

**TRADE LOGISTICS, TRADE COSTS AND BILATERAL TRADE
WITHIN SUB SAHARAN AFRICA – A PANEL ESTIMATION**

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DECLARATION

I, *Ruby Sinam Nutor* hereby declare that this thesis is the original research undertaken by myself under the guidance of my supervisors; and with the exception of references to other people's work which have been duly cited, this thesis has neither in part nor in whole been submitted for another degree elsewhere.



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ABSTRACT

World trade has expanded over the last few decades, but the trade within Africa especially among Sub-Saharan African (SSA) countries has been low. Globally there has been a reduction in tariff rates, reducing trade costs in general, but the SSA region still records the high costs of trade as compared to other developing regions and this has hindered the flow of trade within the region (World Bank Doing Business report, 2013). SSA's poorly developed trade logistics in the form of poor infrastructure, weak institutions, and trade facilitation have largely accounted for the region's high trade cost (Turkson, 2011; Heokman and Nicita, 2008).

Using a logistics augmented gravity model, the study analyzes the impact of improvements in trade logistics performance (aggregated and disaggregated) on the volume of bilateral trade between countries in SSA over a period 2007 to 2012. With three rounds of the Logistic Performance Index (LPI) published by the World Bank, and trade indicators from UNCOMTRADE and CEPII, the Hausman Taylor estimation results indicate a positive impact of logistics performance improvements of exporter country on volumes of bilateral trade among countries in SSA over time.

Findings recommends the need for both private and public institutions that have direct or indirect influence on infrastructure and trade facilitation to develop innovative approaches to help tackle the challenges of high transport and transaction costs, and weak institutional capacities facing many countries in SSA, as a means of boosting trade within the region, increasing their ability to compete in the global economy and attracting Foreign Direct Investment (FDI).

DEDICATION

This thesis is dedicated to the Almighty and ever merciful God, my loving and very dedicated mother, Mrs. Paula Aku Nutor who continues to believe in me and made enormous sacrifices to make this happen, and my children Jason and Alicia, who are my ultimate inspiration and motivation.

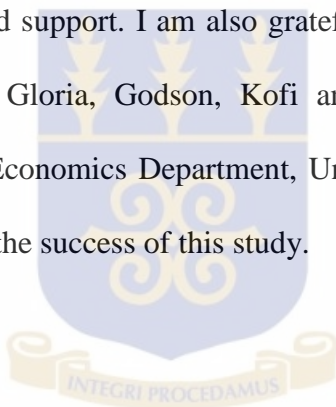


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LIST OF ACRONYMS

CEPII	Centre d'Etudes Prospectives Et d'Informations Internationales
EAP	East Asia and Pacific
ECA	Europe and Central Asia
FDI	Foreign Direct Investment
FE	Fixed Effects
GATT	General Agreements On Tariffs And Trade
GDP	Gross Domestic Product
GLS	Generalized Least Squares
GNP	Gross National Product
HO	Heckscher Orlin
IMF	International Monetary Fund
LAC	Latin America And Caribbean
LPI	Logistics Performance Index
LSDV	Least Squares Dummy Variable
MENA	Middle East And North Africa
MFN	Most Favored Nations
OLS	Ordinary Least Squares
RE	Random Effects
SAS	Southern Asia
SSA	Sub Saharan Africa
TRAINS	Trade Analysis And Information System

UN-COMTRADE	United Nations Commodity Trade Statistics Database
UNCTAD	United Nations Conference On Trade And Development
WDI	World Development Index
WITS	World Integrated Trade Solutions
WTO	World Trade Organization

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Studies focusing on costs of international trade and logistics have attracted extensive coverage in the international trade literature in recent times. This is mainly due to the important roles these factors play in affecting the volumes of global trade. The real costs of trade; the transport and other costs of doing business internationally, are important determinants of a country's ability to participate fully in the world economy (Limao and Venables, 2001). Trade costs may well be defined to include all costs incurred in getting a good to a final user other than the marginal cost of producing the good. Trade costs consist of;- transportation costs (both freight costs and time costs), policy barriers (tariffs and nontariff barriers), information costs, contract costs, enforcement costs, costs associated with the use of different currencies, legal and regulatory costs, as well as local distribution costs. Trade costs can also be categorized into two major categories, that is, costs imposed by policy (artificial costs) and costs imposed by the environment (natural costs). Artificial cost is composed of insurance cost, communication cost, local distribution costs, legal and regulatory cost, foreign exchange cost and contract cost. On the other hand, natural cost relates to distance (transportation and time costs).

Trade costs does vary widely across countries, regions and continents. According to Limao and Veneables, (2001) in Sub-Saharan Africa, transportation cost are higher than cost of production.

Sub-Saharan Africa (SSA) can be geographically referred to as that area of the African continent which lies south of the Sahara. Many SSA countries are small and/or landlocked, with landlocked countries accounting for 40 percent of SSA's total population. . The main impediments faced by landlocked developing countries in accessing markets have been extensively covered in the literature. Studies have found that being landlocked raises total transport costs by about 50 percent (Limao and Venables, 2001). Geography therefore greatly influences the cost of trading. These landlocked countries are dependent on the infrastructure and the institutional quality of their neighboring transit countries to reach overseas markets. This intensifies their detachment from major world markets. Obstacles may be in terms of remoteness from world overseas partner, and also in terms of dependence on trade and transport facilities and services existing in neighboring coastal countries. The extent to which both types of obstacles affect trade competitiveness of landlocked developing countries in turn depends on institutional, regulatory and technological factors that could either hinder or enhance the efficient functioning of transit systems. Consequently, these costs add to the transaction costs of the landlocked countries in SSA and will determine whether these countries will be able to trade more or less with those overseas.

Globally, liberalization has contributed to the reduction of trade tariffs along with other artificial trade barriers. Since the 1990s, many developing countries have adopted an outward-oriented strategy and have in the process witnessed significant acceleration in their economic performance over the past two decades. Most developing countries in Asia,

Latin America and Africa experienced reduction in tariff rates. Most SSA exports have encountered liberalizations reducing tariff and, in some cases, non-tariff barriers thereby increasing the relative constraining power of transport costs.

The empirical literature suggests that although, over time trade costs have generally declined, they have been relatively high especially for developing countries (Portugal-Perez and Wilson, 2008). These high costs emanates from the effects of differences in logistics, infrastructure quality and institutions, and in SSA especially, little or no improvements in logistics. The importance of logistics, trade facilitation and other non-policy barriers have increased significantly in recent times mainly because most developing countries are generally disadvantaged by natural barriers and distance especially in SSA.

