study estimated the gravity model at sectoral level and assessed the relative importance of institution environment for each sector. He used a database that contains nearly 670000 observations of bilateral trade for 109 developed and developing countries classified according to the 29 ISIC rev.2 manufacturing industries. His results of the application of gravity model confirm that institutional environment is more important for exports of more complex institutionally depending goods.

Another study by Bojnec and Ferto (2012), investigated the effects of the institutional determinants on trade in agricultural and food products among the OECD countries by using a gravity model approach. The study employs an extended gravity model to first find the effect of quality institutions on agricultural and food trade respectively. The study investigated the effect of institutional similarity of governance on agricultural and food trade and the bilateral influence of institutional distance on pattern of agricultural and food trade respectively. They found that separate effects for the institution similarity and the institution quality on trade pattern. Institution similarity had positive and significant impact on trade in a similar institutional framework for agricultural, but less for food products. Lastly they found that the institution quality had significant positive impact on trade in both agricultural and food products for importing countries.

2.4. Overview of the Literature

This chapter highlights that institution isa very important factor for trade enhancement. Literatures have pointed that different institutions can act as source of comparative advantage for exporting country. Similarly strong institutions particularly a legal system that is capable of enforcing commercial contracts, impartial and efficient execution of legal proceedings by an independent court have positive impact on expanding trade and therefore as observed by several economists, for trade to take place at less transaction costs, partner countries' institutional environment needs to be perfect. Marcouiller (2002) argued that imperfect contract enforcement in importing countries has the same effect as rising tariffs and hence increases trade costs by the same proportion to tariffs. Overall quality of institutions facilitates trade in regional integrations and for the world trade too.

The empirical literature also highlights the gravity model as methodological approach mostly used in analyzing the impacts of institutions or institutional quality on trade. This makes the gravity model popular and appropriate for predictions in case past information about variables is available. This study uses gravity model to assess the effect of institution on trade in the EAC. No study at all has been done to establish the effects of institution on trade flows in the EAC. This study therefore adds knowledge by using a gravity model developed by Tinbergen (1962) and Poyhonen (1963)to analyze the role played by institution on trade performance of EAC since its re-establishment in 2000 and after its enlargement in 2007 when Rwanda and Burundi became members. However, an improvement is made by the addition of institution indicator variables and other explanatory variables like the economic sizes, population and economic/geographical distance between the trading partners.

CHAPTER THREE

METHODOLOGY

3.1. Introduction

In this part, the study analyzes the effect of institutions on trade direction of EAC and intra EAC trade using an augmented gravity model. This study usespanel data on bilateral trade flows of EAC countries and estimated an augmented gravity model which includes variables to capture the effects of institutional quality. Before the discussion of results, different diagnostic tests was estimated; which included Hausman Tests.

3.2. Theoretical Framework

The origin of the gravity model is found from the period of Sir Isaac Newton in 1687 when he discovered the Law of Universal Gravitation as stated in equation. The gravity model as applied by Tinbergen (1962) and Poyhonen (1963) is the best model for analyzing trade flows of international trade. It is used to explain the determinants of trade of one country to another. Although the model cannot capture the composition of trade which is its limitation; it captures the volume of trade (Appleyard and Field, 2001) and it is still a useful model to explain the driving forces of trade from one country to another (Nganga, 2006). Despite other criticism of applying gravity model in the sense that it lacks theoretical foundation,a study in trade theory by Baldwin and Taglion (2006) has managed to strengthen the theoretical basis for gravity model by validating their empirical importance in testing bilateral trade flows. The gravity model utilizes gravitation force concept in comparison to explain trade flow among countries or regions, it is useful for estimating the impact of bilateral trade and the idea is trade between countries is an increasing function of their masses (i.e. country's GDP are used as a proxy of masses) and a

decreasing function of the distance between them (Helpman and Krugman 1985). They specified a multiplicative form of a model as follows;

$$F_{ij}=\mathrm{G}\frac{\mathrm{M}_i\mathrm{M}_j}{\mathrm{D}_{ij}^2} \quad (1)$$

Where:

F_{ij} = attractive force between two masses

M_i = the first mass

M_j = the second mass

D_{ij} = the distance between the centers of the two masses

G = gravitational constant

After introducing the determinants of trade, the gravity model of bilateral trade becomes:

$$Trade_{ij}=\mathrm{A}\frac{GDP_i^{b1}GDP_j^{b2}}{Distance_{ij}^{b3}} \quad (2)$$

Where, $Trade_{ij}$ is the trade value of country *i*and *j*, GDP_i and GDP_j represent the country's incomes of country *i*and *j* respectively, $Distance_{ij}$ is the geographical or economic distance (distance between the major economic centers of the trading partners) between country *i*and *j's*capital cities while *A*represents a constant of proportionality.

Its multiplicative nature therefore allows us to take the logarithms of equation (2) in order to obtain a linear relationship between the variables as follows;

$$\text{Log}(\boldsymbol{Trade_{ij}}) = A + b_1 \text{Log}(\boldsymbol{GDP_i}) + b_2 \text{Log}(\boldsymbol{GDP_j}) - b_3 \text{Log}(\boldsymbol{Distance_{ij}}) + e_{ij} \quad (3)$$

Where: b_1 , b_2 and b_3 are the coefficients to be estimated and A is a constant. However, e_{ij}represent the error term and captures any other factor that might affect trade flowsbetween countries. Equation (3) predicts trade between countries to be positively relatedto their GDPs and negatively related to distance (which is time invariant) between theireconomic centers.

3.3. Gravity Model Specification

The standard gravity model illustrates the determinants of bilateral trade between countries by showing that trade is positively related to countries' masses and inversely related to impediments like distances and tariffs of trading partners. The model predicts that trade will be greater in fixed terms when the masses of countries are great and closer the countries' are.The basic gravity model for estimating trade flows within regional blocs is a multiplicative form of an equation described as follows;

$$X_{ij} = b_0 GDP_i^{b_1} GDP_j^{b_2} POP_i^{b_3} POP_j^{b_4} DIST_{ij}^{b_5} U_{ij} \quad (4)$$

However, the estimated gravity equation can only be derived by taking the natural logarithms of the variables in equation (4) as follows;

$$ln\, X_{ij} = lnb_0 + b_1 ln\, GDP_i + b_2 ln\, GDP_j + b_3 ln\, POP_i + b_4 ln\, POP_j + b_5 ln\, DIST_{ij} + \mu_{ij} \quad (5)$$

Where:

X_{ij} =the total trade between country i andj

GDP_i = the GDP of country i

GDP_j = the GDP of country j

POP_i =country i's population

POP_j=country j's population

$DIST_{ij}$=the geographical distance between two countries i and j; the greater the distance the more the cost of transportation is, hence reducing the volume of trade between countries i and j

μ_{ij}= the normal error term

ln = the natural logs

Equation (5) has the main variables that determine trade flows within atrading bloc. This is supported by the trade theories proposed by Hecksher-Ohlin modelsand models of imperfect competition.

This paper uses the augmented gravity model with policy variables that proxy the institutional environment of EAC member states to assess their impact on EAC trade performance. Trade performance here represents the actual values of trade flows of the EAC member states. It is also measured as the total exports of theEAC member states. The objective is to estimate the magnitude of the effect of different institution variables on EAC trade and therefore the gravity model is estimated at country's total trade level. The augmented gravity model is shown below.

$$ln\, X_{ij} = ln\, b_0 + b_1\, ln GDP_i + b_2\, ln GDP_j + b_3\, lnPOP_i + b_4\, lnPOP_j + b_5\, ln DIST_{ij} + b_6\, ln INST_i + b_7 ln\, LANG_{ij} + \mu_{ij} \quad (6)$$

Where $X_{ij}$is the export from country *i*to country *j*.This variable estimates the trade performance of each country to make it the indicator of trade performance of this study;$GDP_i$is the real gross domesticproduct of country *i*; $GDP_j$is the real gross domestic product of country *j*; $POP_i$is the population of country; $POP_j$is the population of country *j*; $DIST_{ij}$is the geographical oreconomic

distance between the two countries measured in kilometers between the capitalcities. It shows a negative relationship between trading partners and the volumes of tradebecause it increases the cost of transport;$INST_i$ is the measure of both domestic and international institutional quality, this is the variable of our interest where it captures country i's institution level; $LANG_{ij}$ is a dummy variablewhich is unity if both trading partners i and jspeak common language and equals zero otherwise; $\mu_{ij}$is theerror term.

GDP_i and GDP_j represent the economic size of theexporting and importing countries and are positively related to trade; hence their coefficients $b_1$and $b_2$are expected to be greater than zero based on the gravity model.$b_3$andb_4 could take any signs this is because based on the magnitude of absorption effect and economies of scale, population can influence positively or negatively bilateral trade (Agbodgi, 2008). A large population and a high absorption effect is associated to negative effect on trade flows while a large population and large economies of scale is associated with a positive effect. $b_5$is less than zero meaning distance that measures trade cost is expected to negatively influence trade flows. $b_6$is the coefficient of institution variable where is expected to be greater than zero implying that higher quality of domestic institutions accelerate trade among partners.$\boldsymbol{b_7}$is expectedto be greater than zero indicating that countries that have common language influence trade flows.