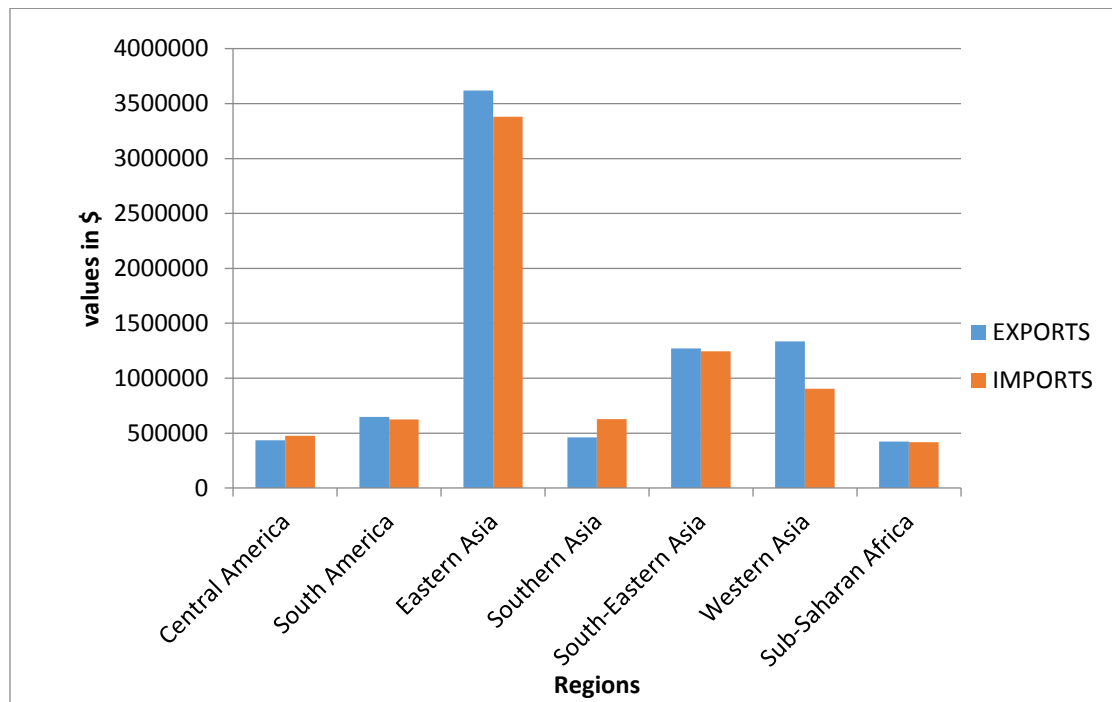
Logistics involve the organization of movement of goods and services over time and space. Policy makers in recent decades have recognized the need for improvements in Trade logistics as a tool for economic growth, diversification and poverty reduction. Trade logistics are crucial for the unrestricted flow of goods internationally and within regions however in SSA, trade logistics are in the form of poor infrastructure and weak institutions. These have largely accounted for the region's high trade cost. The "logistics gap" between high and low income countries remains wide. The Logistic Performance Index (LPI); published by the World Bank in 2012, shows that countries with the worst performance were the least developed ones (most of them also being landlocked countries, small-island states, or post conflict countries). This index captures time costs, logistic competence,

tracking and tracing of consignments, international shipping costs, customs efficiency and infrastructure quality of countries. Some studies have utilized the LPI and have analyzed the impacts of the status of logistics, infrastructure and trade facilitation. Hoekman and Nicita (2008) and Manners and Behars (2007) estimated the gravity model (augmenting it with logistics and infrastructure), stressing the relevance of improved logistics and trade facilitation on trade. Similarly, Turkson (2011), estimated the gravity model augmenting it with logistics and remoteness, and found out that improvement in logistics, infrastructure and facilitation has positive impacts on the volume of bilateral exports between developing countries.

1.2 Problem Statement

Trade and investment flows have expanded globally over in various regions of the world, but this has not been the case in Africa, especially SSA. Africa's share of world exports has dropped by nearly two thirds in three decades from 2.9% in 1976 to 0.9 % in 2006 (Portugal-Perez and Wilson, 2008). Figure 1.1 below shows the values and shares of merchandise exports and imports between developing regions. It clearly indicates that in 2013, SSA lagged behind the other regions of the world in terms of the region's share of global exports. Remoteness from major markets, inadequate transit facilities, cumbersome customs and border-crossing procedures, regulatory, and weak legal and institutional arrangements are some factors that undermine the efforts of countries in SSA to build their productive capacities and to be competitive in world markets.

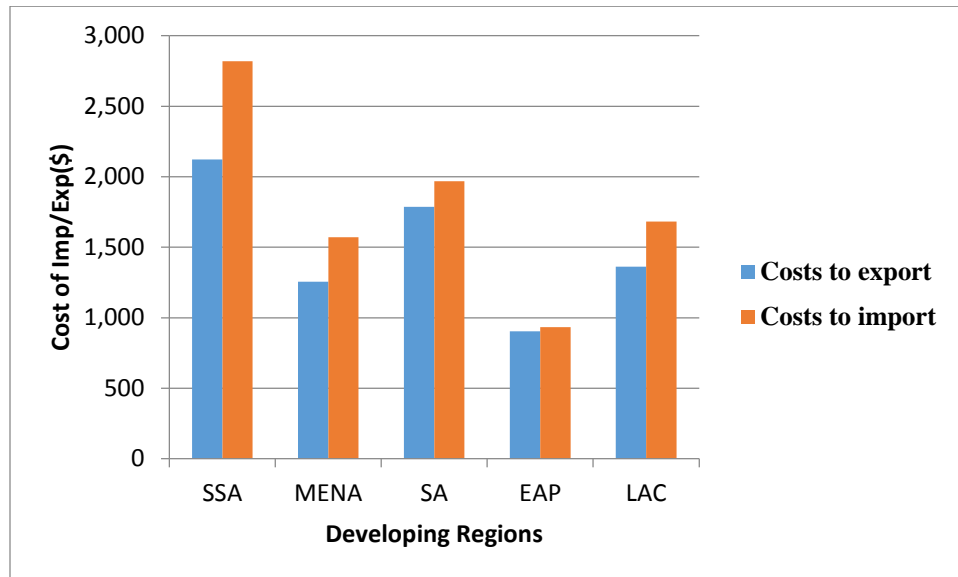
Figure 1.1 Merchandise exports and imports of developing Regions, 2013 (US\$ in current prices)



Source: UNCTADstat, 2012-2013

There are intra-regional bilateral trade opportunities within SSA, especially for countries that share a common border and neighboring countries often have integrated transport networks and in many instances have bilateral transit or customs agreements. However, the poor quality and overall port-oriented design of land transport infrastructure in SSA inhibits intraregional trade. Some recent studies reveal that, transport costs for intra-SSA trade are much higher than the average cost of intra-regional trade in other geographic regions like East Asia (Limao and Venables (2001), Ackah, Turkson and Opoku, 2012). Figure 1.2 shows that average costs of export and import procedures are highest in SSA relative to other developing countries.

Figure 1.2 Costs to Import and Export (US\$ Per Container) among the World's Developing Regions (2012)



Source: World Bank, World Development Indicators, 2012

Consequently, a 2012 publication of the IMF's Direction of Trade Statistics indicates that most countries in SSA, trade more with countries in other regions of the world. As a result, over 80 per cent of the exports from low-income-Sub-Saharan countries go to countries outside of the sub-Saharan region (\$85.2bn in 2006). These countries only exported \$4.5 billion to Sub-Saharan middle income countries and \$9.4 billion to other Sub-Saharan low-income countries. Similarly, majority of SSA middle income countries trade with countries outside the sub-Saharan region. Sub-Saharan countries also import mainly from countries outside their own region.

Mbabazi, Milner and Morrisey (2006) have confirmed that the poor SSA growth performance can be explained by the combination of factors such as low levels of openness,

high natural barriers to trade (especially high costs of transport to distant dynamic markets) and export dependence on primary commodities. Sub-Saharan African countries have performed poorly according to an index of logistics performance released by the World Bank (Arvis et al 2007), since poor logistics would be expected to increase trade costs and reduce trade.

1.3 Objectives of the Study

This study specifically seeks to;

- To estimate the impact of trade logistics performance on the volume of bilateral trade between countries in SSA over a six year period (2007-2012).
- To identify the individual effect of the disaggregated measure of the Logistic Performance Index (LPI) on bilateral trade among countries in SSA over the period 2007 to 2012.

1.4 Significance of the Study

The importance of trade logistics to build or enhance competitiveness and improve trade levels between Sub-Saharan African countries cannot be overemphasized. Efficient logistics, effective transports and trade facilitation policy measures tend to lower costs, increase trade volumes and also attract new investments. As world trade patterns change, new opportunities are arising for Sub-Saharan African countries to be able to compete effectively on the world market and improve trade relations among each other. Information and communication technologies provide new operational solutions, which however, cannot always be fully used due to capacity limitations (human, technological and

institutional). There is therefore the need for special emphasis on reducing transport and transaction costs, improving effective transit systems, transport efficiency and connectivity, along with establishing a supportive legal framework between countries in SSA.

The poor performance of trade among SSA countries is an issue of major concern for development policy makers in the region. These structural and geographical handicaps have prevented SSA from fully harnessing the potential of trade as an engine for sustained economic growth and development. There is urgent need to address these bottlenecks to trade through continued international and national efforts to implement appropriate policies to stem the tide to enable the region reap the full benefits of trade. It is therefore of great importance to explore the different sources of policy-induced trade costs measures and its relative impacts on trade volumes over time.

1.5 Organization of the study

This study will consist of six chapters. Chapter one provides the background of the study, the problem statement, the research questions as well as the objectives, justification and organization of the study. Chapter two discusses the overview of the study. Chapter three then reviews the theoretical literature and empirical studies related to this study. Chapter four discusses the methodology and empirical approach to be used for the study. Chapter five then presents and discusses the empirical results of the study whiles policy recommendations and conclusions are discussed in chapter six.

CHAPTER TWO

OVERVIEW OF TRADE COSTS AND LOGISTICS IN SUB SAHARAN AFRICA

2.1 Introduction

This chapter gives a general overview of the relationship between trade cost and trade logistics, and volumes of bilateral trade of countries in sub Saharan Africa. It provides the trend and structure of trade costs associated with importing and exporting goods after production. Subsequent sections present discussions on the state of logistics and trade facilitation and their impact on trade costs. These costs determine the volume of trade between SSA countries, SSA regions and other countries in the world.

2.2 Trade, GDP and Economic Growth

Recently most countries trade more on international markets than ever before – both in absolute terms and as a proportion of their national output (Novy et al, 2008). It has been found that in the post war era only 13 countries have grown at 7% or more for 25 consecutive years. The Growth Commission of DFID has attested to the fact that one of the eight ingredients in the generic recipe for growth is trade. According to the Commission, no country has grown on a sustained basis in recent times without increasingly integrating itself into the global economy. In the 1990s per capita income grew more than three times faster for those developing countries that lowered trade barriers (5% per year) than for other developing countries (1.4% per year).

Growth is the most important means of raising incomes and reducing poverty- accounting for approximately 80% of poverty reduction in developing countries. Beginning in the nineteenth century, the world saw a remarkable rise in international trade that came to a halt during World War I and later on in the wake of the Great Depression. The percentage growth in trade volumes is roughly comparable in the two waves of globalization (at 400% and 471%, respectively). Trade costs dropped faster during the first wave, explaining the growth of trade in that period. From 1870 to 1913, falling trade costs accounted for over half of the growth in international trade, while the rest was explained by secular increases in output. Consistent with previous studies for the post-world war 2 period, Baier and Bergstrand, (2001), Whalley and Xin, (2007), found that only 33 percent of the present-day global trade boom can be explained by the decline in trade costs.

Evidence suggests that enhancing trade has a positive effect on both the growth and level of income. Sub-Saharan African economies are typically small, undiversified and suffer from weak infrastructure. With over 50% of the population living below \$1.25 a day, SSA has a higher share of the population living in poverty than any other region in the world. SSA's share of world trade has ranged between approximately 1.3% and 2.2% over the last two decades.

Sub-Saharan Africa's trade has grown at relatively low rates since the 1950s, with the result that today the region's share in world trade stands at around 1 percent, down from more than 3 percent in the mid-fifties (Yeats, 1997).

SSA countries during the 1990s, experienced a real GDP growth measuring just 2.4 percent on average. But beginning in 2001, SSA registered its best economic performance since 1980. Region-wide real Gross Domestic Product (GDP) grew at an average annual rate of 4.6 % from 2001 through 2005, and is estimated to have grown at an annual rate of 5.8 percent during 2006.

In 2012, SSA experienced a GDP growth of 4.3% as compared to 3.0 % for the Latin America and the Caribbean(LAC) region and share of trade of GDP was 70%. Between 2000 and 2012, share of exports of GDP rose from 34% to 35%. Increased exports have helped fuel this economic growth as from 2001 to 2005 as the value of merchandise exports from SSA increased by nearly 19 % annually. The Middle East and North Africa (MENA) regionon average, experienced trade growth of 3% in the late 1990s, and 5.6% between 2000 and 2004 with trade growth accelerating to an average by 7% between 2005 and 2007. Global exports increased by 14.3% annually over the same period. The mining and manufacturing sector has increasingly dominated SSA's merchandise exports, accounting for 89% of the total (not including special provisions) in 2005.

In 2007, trade volume in the SSA region was estimated to have grown by 6.4% on a cross-country average basis, the lowest rate in the developing world and representing a decrease from the 7.9 % growth exhibited in 2005-2006. Export growth was similarly low at 6.1 percent, down from 7.8 percent in 2005–2006 and from more than 8% in the previous decade. After experiencing a high 9.4 percent real growth of total trade in goods and services in 2005–2006, the LAC region's performance slowed down to 7.6 % in 2007. Export

growth also slowed to 6.3 % from 7.6% in the mid-2000s, in line with its historical performance. LAC's average trade share of GDP increased from 86 % in 1995–1999 to 9 % in 2007, a smaller increase compared to that of most other regions. South Asia (SAS) experienced the highest growth in trade during this decade with its 2007 average growth rate of 10.8 % which followed a 2005– 2006 growth of almost 12 %.

In 2012 – 2013, exports of goods and services in the MENA region grew at 5.7%, in the LAC region by 3.8 %, while in the EAP (East Asia and the Pacific) region, exports grew by 3.1%. Exports of goods and services in SSA grew at 2.2% exhibiting the lowest growth among the developing regions (**Table 1**). In the same period, exports of goods and services had a share of 39% of the GDP in the MENA region, with SSA's share of exports of goods and services was 35%.