3.4. Type of Data and Source

This study uses panel data for the period 2005-2014.Data on bilateral trade was extracted from WITS UN-COMTRADE database; data on distance between trading partners from Centre d'EtudesProspectives et d'InformationsInternationales (CEPII) while economic size variables

(real GDP and population) wasobtained from World Bank Development Indicators. Kaufmann et al. (2010) measures of institutional qualityhave beenused and obtained from the Worldwide Governance Indicators (WGI).

3.5.Choice of estimation and Diagnostic Tests

Specification testhas beendone to establish the most appropriate modeldesign that fits the data. This is important to develop consistent empirical results and obtain correct policy recommendations and conclusions. More importantly, the use of panel data in a study is advantageous in the sense that it considers both path and space.Panel data is alsoknown for its capability to control for heterogeneity or individual effects.

The Hausman specification test is always estimated to determine the choice between the Fixed Effect Model and the Random Effect Model. The Hausman specification test isbased on the hypothesis of no correlation, where both OLS in least squared dummy variable (LSDV) model and the generalized least squares (GLS) are consistent, but OLS is not efficient. The null hypothesis tests whether the coefficientsestimated by the efficient random effects are the same with the ones estimated by theconsistent fixed effects model. Rejecting the null hypothesis indicates that the fixed effect model is appropriate while the random effect model is not the appropriate estimation technique (Greene 2003).

The diagnostic test ensures that model framework satisfies the various econometric assumptions in order to develop reliable coefficient estimates. These includes test for panel level Heteroskedasticity; the estimation equation assumes that the standard error of the regression is

homoscedastic with the same variance across individuals and time and test for serial correlation; the disturbanceterm in the estimation equation assumes that only correlation over time is due to the presence of the same unit across a panel. Ignoring these tests lead to consistent but inefficient estimates of the regression coefficients, as well asstandard errors.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1. Introduction

The chapter presents descriptive and empirical results of the analysis of variables estimated in the model. Descriptive statistics reports the mean, the standard deviation and the number of observations while the empirical analysis gives the regression results of the estimated model.

4.2. Descriptive Statistics

This section gives a summary of the main variables used in the estimation of the model.

This is shown in tables below.

The results in Table 4.1indicate that the data was a strongly balanced panel with 40 observations.

The mean average of the dependent variable $ln\, X_{ij}$in Burundi stands at 8.23 with the highest level of variability and a dispersion around the mean of 1.04.

The low standard deviation indicates a slight variation of intra-EAC trade among the member states.

Table 4.1: Summary Results for Burundi

Variable		Mean	Std. Dev.	Min	Max	Observations
lnXij	overall	8.234634	1.042896	4.65573	10.38223	N = 40
	between		.6994093	7.432906	9.089782	n = 4
	within		.8434132	5.457458	9.958503	T = 10
InGDPi	overall	7.5362	.3318421	7.018632	8.037106	N = 40
	between		0	7.5362	7.5362	n = 4
	within		.3318421	7.018632	8.037106	T = 10
InGDP	overall	9.767364	.857095	7.856112	11.01759	N = 40
	between		.8899671	8.538428	10.53775	n = 4
	within		.354047	9.067915	10.2849	T = 10
lnPOPi	overall	2.228171	.1004097	2.071184	2.381106	N = 40
	between		0	2.228171	2.228171	n = 4
	within		.1004097	2.071184	2.381106	T = 10
lnPOPj	overall	3.322235	.6061086	2.198139	3.947827	N = 40
	between		.6841398	2.315521	3.805606	n = 4
	within		.0856228	3.172235	3.470376	T = 10
lnDIST	overall	6.230836	.630446	5.19299	6.765532	N = 40
	between		.718819	5.19299	6.765532	n = 4
	within		0	6.230836	6.230836	T = 10
VA	overall	-.8268076	.127337	-1.018934	-.6381497	N = 40
	between		0	-.8268076	-.8268076	n = 4
	within		.127337	-1.018934	-.6381497	T = 10
PV	overall	-1.439739	.2496657	-1.784853	-.8936569	N = 40
	between		0	-1.439739	-1.439739	n = 4
	within		.2496657	-1.784853	-.8936569	T = 10
GE	overall	-1.129336	.0973446	-1.311597	-1.02941	N = 40
	between		0	-1.129336	-1.129336	n = 4
	within		.0973446	-1.311597	-1.02941	T = 10
RQ	overall	-1.090934	.1742333	-1.358372	-.7730746	N = 40
	between		0	-1.090934	-1.090934	n = 4
	within		.1742333	-1.358372	-.7730746	T = 10
RL	overall	-1.082514	.0824916	-1.190349	-.9337996	N = 40
	between		0	-1.082514	-1.082514	n = 4
	within		.0824916	-1.190349	-.9337996	T = 10
CC	overall	-1.139231	.1534909	-1.439089	-.899687	N = 40
	between		0	-1.139231	-1.139231	n = 4
	within		.1534909	-1.439089	-.899687	T = 10
LANG	overall	.25	.438529	0	1	N = 40
	between		.5	0	1	n = 4
	within		0	.25	.25	T = 10

The results in Table 4.2 indicate that the data was also a strongly balanced panel with 40 observations. The mean average of the dependent variable $ln\, X_{ij}$in Kenya stands at 12.10 with the highest level of variability and a dispersion around the mean of 1.01 indicating a variation of intra-EAC trade among the member states.

Table 4.2: Summary Results for Kenya

Variable		Mean	Std. Dev.	Min	Max	Observations
lnXij	overall	12.09736	1.007531	10.31865	13.39808	N = 28
	between		1.110319	10.79806	13.23681	n = 4
	within		.2372065	11.61078	12.43897	T = 7
InGDPi	overall	10.53775	.3409638	9.838304	11.01759	N = 40
	between		0	10.53775	10.53775	n = 4
	within		.3409638	9.838304	11.01759	T = 10
InGDPj	overall	9.016976	1.131288	7.018632	10.80332	N = 40
	between		1.225886	7.5362	10.28578	n = 4
	within		.3518736	8.334661	9.534515	T = 10
lnPOPi	overall	3.684097	.0771402	3.565271	3.803626	N = 40
	between		0	3.684097	3.684097	n = 4
	within		.0771402	3.565271	3.803626	T = 10
lnPOPj	overall	2.958254	.7112404	2.071184	3.947827	N = 40
	between		.8042067	2.228171	3.805606	n = 4
	within		.0914557	2.801267	3.111189	T = 10
lnDIST	overall	6.485913	.2220191	6.226653	6.765532	N = 40
	between		.2531408	6.226653	6.765532	n = 4
	within		0	6.485913	6.485913	T = 10
VA	overall	-.2415944	.0616323	-.3371308	-.1375531	N = 40
	between		0	-.2415944	-.2415944	n = 4
	within		.0616323	-.3371308	-.1375531	T = 10
PV	overall	-1.262397	.0951182	-1.430223	-1.120815	N = 40
	between		0	-1.262397	-1.262397	n = 4
	within		.0951182	-1.430223	-1.120815	T = 10
GE	overall	-.5357361	.0946653	-.6676753	-.3039544	N = 40
	between		0	-.5357361	-.5357361	n = 4
	within		.0946653	-.6676753	-.3039544	T = 10
RQ	overall	-.2211058	.0798341	-.3362499	-.0742952	N = 40
	between		0	-.2211058	-.2211058	n = 4
	within		.0798341	-.3362499	-.0742952	T = 10
RL	overall	-.8833436	.1684762	-1.050641	-.4506766	N = 40
	between		0	-.8833436	-.8833436	n = 4
	within		.1684762	-1.050641	-.4506766	T = 10
CC	overall	-.9834457	.0747134	-1.093986	-.8679072	N = 40
	between		0	-.9834457	-.9834457	n = 4
	within		.0747134	-1.093986	-.8679072	T = 10
LANG	overall	.5	.5063697	0	1	N = 40
	between		.5773503	0	1	n = 4
	within		0	.5	.5	T = 10

--more--

The results in Table 4.3 indicate that the data was a strongly balanced panel with 40 observations. The mean average of the dependent variable $ln\, X_{ij}$in Rwanda stands at 9.43 with the highest level of variability and a dispersion around the mean of 1.78.

Table 4.3: Summary Results for Rwanda

Variable		Mean	Std. Dev.	Min	Max	Observations
lnXij	overall	9.432694	1.777464	5.484855	12.47188	N = 40
	between		1.06654	8.610096	10.98834	n = 4
	within		1.511414	6.307453	13.29448	T = 10
InGDPi	overall	8.538428	.369409	7.856112	8.973375	N = 40
	between		0	8.538428	8.538428	n = 4
	within		.369409	7.856112	8.973375	T = 10
InGDPj	overall	9.516808	1.246122	7.018632	11.01759	N = 40
	between		1.365384	7.5362	10.53775	n = 4
	within		.3446206	8.817358	10.03435	T = 10
lnPOPi	overall	2.315521	.0753764	2.198139	2.428473	N = 40
	between		0	2.315521	2.315521	n = 4
	within		.0753764	2.198139	2.428473	T = 10
lnPOPj	overall	3.300398	.6442287	2.071184	3.947827	N = 40
	between		.7270344	2.228171	3.805606	n = 4
	within		.0918227	3.143411	3.453333	T = 10
lnDISTij	overall	6.105329	.6102608	5.19299	6.667838	N = 40
	between		.6958044	5.19299	6.667838	n = 4
	within		0	6.105329	6.105329	T = 10
VA	overall	-1.228419	.0675629	-1.310688	-1.125637	N = 40
	between		0	-1.228419	-1.228419	n = 4
	within		.0675629	-1.310688	-1.125637	T = 10
PV	overall	-.3452218	.2766617	-.9725428	-.0780671	N = 40
	between		0	-.3452218	-.3452218	n = 4
	within		.2766617	-.9725428	-.0780671	T = 10
GE	overall	-.1649193	.2691182	-.8927882	.0744188	N = 40
	between		0	-.1649193	-.1649193	n = 4
	within		.2691182	-.8927882	.0744188	T = 10
RQ	overall	-.3233804	.3305629	-.935032	.1818233	N = 40
	between		0	-.3233804	-.3233804	n = 4
	within		.3305629	-.935032	.1818233	T = 10
RL	overall	-.4066035	.2700136	-.9155671	.0803815	N = 40
	between		0	-.4066035	-.4066035	n = 4
	within		.2700136	-.9155671	.0803815	T = 10
CC	overall	.2381051	.4488888	-.7416055	.8297951	N = 40
	between		0	.2381051	.2381051	n = 4
	within		.4488888	-.7416055	.8297951	T = 10
LANG	overall	.25	.438529	0	1	N = 40
	between		.5	0	1	n = 4
	within		0	.25	.25	T = 10

The results in Table 4.4indicate that the data was a strongly balanced panel with 40 observations. The mean average of the dependent variable $ln\, X_{ij}$in Tanzania stands at 11.01 with the highest level of variability and a dispersion around the mean of 1.00. The low standard deviation indicates a slight variation of intra-EAC trade among the member states.

Table 4.4: Summary Results for Tanzania

Variable		Mean	Std. Dev.	Min	Max	Observations
lnXij	overall	11.01847	1.003912	8.624902	13.00799	N = 40
	between		.8606033	10.34361	12.24391	n = 4
	within		.6619044	9.299761	12.34309	T = 10
InGDPi	overall	10.28578	.3432303	9.736841	10.80332	N = 40
	between		0	10.28578	10.28578	n = 4
	within		.3432303	9.736841	10.80332	T = 10
InGDPj	overall	9.079969	1.206476	7.018632	11.01759	N = 40
	between		1.31598	7.5362	10.53775	n = 4
	within		.3513223	8.38052	9.580874	T = 10
lnPOPi	overall	3.805606	.0916505	3.665242	3.947827	N = 40
	between		0	3.805606	3.805606	n = 4
	within		.0916505	3.665242	3.947827	T = 10
lnPOPj	overall	2.927877	.6747515	2.071184	3.803626	N = 40
	between		.7627575	2.228171	3.684097	n = 4
	within		.0880446	2.77089	3.080812	T = 10
lnDIST	overall	6.584295	.1532468	6.32304	6.689967	N = 40
	between		.1747282	6.32304	6.689967	n = 4
	within		0	6.584295	6.584295	T = 10
VA	overall	-.1802862	.0454155	-.2904574	-.1315184	N = 40
	between		0	-.1802862	-.1802862	n = 4
	within		.0454155	-.2904574	-.1315184	T = 10
PV	overall	-.212964	.2184628	-.5682614	.0692917	N = 40
	between		0	-.212964	-.212964	n = 4
	within		.2184628	-.5682614	.0692917	T = 10
GE	overall	-.5459283	.1363198	-.7452385	-.3387489	N = 40
	between		0	-.5459283	-.5459283	n = 4
	within		.1363198	-.7452385	-.3387489	T = 10
RQ	overall	-.4040882	.0458455	-.4999689	-.3398611	N = 40
	between		0	-.4040882	-.4040882	n = 4
	within		.0458455	-.4999689	-.3398611	T = 10
RL	overall	-.4377853	.0910263	-.5589831	-.2601365	N = 40
	between		0	-.4377853	-.4377853	n = 4
	within		.0910263	-.5589831	-.2601365	T = 10
CC	overall	-.5657093	.1989646	-.8148	-.2225499	N = 40
	between		0	-.5657093	-.5657093	n = 4
	within		.1989646	-.8148	-.2225499	T = 10
LANG	overall	.5	.5063697	0	1	N = 40
	between		.5773503	0	1	n = 4
	within		0	.5	.5	T = 10

The results in Table 4.5 indicate that the data was also a strongly balanced panel with 40 observations. The mean average of the dependent variable $ln\, X_{ij}$in Uganda stands at 11.13 with the highest level of variability and a dispersion around the mean of 0.867. The low standard deviation also indicates a slight variation of intra-EAC trade among the member states.

Table 4.5: Summary Results for Uganda

Variable		Mean	Std. Dev.	Min	Max	Observations	
lnXij	overall	11.13146	.8666257	9.528708	12.65852	N =	36
	between		.7942451	10.34631	11.99165	n =	4
	within		.5142019	9.847449	11.8499	T =	9
InGDPi	overall	9.707494	.3617607	9.106516	10.1778	N =	40
	between		0	9.707494	9.707494	n =	4
	within		.3617607	9.106516	10.1778	T =	10
InGDPj	overall	9.224541	1.304886	7.018632	11.01759	N =	40
	between		1.434341	7.5362	10.53775	n =	4
	within		.346643	8.525092	9.742079	T =	10
lnPOPi	overall	3.483718	.0964005	3.333718	3.631859	N =	40
	between		0	3.483718	3.483718	n =	4
	within		.0964005	3.333718	3.631859	T =	10
lnPOPj	overall	3.008349	.7528244	2.071184	3.947827	N =	40
	between		.8526318	2.228171	3.805606	n =	4
	within		.0867671	2.851362	3.161284	T =	10
lnDISTij	overall	6.289291	.2738367	5.93206	6.689967	N =	40
	between		.3122219	5.93206	6.689967	n =	4
	within		0	6.289291	6.289291	T =	10
VA	overall	-.501912	.0386839	-.5616352	-.4191726	N =	40
	between		0	-.501912	-.501912	n =	4
	within		.0386839	-.5616352	-.4191726	T =	10
PV	overall	-1.009495	.1656351	-1.433292	-.8378999	N =	40
	between		0	-1.009495	-1.009495	n =	4
	within		.1656351	-1.433292	-.8378999	T =	10
GE	overall	-.5190226	.068997	-.616434	-.3987495	N =	40
	between		0	-.5190226	-.5190226	n =	4
	within		.068997	-.616434	-.3987495	T =	10
RQ	overall	-.2101591	.0638714	-.3647531	-.140546	N =	40
	between		0	-.2101591	-.2101591	n =	4
	within		.0638714	-.3647531	-.140546	T =	10
RL	overall	-.3919375	.0620148	-.5626411	-.3359891	N =	40
	between		0	-.3919375	-.3919375	n =	4
	within		.0620148	-.5626411	-.3359891	T =	10
CC	overall	-.9039216	.1046795	-1.097253	-.7539449	N =	40
	between		0	-.9039216	-.9039216	n =	4
	within		.1046795	-1.097253	-.7539449	T =	10
LANG	overall	.5	.5063697	0	1	N =	40
	between		.5773503	0	1	n =	4
	within		0	.5	.5	T =	10

4.3. Correlation Analysis

Table 4.6: Correlation Analysis for Burundi

	lnXij	InGDPi	InGDP	lnPOPi	lnPOPj	lnDIST	VA	PV	GE	RQ	RL	CC	LANG
lnXij	1.0000												
InGDPi	0.0968	1.0000											
InGDP	0.0491	0.4031	1.0000										
lnPOPi	0.1005	0.9971	0.4052	1.0000									
lnPOPj	-0.1078	0.1400	0.9241	0.1405	1.0000								
lnDIST	-0.0380	-0.0000	0.9032	0.0000	0.9774	1.0000							
VA	-0.0959	-0.9125	-0.3523	-0.9010	-0.1266	-0.0000	1.0000						
PV	0.2656	0.1993	0.0855	0.2429	0.0347	-0.0000	-0.1788	1.0000					
GE	0.4658	0.3024	0.1226	0.2820	0.0393	-0.0000	-0.2708	0.2334	1.0000				
RQ	0.1141	0.9688	0.3834	0.9706	0.1365	0.0000	-0.9151	0.3549	0.2912	1.0000			
RL	0.1290	0.3248	0.1233	0.3278	0.0464	-0.0000	-0.3304	0.5185	0.1832	0.4906	1.0000		
CC	0.0662	-0.7484	-0.3176	-0.7721	-0.1084	0.0000	0.6754	-0.0528	0.0925	-0.7602	-0.3221	1.0000	
LANG	0.1053	0.0000	-0.8384	0.0000	-0.9712	-0.9625	-0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000