The reasons for SSA's poor trade performance are multifaceted. SSA is clearly constrained by its unusual physical and economic geography and constrained access to the sea. The effect is the higher trade costs and low productivity. This is reinforced by the presence and status of 15 landlocked countries.

Table 2.1: Some Key Macroeconomics Indicators of Trade (2012-2013)

Region	GNI Per Capita	Export of Goods and Services (% of GDP)	Imports of goods and services (% of GDP)	Exports of goods and services (Annual % growth)	Imports of goods and services (Annual % growth)
SSA	1,353,	35	35	2.2	-2.4
MENA	3,439	39	33	5.7	-4.9
SA	1,462	22	31	2.1	6.1
EAP	4,884	34	31	3.1	4.7
LAC	8,981	24	26	3.8	6.0

Source: Compiled from World Development Indicators Online Database.
<http://www.worldbank.org>

2.3 Trade Costs in Sub-Saharan Africa

Evidence suggests that the determinants that matter most for explaining trade costs are standard factors like geographic distance (which is a rough proxy for information and transportation costs), trade policy and tariffs, adherence to fixed exchange rate regimes, and membership in an economic or common market.

Well-established body of literature has found a clear link between the quality of infrastructure and transport costs in international trade (Limao and Venables 2001; Clark, Dollar, and Micco 2004). But inefficient ports and poor transport and logistics services are not the only impediments for exporting and importing firms in SSA. These firms also face policy and institutional constraints in the form of complex laws, burdensome regulations, inadequate enforcement of contracts, poor definition and enforcement of rules of

engagement, onerous documentation and other procedures causing delays at customs and border crossings.

Anderson and Marcouiller (2002) studied the effects of institutional quality on trade and found that higher transactions costs associated with poorly enforced commercial contracts and lack of transparency and impartiality in government policies significantly impede international trade. For instance firms in Côte d'Ivoire incur costs of all export-related transactions for a 20-foot container, including inland transport from the factory gate to ocean vessel, of US\$2,000 on average. For firms in El Salvador the cost is less than US\$900. For those in OECD countries it is much lower—in Denmark a little over US\$700, while in Finland only US\$540 (World Bank, 2011). In 2012, SSA indicates the highest cost of exports with \$2,124 per container, with the EAP region representing the lowest export costs of \$904. In the same year SSA also recorded relatively the highest cost (\$2,819) to import per container compared to the LAC, SAS, MENA and EAP region. (Figure 2.1).

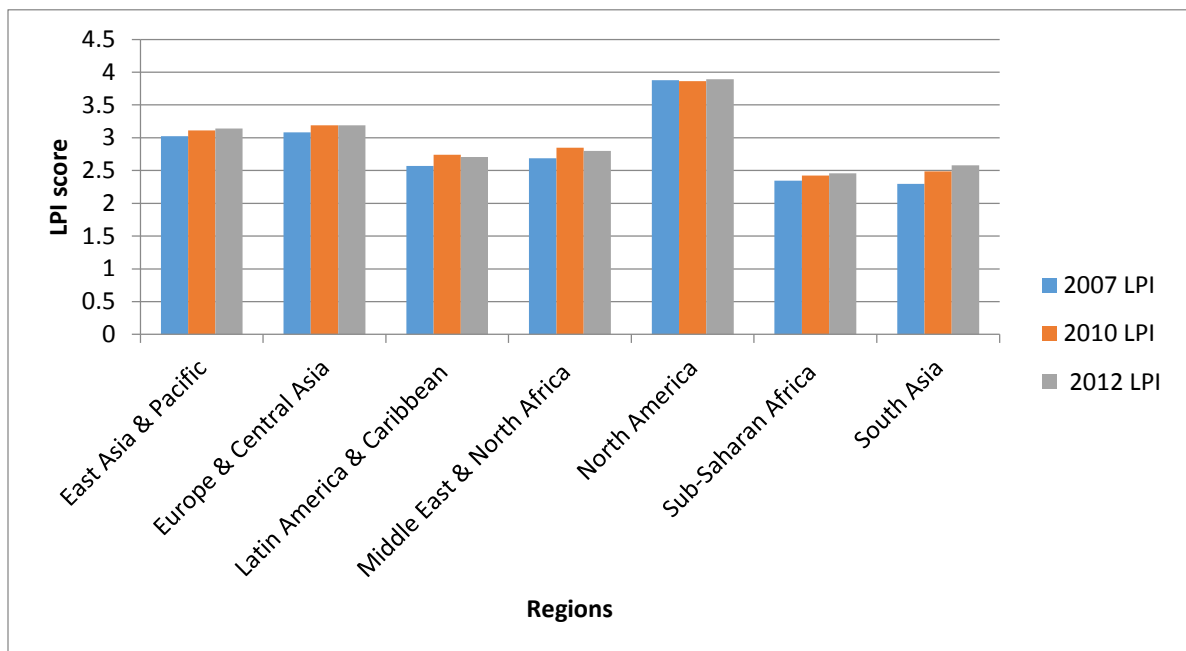
2.4 Trade logistics and facilitations in SSA

Among developing countries, the SSA, SAS, and MENA regions rank below the world average on institutional dimensions related to the business climate indicators as measured by the Doing Business (DB) indicators of the World Bank. There is a significant gap in the quality of trade facilitation between the high-income countries and even the best-performing developing countries. Better trade logistics, as measured by the World Bank's Logistics Performance Index (LPI), are correlated with positive changes in trade. The

world bank's LPI 2013 indicates that among developing regions, the ECA (Europe and Central Asia) and EAP regions score the highest, while the SA and SSA regions lag significantly behind them integration globally. With scoring range from 1 to 5, the LAC, SSA, MENA, EAP, SAS, ECA, and the Euro area obtained values of 2.67, 2.46, 2.58, 2.77, 2.58, 2.77, 2.58, 2.73 and 3.56 respectively

At the bottom of the rankings are low-income countries that are geographically isolated or beset by conflict or other internal problems. Landlocked developing countries, especially in Africa and in Central Asia, are the most constrained in terms of trade logistics, as they typically suffer from difficult geography, poor access to logistics services in neighboring countries, and high coordination and transportation costs. With reference to competence and quality of logistics services as measured by the World Bank(2012) the EAP, LAC, SSA, AND MENA scored 2.64, 2.60 2.42 and 2.49 respectively.

Figure 2.1 Logistic Performance Index by Region (2007, 2009 and 2012)



Source: World Bank Development Indicators online Dataset

Geographical and physical constraints to trade are further hampered by the poor state of SSA's infrastructure which pushes up trading costs. Infrastructure includes services such as water and sewage treatment, energy, transport, information and communication technology (ICT), logistics, and financial services. Many of these sectors are important to the facilitation of trade and investment. Logistics and trade costs are particularly high in SSA (Table 2.2), in part because of transport inefficiencies, inadequate storage facilities, and underdeveloped distribution systems.