Table 4.7: Correlation Analysis for Kenya

	lnXij	InGDPi	InGDPj	lnPOPi	lnPOPj	lnDIST	VA	PV	GE	RQ	RL	CC	LANG
lnXij	1.0000												
InGDPi	0.1536	1.0000											
InGDPj	0.9191	0.2738	1.0000										
lnPOPi	0.1685	0.9528	0.2797	1.0000									
lnPOPj	0.9010	0.1066	0.9434	0.1117	1.0000								
lnDIST	-0.9692	0.0000	-0.8936	-0.0000	-0.9279	1.0000							
VA	-0.1541	-0.4991	-0.1445	-0.4194	-0.0477	0.0000	1.0000						
PV	-0.0634	0.0663	0.0189	0.1727	0.0184	0.0000	0.8153	1.0000					
GE	0.0526	0.7766	0.1870	0.6965	0.0774	-0.0000	-0.0718	0.4048	1.0000				
RQ	0.0157	-0.0873	-0.0213	-0.1549	-0.0161	0.0000	-0.0706	-0.1305	-0.3050	1.0000			
RL	-0.0240	0.1542	0.0569	0.3278	0.0352	0.0000	0.5023	0.7129	0.3744	-0.7250	1.0000		
CC	-0.1659	-0.4928	-0.1694	-0.5623	-0.0630	0.0000	0.8122	0.5726	0.0217	0.2401	0.0226	1.0000	
LANG	0.9150	0.0000	0.8849	0.0000	0.9789	-0.9628	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000

Table 4.8: Correlation Analysis for Rwanda

	lnXij	InGDPi	InGDPj	lnPOPi	lnPOPj	lnDISTij	VA	PV	GE	RQ	RL	CC	LANG
lnXij	1.0000												
InGDPi	0.6150	1.0000											
InGDPj	0.4023	0.2716	1.0000										
lnPOPi	0.6355	0.9789	0.2727	1.0000									
lnPOPj	0.2492	0.1383	0.9774	0.1418	1.0000								
lnDISTij	0.2039	0.0000	0.9241	-0.0000	0.9335	1.0000							
VA	0.0740	-0.2446	-0.0320	-0.0675	-0.0063	-0.0000	1.0000						
PV	0.5081	0.9040	0.2433	0.8574	0.1212	0.0000	-0.3081	1.0000					
GE	0.4554	0.8557	0.2261	0.7891	0.1114	-0.0000	-0.3696	0.9391	1.0000				
RQ	0.6018	0.9711	0.2690	0.9816	0.1391	0.0000	-0.1202	0.8631	0.8487	1.0000			
RL	0.6040	0.9475	0.2665	0.9656	0.1373	0.0000	-0.0303	0.8967	0.8485	0.9759	1.0000		
CC	0.5987	0.9673	0.2658	0.9515	0.1348	0.0000	-0.1861	0.9402	0.9140	0.9675	0.9735	1.0000	
LANG	-0.1711	0.0000	-0.9293	0.0000	-0.9732	-0.8741	0.0000	-0.0000	-0.0000	0.0000	0.0000	0.0000	1.0000

Table 4.9: Correlation Analysis for Tanzania

	lnXij	InGDPi	InGDPj	lnPOPi	lnPOPj	lnDIST	VA	PV	GE	RQ	RL	CC	LANG
lnXij	1.0000												
InGDPi	0.4258	1.0000											
InGDPj	0.7496	0.2864	1.0000										
lnPOPi	0.4278	0.9920	0.2851	1.0000									
lnPOPj	0.6875	0.1285	0.9387	0.1294	1.0000								
lnDIST	-0.6958	-0.0000	-0.6532	0.0000	-0.5961	1.0000							
VA	0.2692	0.3380	0.1218	0.3210	0.0430	-0.0000	1.0000						
PV	0.2561	0.3206	0.1151	0.2928	0.0396	0.0000	0.5315	1.0000					
GE	-0.4065	-0.9273	-0.2673	-0.9239	-0.1199	-0.0000	-0.2032	-0.5114	1.0000				
RQ	0.1917	0.5046	0.1480	0.5870	0.0751	-0.0000	0.0877	-0.0942	-0.4204	1.0000			
RL	-0.3657	-0.6231	-0.1997	-0.6541	-0.0856	0.0000	-0.4882	-0.7836	0.7204	-0.4743	1.0000		
CC	-0.2965	-0.7313	-0.1976	-0.7542	-0.0969	0.0000	0.2625	-0.0054	0.7931	-0.3663	0.3057	1.0000	
LANG	0.5993	0.0000	0.8752	0.0000	0.9846	-0.5141	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000

Table 4.10: Correlation Analysis for Uganda

	lnXij	InGDPi	InGDPj	lnPOPi	lnPOPj	lnDISTij	VA	PV	GE	RQ	RL	CC	LANG
lnXij	1.0000												
InGDPi	0.5334	1.0000											
InGDPj	0.3402	0.2432	1.0000										
lnPOPi	0.5148	0.9869	0.2431	1.0000									
lnPOPj	0.0752	0.1020	0.9509	0.1033	1.0000								
lnDISTij	-0.5953	-0.0000	0.3984	0.0000	0.6329	1.0000							
VA	-0.2485	-0.4035	-0.0926	-0.4141	-0.0431	0.0000	1.0000						
PV	0.4817	0.8073	0.2070	0.7773	0.0800	-0.0000	-0.0785	1.0000					
GE	-0.2250	-0.4535	-0.1028	-0.4074	-0.0423	0.0000	0.4850	-0.1828	1.0000				
RQ	-0.0837	-0.2472	-0.0647	-0.2731	-0.0280	0.0000	-0.0131	-0.3643	0.1122	1.0000			
RL	0.2683	0.5047	0.1434	0.5333	0.0548	0.0000	0.4134	0.7728	0.1635	-0.2649	1.0000		
CC	-0.4297	-0.8727	-0.2053	-0.8831	-0.0914	0.0000	0.6579	-0.5108	0.5589	0.3770	-0.1279	1.0000	
LANG	0.0439	0.0000	0.9251	0.0000	0.9920	0.6251	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000

The correlation tables show that trade and GDP have a positive correlation, Rwanda having the strongest positive correlation coefficient followed by Uganda. Tanzania, Kenya and Burundi have a weak positive correlation. This contrasts the basic intuition that bigger countries tend to trade more. We find a strong negative correlation between trade and distance especially in Kenya, Tanzania and Uganda respectively showing that country pairs that are further apart tend to trade less in line with the basic intuition of the gravity model.

The institutional indicators have a mixed relationship in the different member's states. Burundi has positive correlation coefficient between trade and Political Stability and Absence of Violence (PV), Government effectiveness (GE),Regulatory Quality (RQ), Rule of Law (RL) and Control of Corruption (CC) but a negative correlation coefficient in Voice and Accountability (VA).

Only Government effectiveness (GE) is significant at 95% confidence level. Rwanda on the other hand, has a positive relationship between trade and the institutional indicators.

Kenya has positive correlation coefficient between trade and some of the institutional indicators like Government effectiveness (GE) andRegulatory Quality (RQ).Tanzania has a positive relationship between trade and institutional indicators like Voice and Accountability (VA), Political Stability and Absence of Violence (PV) and Regulatory Quality (RQ). Lastly, Uganda has a positive correlation between trade and two of the Kaufmann's institutional indicators; Political Stability and Absence of Violence (PV) and Rule of Law (RL). All member's states but Rwanda have a positive correlation btw trade and language with a basic intuition that common language facilitates trade.

4.4. Empirical Results

The results from the analysis were estimated using Fixed Effect (FE) and Random Effect (RE) models.

Diagnostic Tests

The augmented version of the model for FE and RE fits the data remarkably well in explaining the variation in bilateral trade in EAC. The choice between the two models depends on the Hausman test for specification. The Hausman test statistics shows that under the null hypothesis of correlation between individual effects and the explanatory variables, the FE estimator is consistent, RE is efficient while FE is not. The chi-square statistics from the Hausman test statistics in all the five cases are greater than 90 % and are significant at 1% level of confidence as show in the appendix. This means we accept the null hypothesis that the difference in

coefficient of the estimated model is not systematic. It therefore signifies that we estimate a random effect model.

Fixed Effect (FE) verses Random Effect (RE)

Appendix 1 gives a summary of the FE and RE estimated model. The FE model allows us to analyze the impacts of variables that change over time by controlling for time invariant differences between the individuals leading to unbiased estimates. It treats variables as individual entities with distinct characteristics in influencing the predictor variable. Most variables were omitted due to collinearity.

In the presence of differences across entities having significant influences on the dependent variable, we estimate using random effect. It allows us to include time invariant variables as shown in the estimated models in the appendix.