Table 2: 2 Trade cost across developing regions (2012-2013)

Region	Costs to export (US\$ per container)	Costs to import (US\$ per container)	Time to export (days)	Time to import (days)	Documents to export (numbers)	Documents to import (numbers)
SSA	2,124	2,819	31	38	8	9
MENA	1,255	1,571	24	29	6	8
SA	1,787	1,968	33	34	8	10
EAP	904	933	23	25	7	7
LAC	1,363	1,682	18	20	6	7

Source: Compiled from World Development Indicators Online Database. <http://www.worldbank.org>

Borders and Customs Procedures : The World Bank's Doing Business Online Database indicates that, SSA has the highest average costs (fees levied on a 20-foot container) for both export and import procedures of any world region, roughly twice as high as in high-income countries. The time required to export and import a good is an important barrier to trade. Among global regions, SSA has the highest number of export procedures and the second-highest number of import procedures.

Hausman, Lee, and Subramanian (2012) as well as Djankov, Freund, and Pham (2010) in two separate studies find that a percent reduction in the time to export increases exports by roughly 0.4 percent. According to Djankov et al (2006), seventy-five percent of delays at borders are due to administrative hurdles - numerous customs procedures, tax procedures, clearances and cargo inspections - often before the containers reach the port. The problems are worse for landlocked African countries, whose exporters need to comply with different

requirements at each border. The administrative costs of crossing borders include documentation time and fees, customs clearance fees, and terminal handling charges. There are 15 government agencies enforcing duplicative laws on either side of the Chirundu Border Post, resulting in average border crossing times ranging from 26 to 46 hours northbound into Zambia, and from 6 to 17 hours southbound into Zimbabwe.

Export times in Sub-Saharan Africa are longer compared to the other regions, taking 47½ days on average. World Bank Doing Business Data 2013 indicates a wide variation across countries in Sub-Saharan Africa, ranging from 10 days in Mauritius to 75 days in the Chad; it also takes 16 days on average in South Africa, and 53 days in Zimbabwe. For instance, Rwandan coffee producers require an average of 42 days to export, excluding maritime transport, owing to long distances to port, poor road conditions, and customs delays. In contrast, Colombian producers in Latin America require only 14 days to export, excluding maritime transport.

Evidence from researches (Mohammed Amin, 2011) analyzing the relationship between the number of documents required to export and import and the time it takes to complete all procedures to trade have shown that an increase in the number of documents required for export and import tends to increase the time cost of shipments. In many SSA corridors, the harshest constraints are administrative procedures at borders, administrative procedures and delays at borders account for an estimated 20 percent of freight costs in East Africa, and delays at southern African border posts cost an estimated \$48 million in 2001. On the Northern Corridor, trucks reportedly often lose more than one day at Malabar, the Uganda–

Kenya border post. Table 2.2 indicates the average number of documents required by Government agencies that operate at borders (Customs, Immigration, Agriculture and Health Ministry) to import and export in the various developing regional groups in 2013. With the exception of South Asia, SSA requires the largest number of document to export and import.

2.5 Transport Infrastructure in SSA

In Sub Saharan Africa, transportation costs are estimated to be typically higher than tariffs. A study by the World Bank in 2001 shows that for the majority of the United States' trading partners, transport cost incidence for exports is higher than tariff costs incidence. For sub-Saharan African countries, this is five times higher.

The World Banks LPI report in 2012 indicates that in terms of the quality of trade and transport infrastructure, the regions EAP, LAC, SSA, and MENA scored 2.58, 2.52, 2.30 and 2.40 respectively. SSA obtained the lowest score upon experiencing the highest trade costs for the past decade. The poor state of SSA's transport infrastructure has been the major cause of its rising trade costs. In Rwanda, for instance coffee is transported over 1,500 km on roads of variable quality via Uganda to the port in Mombasa, Kenya, or alternately by road and rail to Dar es Salaam, Tanzania. Transport costs usually represent up to 40 percent of total costs of Rwandan coffee exports.

Road Infrastructure in SSA: Most trade occurring between countries that share a border takes place via land. Hummels (2007) estimated that 90 per cent of trade between

neighboring countries and the United States occurs via land. Of this, road is the principle mode of transport. Data for the European Union also show that road is the most important means of land transport. In Europe, around 72 per cent of trade volumes are shipped through the road network. On the other hand, Sub Saharan Africa roads and railways are in poor overall condition. Over the last several decades, SSA has lagged behind other regions of the world in quantity and quality of land transport infrastructure and has made slower progress in improving maintenance and management of infrastructure.

Roads in SSA have lost nearly one-third of their value due to underinvestment and continuous deferral of maintenance. When road infrastructure is sufficiently poor, drivers take alternate routes that often require longer travel times. For example, Burundi's most direct route to the coast is through neighboring Tanzania, but infrastructure along this route is so poor that the primary Burundian transit route to Mombasa is via Rwanda, Uganda, and Kenya, an additional 600 km. Also due to bridges washing out in Togo, many freight shipments from northern Togo must travel to Tema in Ghana, via Ouagadougou, Burkina Faso, a detour of an estimated 1,750 km that contributes to overuse of and damages to the county's roads.

Rail Infrastructure in SSA: Rail capacity in SSA has declined due to infrastructure deterioration and breakdowns and delays are frequent which leads to endemic unreliability in operations. In the 1980s for instance, there were 20,000 km of rail lines in southern Africa, but only 10,000 km were in use in 2002. Even in South Africa, the SSA country with the most developed rail sector, current capacity on the railway connecting manganese

mines to Port Elizabeth is 3.5 million tons per year, whereas demand is approximately 4.2 million tons per year. As with road transport, rail transport in SSA is protracted and unreliable: The 1,145 km train trip from Kampala, Uganda, to Mombasa, Kenya can take from 14 to 21 days. Ghana has experienced a long and severe decline in rail traffic, and most of its goods (and all of its containers) now travel by truck, leaving manganese and bauxite (which can only feasibly be moved by rail due to their weight) to make up 83 percent of Ghana's rail traffic.

Port Infrastructure in SSA: Trade among countries without a common border takes place mainly via the ocean. In particular, ocean shipping is the main mode of transport for bulk commodities (such as oil, petroleum products, iron ore, coal and grain). These represent a large share of trade in terms of weight, but are a small and falling share of trade in terms of value. Technological and institutional changes have lowered shipping costs over the years. This includes the development of open registry shipping scale effects from increased trade and containerization. Standardized containers allow the use of a multi-modal transport system, without unpacking and repacking. However, there is no clear direct evidence of a downward trend in ocean shipping prices globally.

Ports in SSA on the other hand are inefficient by global standards and lack sufficient capacity, resulting in increased port charges, higher maritime freight costs, and delays, all of which adversely affect SSA's trade costs export competitiveness.

Many of the major ports in SSA are congested because of insufficient capacity, and procedural delays and inefficiencies often compound the problem. As a result, goods moving in or out of ports suffer lengthy delays. Moreover, problems in one SSA port may affect port schedules in other SSA ports on the same shipping route, compounding delays and creating uncertainty. For instance, port operations throughout West Africa affect fruit shipment quality and the competitiveness of tropical fruit exports.

Despite being a comparable distance by sea from the EU, tropical fruit shipped from the largest exporters in Latin America spends less time in transit between ports than tropical fruit shipped from West Africa. This is mainly due to the fact that most of the produce exported from Latin America is shipped on dedicated fruit vessels operated by the major global produce companies, such as Dole and Del Monte. Latin American producers reportedly benefit from efficient shipping route options to all of the major ports in the EU, with produce often reaching its final EU destination, in 12 or 13 days. In contrast, some produce exported from West Africa is shipped on container vessels that make other port calls en route and can take around 20 days to arrive at its final EU destination.