4.5. Further Discussion of the Results

In the analysis, the first step in to regress and measure the statistical significance of the variable of our interest which are the main determinants of trade in EAC. The natural log of the variables was to estimate and then testing for multicollinearity on independent variables for each country.

On the next page are some of the findings after regression.

Table 4.11: Determinants of Intra EAC trade

Variables	Expected sign	Burundi to rest of EAC	Kenya to rest of EAC	Rwanda to rest of EAC	Uganda to rest of EAC	Tanzania to rest of EAC
Constant	(+)	57.1258 (0.499)	-57.25358 (0.013)	-52.1346 (0.609)	-8.138222 (0.517)	297.2397 (0.132)
lnGDPi	(+)	-65.43 (0.163)	-3.799997 (0.000)	1.342918 (0.870)	-0.010280 (0.995)	27.32511 (0.165)
lnGDPj	(+)	-0.154 (0.953)	0.1606641 (0.6370	5.878294 (0.081)	1.219001 (0.005)	1.527067 (0.007)
lnPOPi	(+) OR (-)	208.0235 (0.132)	34.48982 (0.000)	13.1379 (0.833)	10.19117 (0.165)	-127.3662 (0.239)
lnPOPj	(+) OR (-)	-7.81274 (0.000)	-0.3164552 (0.778)	-4.92001 (0.613)	-6.929444 (0.000)	-18.11842 (0.002)
lnDISTij	(-)	6.04743 (0.249)	-4.788203 (0.005)	-3.187929 (0.634)	1.124039 (0.117)	-9.880345 (0.000)
VA	(+)	-3.536738 (0.266)	33.9722 (0.000)	4.853609 (0.640)	0.5753717 (0.872)	29.32874 (0.166)
PV	(+)	-6.224148 (0.243)	-17.33535 (0.000)	-4.012135 (0.530)	1.545253 (0.194)	-8.979094 (0.345)
GE	(+)	6.337549 (0.001)	7.240362 (0.000)	1.765874 (0.762)	0.4572896 (0.537)	-6.71243 (0.630)
RQ	(+)	15.10356 (0.368)	-	-6.563107 (0.571)	0.1494422 (0.943)	11.73511 (0.137)
RL	(+)	4.450669 (0.234)	-4.251357 (0.000)	-1.340749 (0.867)	-5.450249 (0.118)	-24.77133 (0.219)
CC	(+)	10.90073 (0.209)	-	2.771428 (0.386)	3.655318 (0.257)	-9.105287 (0.043)
LANG	(+)	-2.11979 (0.349)	-0.0931788 (0.953)	3.918275 (0.609)	7.773418 (0.000)	20.23894 (0.001)
R-Squared		0.6087	0.9939	0.7301	0.9732	0.8611
Prob>chi		0.0000	0.0000	0.0000	0.0000	0.0000
No. of Observation		40	40	40	40	40

Source: Researcher'sComputation (Values in brackets are P-values)

From the five panel data regression model i.e. Regression for each EAC partner state, trade with each other produced mixed results. The first important implication of the gravity model is that countries are expected to trade more when their economic masses increase.In this study, it is represented by the GDP of trading countries and are expected to have positive sign. For Tanzania and Uganda, importing countries' GDP were significant at 5 percent with the expected sign to explain their export with EAC countries which means that a onepercent change in GDP of partner country increases Tanzania and Uganda export by 1.53 and 1.22 percent respectively.

Rwanda and Tanzania GDPs,though not significant explained their export to the rest of EAC members at 5 percent level which also imply that an increase of Rwanda's and Tanzania's GDP by 1 percent will boost Rwanda's and Tanzania's exports to EAC by 1.34 and 27.3 percent. An increase because, importing countries' GDP act as the purchasing capacity of the importers and therefore initiates a demand pull factor for exportation. The rest of EAC member states exports to other EAC members were neither explained by their GDP nor importing countries' GDP since the GDP variables were neither significant nor positive. This can be explained by fact that EAC members are natural trading partners and therefore the increased trade may not necessary be explained by their GDP rather their previous relationship in trade.

The institutional variables had a mixed result to each regression. The expected result was that all the institutional indicators should have a positive impact on EAC trade flow. For Kenya, Voice and Accountability (VA) and Government effectiveness (GE) were both positive and significantly influencing their exports to rest of EAC members. Burundi had only Government effectiveness (GE) being positive and significant in affecting trade flows to EAC members states. For Tanzania, Control of Corruption (CC) was significant but negatively influencing trade flows. Rwanda and Uganda had no significant institutional indicators.

The language dummy variable was expected to have a positive sign. Language variable was found to be insignificantly explaining the EAC trade performance in Burundi, Kenya and Rwanda; meaning that having different or similar language does not influence intra EAC export in those countries. Both Tanzania and Uganda had significant and positive language variable; meaning in their case similar language influences trade flows significantly.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1. Summary of key Findings

This paper has analyzed the effect of institutions on trade flow in the EAC using the augmented gravity model. The result shows that the effectof institution is positive though for only significant institutional indicators but also highlights how some of the Kaufmann's institutional indicators are insignificant. Like this study, several other studies such as by Groot et al (2003); Fanta (2011); Dollar and Kraay (2002) have pointed the importance of quality institutions in promoting trade in regional trade agreements (RTA). The objectives of the study were analyzed using data from World Governance Indicators.

The standard gravity model variables also give their expected signs highlighting theroles played by intra-regional trade. The positive sign on the GDPcoefficients in some EAC countries represents the role played by economic growth in promoting bilateral tradeand have very strong elasticities. It is also clear that countries have developed moreforeign trade relations with countries with big economic growth and population sizes.

5.2. Conclusion

It is clear that the variables in the gravity model i.e. countries' economic mass is an important factor explaining the export performance of EAC countries. The results have significantly shown that some EAC partner state's export performance were explained by partners' economic mass and other by own economic mass. On the other hand, institutional condition of exporting

countries proxied byvoice and accountability (VA), governmenteffectiveness (GE)andcontrol of corruption (CC) were also significant in explaining trade performance of EAC partner states although they do not jointly explain trade performance of a single country. For Rwanda, institutional variables were found not to be robust determinant for her export performance. Therefore the study concludes by recommending more research on the effect of domestic institutional quality on bilateral trade flow both in EAC region and Africa in order to have a solid conclusion on the relationship between institutional quality and trade performance in the EAC and Africa as a continent.

5.3. Policy Recommendations

The findings from the study are useful in advocating for institutional reform in EAC to promote trade among partner states and also to maximize the benefits of regional trade integration. The governmentsof all EAC member's states should ensure that there is an appropriate process of policy formulation and they shouldencourage implementation of credible policies that will promote integration of the EAC should be given priority by all partner states.Public resources and power should also not be used for private benefit.

5.4. Limitations of the Study

One major limitation of this study was the availability of institutional data for the all EAC partner states. Data for some years were missing. Another limitation is that most of the variables were not significant.

Therefore further study in assessing the impact of institutions in EAC would be interesting if they can be based on the use of other institutional, quality indicators and the use of different methods so as to see the impact on institutions in promoting trade.

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APPENDICES

Appendix 1

Appendix 1 presents all the tests and regressions that were run on the final data for the study.

Appendix 1.1: Burundi

Descriptive Statistics

```
       E:  404, 646, ..., 834                                  n =          4
    Year:  2005, 2006, ..., 2014                               T =         10
           Delta(Year) = 1 unit
           Span(Year)  = 10 periods
           (E*Year uniquely identifies each observation)

Distribution of T_i:   min       5%      25%       50%       75%      95%      max
                        10       10       10        10        10       10       10

     Freq.  Percent    Cum.  |  Pattern
-------------------------------------------
         4   100.00  100.00  |  1111111111
-------------------------------------------
         4   100.00          |  XXXXXXXXXX
```

Fixed Effect

```
note: lnDIST omitted because of collinearity
note: LANG omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =        40
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.4798                         Obs per group: min =        10
       between = 0.0513                                        avg =      10.0
       overall = 0.0101                                        max =        10

                                                F(10,26)           =      2.40
corr(u_i, Xb)  = -0.9966                        Prob > F           =    0.0357

------------------------------------------------------------------------------
       lnXij |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      InGDPi |  -61.00552   44.64394    -1.37   0.183    -152.7724     30.7614
       InGDP |  -.7775558   2.504627    -0.31   0.759     -5.92589    4.370779
      lnPOPi |   177.0427   132.1524     1.34   0.192    -94.60046    448.6858
      lnPOPj |    17.7668   13.08274     1.36   0.186    -9.125146    44.65875
      lnDIST |           0  (omitted)
          VA |  -3.459422   3.020688    -1.15   0.263    -9.668536    2.749692
          PV |  -5.724635   5.073743    -1.13   0.270    -16.15386    4.704592
          GE |   6.460336   1.739635     3.71   0.001     2.884466    10.03621
          RQ |   12.40714   16.01392     0.77   0.445    -20.50994    45.32422
          RL |    4.55248   3.553263     1.28   0.211    -2.751356    11.85632
          CC |   9.942601   8.260772     1.20   0.240    -7.037659    26.92286
        LANG |           0  (omitted)
       _cons |   48.05637   66.87971     0.72   0.479    -89.41684    185.5296
-------------+----------------------------------------------------------------
     sigma_u |  11.669225
     sigma_e |  .74501124
         rho |  .99594048   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(3, 26) =     3.98                 Prob > F = 0.0186

.
```

Random Effect Model

```
Random-effects GLS regression                   Number of obs      =        40
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.4042                         Obs per group: min =        10
       between = 0.9994                                        avg =      10.0
       overall = 0.6087                                        max =        10

                                                Wald chi2(12)      =     41.99
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

lnXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
InGDPi	-65.43249	46.92655	-1.39	0.163	-157.4068	26.54186
InGDP	-.1535974	2.614986	-0.06	0.953	-5.278875	4.97168
lnPOPi	208.0235	138.1027	1.51	0.132	-62.65279	478.6997
lnPOPj	-7.81274	2.018791	-3.87	0.000	-11.7695	-3.855982
lnDIST	6.04743	5.250647	1.15	0.249	-4.24365	16.33851
VA	-3.536738	3.178871	-1.11	0.266	-9.767211	2.693735
PV	-6.224148	5.333256	-1.17	0.243	-16.67714	4.228843
GE	6.337549	1.829719	3.46	0.001	2.751365	9.923732
RQ	15.10356	16.79266	0.90	0.368	-17.80944	48.01657
RL	4.450669	3.739255	1.19	0.234	-2.878136	11.77947
CC	10.90073	8.679107	1.26	0.209	-6.110009	27.91147
LANG	-2.11979	2.2638	-0.94	0.349	-6.556757	2.317177
_cons	57.1258	84.59102	0.68	0.499	-108.6695	222.9211
sigma_u	0					
sigma_e	.74501124					
rho	0	(fraction of variance due to u_i)				

Hausman Specification Test

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
InGDPi	-61.00552	-65.43249	4.426973	.
InGDP	-.7775558	-.1535974	-.6239583	.
lnPOPi	177.0427	208.0235	-30.98081	.
lnPOPj	17.7668	-7.81274	25.57954	12.92604
VA	-3.459422	-3.536738	.0773161	.
PV	-5.724635	-6.224148	.4995125	.
GE	6.460336	6.337549	.1227879	.
RQ	12.40714	15.10356	-2.696427	.
RL	4.55248	4.450669	.1018106	.
CC	9.942601	10.90073	-.9581277	.

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

 Test:  Ho:  difference in coefficients not systematic

              chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                       =        3.91
             Prob>chi2 =      0.9511
             (V_b-V_B is not positive definite)
```

Robust Regression, Corrected for Heteroskedasticity

```
Random-effects GLS regression                   Number of obs      =        40
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.4042                         Obs per group: min =        10
       between = 0.9994                                        avg =      10.0
       overall = 0.6087                                        max =        10

                                                Wald chi2(12)      =     41.99
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

lnXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
InGDPi	-65.43249	46.92655	-1.39	0.163	-157.4068	26.54186
InGDP	-.1535974	2.614986	-0.06	0.953	-5.278875	4.97168
lnPOPi	208.0235	138.1027	1.51	0.132	-62.65279	478.6997
lnPOPj	-7.81274	2.018791	-3.87	0.000	-11.7695	-3.855982
lnDIST	6.04743	5.250647	1.15	0.249	-4.24365	16.33851
VA	-3.536738	3.178871	-1.11	0.266	-9.767211	2.693735
PV	-6.224148	5.333256	-1.17	0.243	-16.67714	4.228843
GE	6.337549	1.829719	3.46	0.001	2.751365	9.923732
RQ	15.10356	16.79266	0.90	0.368	-17.80944	48.01657
RL	4.450669	3.739255	1.19	0.234	-2.878136	11.77947
CC	10.90073	8.679107	1.26	0.209	-6.110009	27.91147
LANG	-2.11979	2.2638	-0.94	0.349	-6.556757	2.317177
_cons	57.1258	84.59102	0.68	0.499	-108.6695	222.9211
sigma_u	0					
sigma_e	.74501124					
rho	0	(fraction of variance due to u_i)				

Appendix 1.2: Kenya

Descriptive Statistics

```
      E:  108, 646, ..., 834                        n =          4
   Year:  2005, 2006, ..., 2014                     T =         10
          Delta(Year) = 1 unit
          Span(Year)  = 10 periods
          (E*Year uniquely identifies each observation)

Distribution of T_i:   min      5%     25%       50%       75%     95%     max
                        10      10      10        10        10      10      10

    Freq.  Percent    Cum. |  Pattern
-------------------------+----------
        4   100.00  100.00 |  1111111111
-------------------------+----------
        4   100.00         |  XXXXXXXXXX
```

Fixed Effect

```
note: lnPOPi omitted because of collinearity
note: lnDIST omitted because of collinearity
note: VA omitted because of collinearity
note: LANG omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =        28
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.8963                         Obs per group: min =         7
       between = 0.8459                                        avg =       7.0
       overall = 0.7470                                        max =         7

                                                F(8,16)            =     17.29
corr(u_i, Xb)  = -0.9857                        Prob > F           =    0.0000
```

lnXij	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
InGDPi	-1.026731	.409034	-2.51	0.023	-1.893844	-.1596174
InGDPj	-.2217112	.508466	-0.44	0.669	-1.299611	.8561886
lnPOPi	0	(omitted)				
lnPOPj	-2.568893	2.491061	-1.03	0.318	-7.849705	2.71192
lnDIST	0	(omitted)				
VA	0	(omitted)				
PV	15.3483	4.101864	3.74	0.002	6.65274	24.04387
GE	3.994705	2.279488	1.75	0.099	-.8375936	8.827004
RQ	-8.581997	1.99904	-4.29	0.001	-12.81977	-4.344221
RL	-16.85829	3.934286	-4.28	0.001	-25.19861	-8.517979
CC	-16.97528	5.131629	-3.31	0.004	-27.85384	-6.096711
LANG	0	(omitted)				
_cons	19.71636	7.575818	2.60	0.019	3.656341	35.77637
sigma_u	3.3749817					
sigma_e	.09922454					
rho	.99913639	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(3, 16) =   111.37              Prob > F = 0.0000

.
```

Random Effect Model

```
note: RL omitted because of collinearity
note: CC omitted because of collinearity

Random-effects GLS regression                   Number of obs      =        28
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.8897                         Obs per group: min =         7
       between = 1.0000                                        avg =       7.0
       overall = 0.9939                                        max =         7

                                                Wald chi2(10)      =   2762.83
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

lnXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
InGDPi	-7.400124	1.591606	-4.65	0.000	-10.51962	-4.280633
InGDPj	.1606641	.3405596	0.47	0.637	-.5068205	.8281486
lnPOPi	66.89583	14.49868	4.61	0.000	38.47895	95.31272
lnPOPj	-.3164552	1.120146	-0.28	0.778	-2.511901	1.87899
lnDIST	-4.788203	1.719419	-2.78	0.005	-8.158203	-1.418202
VA	81.56174	19.39206	4.21	0.000	43.55401	119.5695
PV	-46.12809	10.72906	-4.30	0.000	-67.15667	-25.09952
GE	21.78179	5.160361	4.22	0.000	11.66767	31.89591
RQ	8.235839	1.846306	4.46	0.000	4.617146	11.85453
RL	0	(omitted)				
CC	0	(omitted)				
LANG	-.0931788	1.589289	-0.06	0.953	-3.208127	3.02177
_cons	-149.131	41.37681	-3.60	0.000	-230.228	-68.03393
sigma_u	0					
sigma_e	.09922454					
rho	0	(fraction of variance due to u_i)				

Hausman Specification Test

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
InGDPi	-1.026731	-7.400124	6.373394	.
InGDPj	-.2217112	.1606641	-.3823752	.377567
lnPOPj	-2.568893	-.3164552	-2.252437	2.225007
PV	15.3483	-46.12809	61.4764	.
GE	3.994705	21.78179	-17.78708	.
RQ	-8.581997	8.235839	-16.81784	.7663644

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 1.08
Prob>chi2 = 0.9825
(V_b-V_B is not positive definite)

Robust Regression, Corrected for Heteroskedasticity

Random-effects GLS regression — Number of obs = 28
Group variable: E — Number of groups = 4

R-sq: within = 0.8897 — Obs per group: min = 7
between = 1.0000 — avg = 7.0
overall = 0.9939 — max = 7

Wald chi2(10) = 2762.83
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

lnXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
InGDPi	-7.400124	1.591606	-4.65	0.000	-10.51962	-4.280633
InGDPj	.1606641	.3405596	0.47	0.637	-.5068205	.8281486
lnPOPi	66.89583	14.49868	4.61	0.000	38.47895	95.31272
lnPOPj	-.3164552	1.120146	-0.28	0.778	-2.511901	1.87899
lnDIST	-4.788203	1.719419	-2.78	0.005	-8.158203	-1.418202
VA	81.56174	19.39206	4.21	0.000	43.55401	119.5695
PV	-46.12809	10.72906	-4.30	0.000	-67.15667	-25.09952
GE	21.78179	5.160361	4.22	0.000	11.66767	31.89591
RQ	8.235839	1.846306	4.46	0.000	4.617146	11.85453
RL	0	(omitted)				
CC	0	(omitted)				
LANG	-.0931788	1.589289	-0.06	0.953	-3.208127	3.02177
_cons	-149.131	41.37681	-3.60	0.000	-230.228	-68.03393
sigma_u	0					
sigma_e	.09922454					
rho	0	(fraction of variance due to u_i)				

Appendix 1.3: Rwanda

Descriptive Statistics

E: 108, 404, ..., 834 — n = 4
Year: 2005, 2006, ..., 2014 — T = 10
Delta(Year) = 1 unit
Span(Year) = 10 periods
(E*Year uniquely identifies each observation)

Distribution of T_i:	min	5%	25%	50%	75%	95%	max
	10	10	10	10	10	10	10

Freq.	Percent	Cum.	Pattern
4	100.00	100.00	1111111111
4	100.00		XXXXXXXXXX

Fixed Effect