2.6 Trade Policies

Over the last few decades, countries have improved many aspects of policy relevant to trade. Tariffs contribution to total trade costs has decreased over time. Tariff protection and preferences has fallen consistently in all regions and income groups from the mid-1990s to 2007, and especially in low-income countries. Tariffs have progressively been reduced since the establishment of the General Agreement on Tariffs and Trade (GATT) in 1948 (World Trade Report 2008). High-income countries, which were earlier reformers,

still have the lowest average tariffs at 6% compared to a developing country average of 11%. [World Bank's Trade (MFN) Tariff Restrictiveness Index (MFN TTRI)].

The tariff average prevailing before the Geneva Round of negotiations (1947) was approximately between 20% and 30% (WTO, 2007). Tariffs went down for both developed and developing countries. Globally, Most Favored Nation (MFN) average tariffs have fallen from 14.1% during 1995 and 1999 to 11.7% during 2000 and 2004 and further to 9.4% in 2007, a decline of more than 33%. An important contribution has also been provided by preferential tariff treatment in favor of least-developed countries (LDCs), bringing duty free access for most of them to major developed countries. On average, countries in the SSA region consistently score or rank relatively poorly on most trade-related policy categories compared to other regions. SSA is the second most trade-restrictive region, after SAS, with an applied tariff weighted average of 11% (albeit improved compared to 15% in (1995–99)). Comoros, Sudan, Zimbabwe, and the Seychelles are the most closed economies, having the highest restrictiveness indices and MFN tariffs (whether on a simple average or trade-weighted basis).

Among developing countries, performance of those in the EAP and SAS regions is noted for the large declines in their average MFN tariffs, which fell by 50 and 47% respectively. Although SAS's percentage decline is the largest, it also had the highest tariff levels, averaging 26%. Among developing regions, the smallest decline was in MENA region (22%), which is the most restrictive region with average tariffs around 16 percent. It is followed by the SAS and SSA regions. The ECA region has the lowest average tariff (7%),

followed by the LAC region (9%). Although they have fallen in recent years, SSA's tariffs are on average 50% higher than those of comparable countries in South America and Asia.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter of the study provides theoretical and empirical foundations to support the study. Literature is reviewed on the theories and empirical works that provide explanations to trade logistics, trade costs and volumes as well as bilateral trade. The next section presents a review of the theoretical literature, while Section 3.3 is dedicated to the review of the empirical literature. This chapter sets out to pinpoint the gaps in the existing literature as well as establish the significance and contribution of this current study.

3.2 Theoretical Literature

Over the last centuries there have been many theories regarding international trade. Adam Smith first described the principle of absolute advantage in the context of international trade, using labor as the only input. The principle of absolute advantage refers to the ability of a country to produce more of a good or service than the other, using the same amount of resources. David Ricardo subsequently developed one of the theories of international trade in 1817, the comparative advantage theory. Ricardo challenged the idea that the purpose of trade was to accumulate gold or silver. Comparative advantage refers to the ability of a party to produce a particular good or service at a relatively lower opportunity cost. Ricardo thus argued in favor of specialization and free trade among countries.

In the 1920s, Eli Heckscher and Bertil Ohlin presented a theory, called the factor proportions model. The idea was that a country with a high ratio of labor to capital will tend to export goods that are labor-intensive, and vice versa. The Heckscher-Ohlin (H.O) theory explains why countries trade goods and services with each other, with emphasis on differences in resource endowment between countries.

This model showed that the comparative advantage by Ricardo is actually influenced by the interaction between the resources countries have (relative abundance of production factors) and production technology (which influences the relative intensity by which the different production factors are utilized during the production cycle). The gravity equation for describing trade flows first appeared in the empirical literature without any serious attempt to justify it theoretically. It has been argued that the standard Ricardian and H.O models do not provide enough foundation for the gravity model.

Tinbergen (1962) and Poyhonen (1963) did the first econometric studies of trade flows based on the gravity equation, but gave only an intuitive justification that the size of bilateral trade flows between any two countries can be approximated by the “gravity equation” an analogy with the Newtonian theory of gravitation. According to Tinbergen, countries trade in proportion to their respective GDPs and proximity just as planets are mutually attracted in proportion to their sizes and proximity.

Tinbergen’s traditional gravity equation (equation 3.1) for trade simply states that the trade flow from country i to country j , denoted by T_{ij} , is proportional to the product of the two countries’ GDPs, denoted by Y_i and Y_j and , and inversely proportional to their distance, D_{ij}

$$T_{ij} = \alpha_0 Y_i^{\alpha_1} Y_j^{\alpha_2} D_{ij}^{\alpha_3} \varepsilon_{ij} \dots \dots \dots \quad (3.1)$$

$\alpha_0, \alpha_1, \alpha_2$ and α_3 are unknown parameters to be estimated, and ε_{ij} is an error factor assumed to be statistically independent of the regressors.

The gravity models normal approach has been to estimate the gravity equation using the ordinary least squares in logarithms of the dependent variable. The gravity equation has worked well empirically, yielding sensible parameter estimates and explaining variation in trade. However it has been disputed for a lack of theoretical foundation. Over the years there have been several debates both in understanding the theoretical basis for the equation and in improving its empirical estimation.

The monopolistic competition model of the New Trade Theory was one approach to providing theoretical foundations to the gravity model (Helpman 1987; Bergstrand 1989) based on product differentiation among producing firms, and the empirical success of the gravity model is considered to be supportive of the monopolistic competition explanation of intra industry trade. However, Deardorff (1998) and Feenstra (2004) have cast doubt on this interpretation, noting the compatibility of the gravity equation with some forms of the Heckscher-Ohlin model and, consequently, the need for empirical evidence to distinguish among potential theoretical bases: product differentiation by country of origin; product differentiation by firm; and particular forms of Heckscher-Ohlin-based comparative advantage.

Alternatively, there have being other approaches to gravity- based explanations of bilateral trade that do not depend on complete specialization(Haveman and Hummels (2004),

involving accounting for trade frictions in the form of distance based shipping costs or other trade costs, as well as policy-based trade barriers.

Linnemann (1966) came up with a theoretical justification in terms of a Walrasian general equilibrium system, but the Walrasian model did include too many explanatory variables for each trade flow to be easily reduced to the gravity equation (Deardorff, 1998). Leamer (1974) used both the gravity equation and the H.O models to motivate explanatory variables in a regression analysis of trade flows, but he did not integrate the two approaches theoretically.

The first significant attempt to provide a theoretical basis for gravity models was the work of Anderson (1979) in the context of a model where goods were differentiated by country of origin (the Armington assumption) and where consumers have preferences defined over all the differentiated products. He assumed both Cobb-Douglas and constant-elasticity-of-substitution (CES) preferences and implied that, whatever the price, a country will consume at least some of every good from every country and thus larger countries import and export more. He represented trade costs as “iceberg” costs, where only a fraction of the good shipped arrives to destination, with the rest having melted in transit indicating that transport costs reduce trade flows.

Several studies have criticized Anderson’s work and have prompted several more formal attempts to derive the gravity equation from models that assumed product differentiation. Jeffrey Bergstrand (1985) explored the theoretical determination of bilateral trade and like

Anderson, used CES preferences over Armington-differentiated goods to derive a reduced form equation for bilateral trade involving price indexes. Bergstrand (1985 and 1989) showed that a gravity model is a direct implication of a model of trade based on monopolistic competition developed by (Krugman 1980). Bergstrand (1989, 1990) departed further from the H.O model by assuming monopolistic competition, and product differentiation among firms rather than among countries. He used this framework of the perfectly competitive H.O model and the one-sector monopolistically competitive model of Krugman (1979) to derive another version of the gravity equation. Leamer and Stern (1970) derived the a gravity equation from a probability model of transactions, an approach which was very similar to Deardorff (1998) , but they applied it only to trade, not to all transactions, and did not make any explicit connection with the H.O model.

Deardorff (1998) analyzed two different cases of HO-model equilibria, one with frictionless trade (literally zero barriers to trade) and one without it and showed that a gravity model can arise from a traditional factor-proportions explanation of trade. He observed that trade barriers do not imply complete specialization by countries in largely different goods, so considered bilateral impeded trade under the assumption that each good is produced by only one country. Based on this, he established that bilateral trade patterns in the HO model are essentially the same as in other models with differentiated products. He therefore derived bilateral trade in terms of incomes and trade barriers in a clearer form.

Eaton and Kortum (2002) derived a gravity-type equation from a Ricardian type of model, and Helpman et al. (2008) and Chaney (2008) obtained it from a theoretical model of international trade in differentiated goods with firm heterogeneity.

Trade literature over the past decades has made extensive use of the gravity equation but its specification has been subjected to some theoretical refinement and augmentation. A major argument was that the traditional specification of the gravity equation does not account for average trade resistance between a country and its trading partners. After a period of extensive theoretical critique for its lack of theoretical foundation, the equation was augmented by Anderson and Van Wincoop (2003) to include multilateral resistance. This equation is shown and explained in the next chapter.

3.3 Empirical Literature

Empirical studies such as Wilson et al (2008), Djankov et al (2006), Hoekman and Nicita (2008), Behar and Manners (2008) and Turkson (2011) have confirmed the view that trade facilitation and logistics are essential for increasing trade flows especially in developing countries.

With the provision of data on the performance index of logistics of countries developed by the World Bank, Behar and Manners, (2008) and Turkson(2011) studied the relationships between logistics and bilateral exports. Behar and Manners, (2008) specifically investigated whether logistics in the countries' neighbors play a role in bilateral exports. They identified that neighbors' can be particularly important especially

for landlocked countries because aside airfreight, landlocked countries rely on the logistics of their neighbors to send goods overseas. Based on the empirical success of the gravity model (Anderson 1979, Bergstrand 1985), the authors model the relationship between exports and logistics using a gravity equation augmenting it with additional specifications such as: terms for infrastructure in neighboring countries and interactions between logistics; and whether or not the countries are landlocked.

Furthermore, Hoekman and Nicita (2008) and Behar and Manners, (2008) and Turkson(2011) introduced heterogeneity through the composition of bilateral exports (i.e. primary commodities versus manufactured commodities) as well as countries of different income levels (low, middle and high income). Also both the aggregate logistics performance index and the different components that make up the index (i.e. customs, infrastructure, shipments, tracking and tracing, timeliness and logistics competence) were used in order to illustrate the importance of each of the seven different elements of the aggregate logistics performance index. Based on a multiplicative form gravity regression frameworks used by Behar and Manner (2008) and Hoekman and Nicita (2008), Turkson (2011)estimated a gravity equation specification, augmenting it with measures of logistics and remoteness. The study adopted the negative binomial pseudo maximum likelihood (NBPML) estimation model instead of the Poisson pseudo maximum likelihood to account for the unobserved heterogeneity between countries and zero trade flows.

Regression specification results suggest that aggregate Logistics Performance Index (LPI) of both exporters and importers have a statistically significant positive impact on bilateral

trade flows. With reference to aggregate LPI category , the coefficients for customs efficiency, infrastructure and timeliness indicated that the state of logistics indicators in developing countries (as an importers) have a greater impact on trade flows than the state of the logistics indicators in the developed countries. With regards to the individual measures of logistics, the ease and affordability of shipping and timeliness had the greatest and least impact on bilateral exports respectively. Results generally suggests logistics in the developing countries tend to have a greater impact on trade flows than logistics in the developed countries, therefore indicating that logistics matters for increased trade among developing countries.

A number of studies (Clarke et al, 2004; Bougheas et al, 1999; Limao and Venables, 2001; Francois and Manchin; 2006), Nordas and Piermartini, 2004) have associated the quality of infrastructure with trade volumes and have concluded that the level of infrastructure is one of the main determinants of trade costs especially in developing countries. Many countries in the developing world especially SSA' have not been able to take advantage of globalization to increase trade among themselves and with the rest of the world mainly because of the lack of infrastructure to be able to produce and compete effectively in export markets.

Besides, Bougheas et al (1999) studied the link between the stock of infrastructure and the volume of trade upon realizing that in the trade literature, little has been said about the resource costs of infrastructure and the relationship between infrastructure and transport costs. Since the gravity model only uses distance to model transport costs, their theoretical

model shows that in addition to transport costs, availability of public infrastructure (road, port and telecommunication networks) is also a function of distance. Using evidence from European countries the authors were able to confirm their theoretical findings that by extending the Dornbusch-Fisher-Samuelson (DSF, 1997) Ricardian trade model. Their results show a positive relationship between the level of infrastructure and trade volumes for pairs of countries for which it is optimal to invest in infrastructure (since a higher level of public infrastructure should reduce transport costs).

In a related study, Nordas and Piermartini (2004) also explored the impact of the quality of infrastructure on a country's trade performance, estimating a gravity model that incorporates bilateral tariffs and a number of indicators for the quality of infrastructure. The study focused on three types of trade costs: tariff barriers, transport costs and the cost of information. They analyzed the differences in costs of telecommunication services between Britain and the USA, Switzerland and Albania and concluded that though the distance between Switzerland and Albania is much less than the distance between Switzerland and the US, Albania has a poorer telecommunications infrastructure and a less competitive telecommunications sector than the US and this probably explains the difference.

Limao and Venables (2001) also made evident the importance of infrastructure in determining transport costs but within the SSA context. Using the basic gravity model in analyzing SSA's bilateral trade, the authors find that being landlocked raises transport costs by around 50% and that in general infrastructure problems largely explain the relatively

low levels of African trade. Further analysis based on actual SSA trade flows led to the prediction of trade costs on SSA trade (both intra-SSA and with the rest of the world) and the fact that higher African trade costs are higher than those of other regions.