```
note: lnDISTij omitted because of collinearity
note: LANG omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =        40
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.6723                         Obs per group: min =        10
       between = 0.1028                                        avg =      10.0
       overall = 0.0448                                        max =        10

                                                F(10,26)           =      5.33
corr(u_i, Xb)  = -0.9971                        Prob > F           =    0.0003
```

lnXij	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
InGDPi	4.265705	7.955853	0.54	0.596	-12.08778	20.61919
InGDPj	2.24156	3.74349	0.60	0.554	-5.453293	9.936414
lnPOPi	-28.32059	63.41681	-0.45	0.659	-158.6757	102.0345
lnPOPj	27.20991	19.28674	1.41	0.170	-12.43454	66.85437
lnDISTij	0	(omitted)				
VA	5.754043	9.932892	0.58	0.567	-14.66331	26.1714
PV	-3.413645	6.108898	-0.56	0.581	-15.97067	9.143374
GE	.8210505	5.593838	0.15	0.884	-10.67725	12.31935
RQ	-5.441203	11.07801	-0.49	0.627	-28.21238	17.32997
RL	-1.513897	7.625073	-0.20	0.844	-17.18746	14.15967
CC	3.033762	3.058044	0.99	0.330	-3.252138	9.319662
LANG	0	(omitted)				
_cons	-69.62101	96.13337	-0.72	0.475	-267.226	127.984
sigma_u	22.488888					
sigma_e	1.0597153					
rho	.99778446	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(3, 26) =     1.83                 Prob > F = 0.1663
```

Random Effect Model

```
Random-effects GLS regression                   Number of obs      =        40
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.6291                         Obs per group: min =        10
       between = 0.9992                                        avg =      10.0
       overall = 0.7301                                        max =        10

                                                Wald chi2(12)      =     73.04
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

lnXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
InGDPi	1.342918	8.174826	0.16	0.870	-14.67945	17.36528
InGDPj	5.878294	3.369713	1.74	0.081	-.7262214	12.48281
lnPOPi	13.1379	62.36281	0.21	0.833	-109.091	135.3668
lnPOPj	-4.92001	9.725923	-0.51	0.613	-23.98247	14.14245
lnDISTij	-3.187929	6.692569	-0.48	0.634	-16.30512	9.929265
VA	4.853609	10.39059	0.47	0.640	-15.51157	25.21879
PV	-4.012135	6.389166	-0.63	0.530	-16.53467	8.5104
GE	1.765874	5.835087	0.30	0.762	-9.670687	13.20243
RQ	-6.563107	11.5852	-0.57	0.571	-29.26967	16.14346
RL	-1.340749	7.984945	-0.17	0.867	-16.99095	14.30946
CC	2.771428	3.199337	0.87	0.386	-3.499157	9.042012
LANG	3.918275	14.10045	0.28	0.781	-23.71811	31.55466
_cons	-52.1346	101.9961	-0.51	0.609	-252.0432	147.774
sigma_u	0					
sigma_e	1.0597153					
rho	0	(fraction of variance due to u_i)				

Hausman Specification Test

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
InGDPi	4.265705	1.342918	2.922787	.
InGDPj	2.24156	5.878294	-3.636734	1.630568
lnPOPi	-28.32059	13.1379	-41.45849	11.514
lnPOPj	27.20991	-4.92001	32.12992	16.65487
VA	5.754043	4.853609	.9004342	.
PV	-3.413645	-4.012135	.59849	.
GE	.8210505	1.765874	-.9448236	.
RQ	-5.441203	-6.563107	1.121904	.
RL	-1.513897	-1.340749	-.1731481	.
CC	3.033762	2.771428	.2623343	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 3.63
Prob>chi2 = 0.9626
(V_b-V_B is not positive definite)

Robust Regression, Corrected for Heteroskedasticity

Random-effects GLS regression — Number of obs = 40
Group variable: E — Number of groups = 4

R-sq: within = 0.6291 — Obs per group: min = 10
between = 0.9992 — avg = 10.0
overall = 0.7301 — max = 10

Wald chi2(12) = 73.04
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

lnXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
InGDPi	1.342918	8.174826	0.16	0.870	-14.67945	17.36528
InGDPj	5.878294	3.369713	1.74	0.081	-.7262214	12.48281
lnPOPi	13.1379	62.36281	0.21	0.833	-109.091	135.3668
lnPOPj	-4.92001	9.725923	-0.51	0.613	-23.98247	14.14245
lnDISTij	-3.187929	6.692569	-0.48	0.634	-16.30512	9.929265
VA	4.853609	10.39059	0.47	0.640	-15.51157	25.21879
PV	-4.012135	6.389166	-0.63	0.530	-16.53467	8.5104
GE	1.765874	5.835087	0.30	0.762	-9.670687	13.20243
RQ	-6.563107	11.5852	-0.57	0.571	-29.26967	16.14346
RL	-1.340749	7.984945	-0.17	0.867	-16.99095	14.30946
CC	2.771428	3.199337	0.87	0.386	-3.499157	9.042012
LANG	3.918275	14.10045	0.28	0.781	-23.71811	31.55466
_cons	-52.1346	101.9961	-0.51	0.609	-252.0432	147.774
sigma_u	0					
sigma_e	1.0597153					
rho	0	(fraction of variance due to u_i)				

Appendix 1.4: Tanzania

Descriptive Statistics

E: 108, 404, ..., 800 — n = 4
Year: 2005, 2006, ..., 2014 — T = 10
Delta(Year) = 1 unit
Span(Year) = 10 periods
(E*Year uniquely identifies each observation)

Distribution of T_i:	min	5%	25%	50%	75%	95%	max
	10	10	10	10	10	10	10

Freq.	Percent	Cum.	Pattern
4	100.00	100.00	1111111111
4	100.00		XXXXXXXXXX

Fixed Effect

```
note: lnDIST omitted because of collinearity
note: LANG omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =        40
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.6808                         Obs per group: min =        10
       between = 0.7137                                        avg =      10.0
       overall = 0.3690                                        max =        10

                                                F(10,26)           =      5.55
corr(u_i, Xb)  = -0.9982                        Prob > F           =    0.0002
```

lnXij	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
InGDPi	27.61831	20.11769	1.37	0.182	-13.73419	68.97082
InGDPj	1.290992	1.506451	0.86	0.399	-1.805561	4.387546
lnPOPi	-127.2285	110.2685	-1.15	0.259	-353.8886	99.43162
lnPOPj	-18.55732	6.539937	-2.84	0.009	-32.00036	-5.114292
lnDIST	0	(omitted)				
VA	29.51043	21.57266	1.37	0.183	-14.8328	73.85366
PV	-8.938765	9.695097	-0.92	0.365	-28.86732	10.98979
GE	-6.599338	14.19019	-0.47	0.646	-35.76769	22.56901
RQ	11.86411	8.082531	1.47	0.154	-4.749773	28.47799
RL	-24.8236	20.52299	-1.21	0.237	-67.00921	17.362
CC	-9.168572	4.595288	-2.00	0.057	-18.61432	.277178
LANG	0	(omitted)				
_cons	242.2893	200.6598	1.21	0.238	-170.1729	654.7515
sigma_u	13.285555					
sigma_e	.45800652					
rho	.99881295	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(3, 26) =    11.74                 Prob > F = 0.0000

.
```

Random Effect Model

```
Random-effects GLS regression                   Number of obs      =        40
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.6805                         Obs per group: min =        10
       between = 1.0000                                        avg =      10.0
       overall = 0.8611                                        max =        10

                                                Wald chi2(12)      =    167.37
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

lnXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
InGDPi	27.32511	19.67925	1.39	0.165	-11.24552	65.89574
InGDPj	1.527067	.5612645	2.72	0.007	.4270088	2.627125
lnPOPi	-127.3662	108.2639	-1.18	0.239	-339.5596	84.82723
lnPOPj	-18.11842	5.89567	-3.07	0.002	-29.67372	-6.56312
lnDIST	-9.880345	2.141698	-4.61	0.000	-14.078	-5.682694
VA	29.32874	21.15487	1.39	0.166	-12.13404	70.79152
PV	-8.979094	9.516241	-0.94	0.345	-27.63058	9.672395
GE	-6.71243	13.91717	-0.48	0.630	-33.98959	20.56473
RQ	11.73511	7.900509	1.49	0.137	-3.749602	27.21983
RL	-24.77133	20.14818	-1.23	0.219	-64.26103	14.71837
CC	-9.105287	4.496936	-2.02	0.043	-17.91912	-.2914549
LANG	20.23894	6.333081	3.20	0.001	7.82633	32.65155
_cons	297.2397	197.1902	1.51	0.132	-89.24589	683.7254
sigma_u	0					
sigma_e	.45800652					
rho	0	(fraction of variance due to u_i)				

Hausman Specification Test

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
InGDPi	27.61831	27.32511	.2932051	4.177137
InGDPj	1.290992	1.527067	-.2360745	1.39799
lnPOPi	-127.2285	-127.3662	.1377146	20.92979
lnPOPj	-18.55732	-18.11842	-.4389048	2.830522
VA	29.51043	29.32874	.1816887	4.225051
PV	-8.938765	-8.979094	.0403291	1.853664
GE	-6.599338	-6.71243	.113092	2.770135
RQ	11.86411	11.73511	.1289945	1.705654
RL	-24.8236	-24.77133	-.0522746	3.90436
CC	-9.168572	-9.105287	-.0632846	.9456424

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 0.03
Prob>chi2 = 1.0000

Robust Regression, Corrected for Heteroskedasticity

Random-effects GLS regression — Number of obs = 40
Group variable: E — Number of groups = 4

R-sq: within = 0.6805 — Obs per group: min = 10
between = 1.0000 — avg = 10.0
overall = 0.8611 — max = 10

Wald chi2(12) = 167.37
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

lnXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
InGDPi	27.32511	19.67925	1.39	0.165	-11.24552	65.89574
InGDPj	1.527067	.5612645	2.72	0.007	.4270088	2.627125
lnPOPi	-127.3662	108.2639	-1.18	0.239	-339.5596	84.82723
lnPOPj	-18.11842	5.89567	-3.07	0.002	-29.67372	-6.56312
lnDIST	-9.880345	2.141698	-4.61	0.000	-14.078	-5.682694
VA	29.32874	21.15487	1.39	0.166	-12.13404	70.79152
PV	-8.979094	9.516241	-0.94	0.345	-27.63058	9.672395
GE	-6.71243	13.91717	-0.48	0.630	-33.98959	20.56473
RQ	11.73511	7.900509	1.49	0.137	-3.749602	27.21983
RL	-24.77133	20.14818	-1.23	0.219	-64.26103	14.71837
CC	-9.105287	4.496936	-2.02	0.043	-17.91912	-.2914549
LANG	20.23894	6.333081	3.20	0.001	7.82633	32.65155
_cons	297.2397	197.1902	1.51	0.132	-89.24589	683.7254
sigma_u	0					
sigma_e	.45800652					
rho	0	(fraction of variance due to u_i)				

Appendix 1.5: Uganda

Descriptive Statistics

E: 108, 404, ..., 834 — n = 4
Year: 2005, 2006, ..., 2014 — T = 10
Delta(Year) = 1 unit
Span(Year) = 10 periods
(E*Year uniquely identifies each observation)

Distribution of T_i:	min	5%	25%	50%	75%	95%	max
	10	10	10	10	10	10	10

Freq.	Percent	Cum.	Pattern
4	100.00	100.00	1111111111
4	100.00		XXXXXXXXXX

Fixed Effect

```
note: lnDISTij omitted because of collinearity
note: LANG omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =        36
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.9367                         Obs per group: min =         9
       between = 0.0004                                        avg =       9.0
       overall = 0.0003                                        max =         9

                                                F(10,22)           =     32.57
corr(u_i, Xb)  = -0.9952                        Prob > F           =    0.0000
```

lnXij	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
InGDPi	.4382588	1.639057	0.27	0.792	-2.960938	3.837455
InGDPj	.3132835	.5882281	0.53	0.600	-.9066269	1.533194
lnPOPi	17.08011	7.584224	2.25	0.035	1.351391	32.80883
lnPOPj	-12.1777	3.028406	-4.02	0.001	-18.45824	-5.897174
lnDISTij	0	(omitted)				
VA	-.2755274	3.345227	-0.08	0.935	-7.213103	6.662049
PV	1.542489	1.109442	1.39	0.178	-.7583532	3.843331
GE	.2388293	.6982793	0.34	0.736	-1.209313	1.686972
RQ	-.2943251	1.974179	-0.15	0.883	-4.388522	3.799872
RL	-5.292514	3.256546	-1.63	0.118	-12.04618	1.461149
CC	4.754803	3.054916	1.56	0.134	-1.580706	11.09031
LANG	0	(omitted)				
_cons	-15.1136	11.26885	-1.34	0.194	-38.48377	8.256571
sigma_u	10.000681					
sigma_e	.16314384					
rho	.99973395	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(3, 22) =    59.34                 Prob > F = 0.0000
```

Random Effect Model

```
Random-effects GLS regression                   Number of obs      =        36
Group variable: E                               Number of groups   =         4

R-sq:  within  = 0.9242                         Obs per group: min =         9
       between = 0.9999                                        avg =       9.0
       overall = 0.9732                                        max =         9

                                                Wald chi2(12)      =    836.62
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

lnXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
InGDPi	-.0102801	1.741928	-0.01	0.995	-3.424397	3.403837
InGDPj	1.219001	.4295836	2.84	0.005	.377033	2.06097
lnPOPi	10.19117	7.332365	1.39	0.165	-4.179999	24.56234
lnPOPj	-6.929444	1.83988	-3.77	0.000	-10.53554	-3.323346
lnDISTij	-1.124039	.716631	-1.57	0.117	-2.52861	.2805323
VA	.5753717	3.559342	0.16	0.872	-6.400811	7.551554
PV	1.545253	1.189179	1.30	0.194	-.7854946	3.876
GE	.4572896	.7401414	0.62	0.537	-.993361	1.90794
RQ	.1494422	2.10395	0.07	0.943	-3.974224	4.273108
RL	-5.450249	3.489673	-1.56	0.118	-12.28988	1.389385
CC	3.655318	3.226194	1.13	0.257	-2.667906	9.978541
LANG	7.773418	1.555844	5.00	0.000	4.72402	10.82282
_cons	-8.138222	12.55084	-0.65	0.517	-32.73741	16.46097
sigma_u	0					
sigma_e	.16314384					
rho	0	(fraction of variance due to u_i)				

Hausman Specification Test

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
InGDPi	.4382588	-.0102801	.4485389	.
InGDPj	.3132835	1.219001	-.9057178	.4018336
lnPOPi	17.08011	10.19117	6.888937	1.938267
lnPOPj	-12.1777	-6.929444	-5.248261	2.405429
VA	-.2755274	.5753717	-.8508991	.
PV	1.542489	1.545253	-.0027635	.
GE	.2388293	.4572896	-.2184602	.
RQ	-.2943251	.1494422	-.4437673	.
RL	-5.292514	-5.450249	.1577349	.
CC	4.754803	3.655318	1.099485	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 4.43
Prob>chi2 = 0.9256
(V_b-V_B is not positive definite)

Robust Regression, Corrected for Heteroskedasticity

Random-effects GLS regression — Number of obs = 36
Group variable: E — Number of groups = 4

R-sq: within = 0.9242 — Obs per group: min = 9
between = 0.9999 — avg = 9.0
overall = 0.9732 — max = 9

Wald chi2(12) = 836.62
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

lnXij	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
InGDPi	-.0102801	1.741928	-0.01	0.995	-3.424397	3.403837
InGDPj	1.219001	.4295836	2.84	0.005	.377033	2.06097
lnPOPi	10.19117	7.332365	1.39	0.165	-4.179999	24.56234
lnPOPj	-6.929444	1.83988	-3.77	0.000	-10.53554	-3.323346
lnDISTij	-1.124039	.716631	-1.57	0.117	-2.52861	.2805323
VA	.5753717	3.559342	0.16	0.872	-6.400811	7.551554
PV	1.545253	1.189179	1.30	0.194	-.7854946	3.876
GE	.4572896	.7401414	0.62	0.537	-.993361	1.90794
RQ	.1494422	2.10395	0.07	0.943	-3.974224	4.273108
RL	-5.450249	3.489673	-1.56	0.118	-12.28988	1.389385
CC	3.655318	3.226194	1.13	0.257	-2.667906	9.978541
LANG	7.773418	1.555844	5.00	0.000	4.72402	10.82282
_cons	-8.138222	12.55084	-0.65	0.517	-32.73741	16.46097
sigma_u	0					
sigma_e	.16314384					
rho	0	(fraction of variance due to u_i)				