Wilson, Mann and Otsuki (2004) measured and estimated the relationship between trade facilitation and trade flows in manufactured goods in 2000-2001 in global trade. The authors considered four important categories: port efficiency, customs environment, regulatory environment, and service sector infrastructure. The authors also defined trade facilitation, by incorporating relatively concrete “border” elements. In addition, they considered four aspects of trade facilitation efforts: ports, customs, regulations, and e-business (which are a proxy for the service sectors of telecommunications and financial intermediation and important for all types of trade). The authors pointed out that empirical research on the issue of trade facilitation faces three challenges: defining and measuring trade facilitation; choosing a modeling methodology to estimate the importance of trade facilitation for trade flows; and designing a scenario to estimate the effect of improved trade facilitation on trade flows.

Njinkeu, Wilson and Fosso (2008) also examined the role of trade facilitation reforms, such as increased port efficiency, improved customs and regulatory environments, and upgrading services infrastructure on trade between African countries by considering how regional trade agreements relate to intra-African trade flows. Similar to Limao and Venables (2001), the study addresses the role of the trade facilitation in promoting intra-African trade. The authors were of the view that, although world trade, viewed as a vehicle

for raising standard of living has expanded faster than economic growth over the years, African countries have not seen similar trade expansion . They attributed this performance to several factors traditionally associated with growth, institutions, customs environment and infrastructure. The authors argued that past studies on trade facilitation, have not explicitly focused on the competitiveness agenda of African countries as pursued in various trade facilitation options including those considered in the autonomous policy debate or ongoing multilateral (WTO) or bilateral Economic Partnership Agreements (EPA) trade negotiations. Within the framework of the gravity model, Njinkeu et al. (2008) also studied bilateral trade between African countries and the rest of the world, and included a set of trade facilitation indicators (port efficiency, customs and regulatory environment, and services infrastructure) as well as incorporating tariffs and regional trade agreements to see which of these factors might have a greater effect on intra-African trade flows. They hold the view that an impediment to quantitative analysis of trade facilitation is the availability of properly defined and measured development of trade facilitation indicators.

Studies such as Dollar and Kray (2002), Rodrik et al. (2004) and Chang et al (2005) have provided evidence to the effect that institutions as well as infrastructure and facilitation are essential for trade and that if some countries were lagging behind in terms of trade and growth, then the poor state of institutions and infrastructure among other factors are likely to blame.

Clark , Dollar and Micco (2008) investigated the determinants of shipping costs to the U.S. with a large database of more than 300,000 observations per year on shipments of products

aggregated at six-digit HS level from different ports around the world and identified that distance, volumes and product characteristics matter. Unlike other studies that relied on macro level data, they adopted micro data because it gives more advantage in terms of being able to answer questions concerning other factors influencing transport costs, such as port efficiency. The aim of the paper was to measure how important inefficiencies within the ports are to transport costs. Based on the gravity approach to the study of international bilateral trade where geographical distance is used as proxy for transport costs, they analyze the effect of port efficiency on transport costs and other standard variables. They find that - improving port efficiency from the 25th to the 75th percentile reduces shipping costs by 12 percent. According to the authors inefficient ports also increase handling costs, which are one of the components of shipping costs. The authors explain variations in port efficiency and find that they are linked to excessive regulation, the prevalence of organized crime, and the general condition of the country's infrastructure.

In an attempt to determine how time delays affect international trade Djankov, Freund and Pham (2008), introduced and utilized a new data on trade costs by the World Bank Doing business and data on the average time it takes to get a 20- foot container of an identical good from a factory in the largest business city to a ship in the most accessible port to determine how time delays affect international trade. Their main objective was to estimate the effect of time costs on trade volumes estimating a modified gravity equation, controlling for endogeneity and remoteness. According to the authors, trade facilitation is not only about the physical infrastructure, but seventy-five percent of it is due to administrative hurdles that often occur before the containers reach the port. These problems

are magnified for landlocked African countries, whose exporters need to comply with different requirements at each border. The authors found out that on average, each additional day that a product is delayed prior to being shipped reduces trade by at least 1 percent. Also the coefficient on time delays in developing countries is significantly different from that for developed countries implying that a 10% increase in export time reduces developing country exports by 8 -12 %.

Such time delays also tend to have an even greater impact on developing country exports and exports of time sensitive agricultural products (fruits and vegetables) and time sensitive manufactured goods (office and photographic equipment). In order to examine the extent to which they are hampered, Djankov et al(2006)estimated the “difference-in-difference”gravity regressions using trade data of products for which time matters the most and the least. Their results have important implications for developing countries seeking to expand exports, implying that improving trade facilitation can have relatively large effects on exports volumes.

With regard to the regulatory aspect of trade facilitation, Amin (2011) analyzed the nature of relationship between the number of documents required to export and import as well as the time it takes to complete all procedures to trade. Focusing on the associated time cost, they suggest that the impact of increased documentation on the time cost (of exporting and importing) is likely to depend on how efficient the underlying system is in supplying the required documents. Djankov et al. (2006) uses the same time cost measure and finds that it has significant effects on the volume of trade. Their present paper complements the study

by highlighting an important determinant of the time cost of clearing all the required procedures for shipment. Amin (2011) acknowledged that a number of other important dimensions of trade facilitation were not included in their study. These include internet availability (Freund and Weinhold, 2000) and standards harmonization and automating customs procedures.

Heokman and Nicita, (2008), generally reviewed prevailing trade policies and assess their impacts on developing country trade. They sought to explore the relative impacts on trade volumes of different sources of policy-induced trade costs. Their objective was to compare the impact of border barriers [tariffs, adjusted for bilateral preferences, and Non Tax Measures (NTMs) with other sources of trade costs. Using the Logistics Performance Index and trade costs data within the gravity model framework, the results of the Poisson pseudo maximum likelihood (PPML) estimators were typical of those of other gravity equation models. In their specification, they estimated using the trade facilitation index where these results indicated that administrative and regulatory policies are as important as trade policies in impeding trade, and thus the need for many developing countries in taking action to facilitate trade. They also captured the effects of African regional integration schemes. Results showed that port efficiency and services infrastructure have a positive impact on African trade but that customs and regulatory environments are the factors that lower intra-African trade. They also showed that almost all regional trade agreements have a positive effect on trade flow.

3.4 Conclusion

Most empirical studies provide evidence of a positive relationship of improved logistics, trade costs on volumes of trade globally. In SSA, researchers such as (Limao and Venables, 2011) have confirmed the need for improving infrastructure and logistics to reduce the high costs of intra-Africa trade and increase trade volumes. Behar and Manners (2008) and Turkson (2012) with the use of the World Bank's LPI (2007) were able to show the positive relationship between logistics, infrastructure and bilateral trade in SSA. The availability of the LPI for 2010, 2012 and 2014 and improvement of most SSA's trade facilitations infrastructure over these years necessitates further research in the field to provide new evidence. The study therefore aims at providing further evidence on the relationship between improvements in trade logistics and growth in bilateral exports of countries in SSA.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter entails the methodology adopted in this study. It discusses the theoretical framework underpinning the study, the model to be estimated, the description of the variables, estimation technique, diagnostic tests and concluding remarks.

4.2 Theoretical framework of the Gravity Model

After periods of extensive theoretical critique, the traditional gravity equation (equation 3.1) was augmented by Anderson and Van Wincoop (2003) to include multilateral resistance terms, based on the impact of national borders which resulted from estimating the traditional gravity equation for bilateral trade between the USA states and Canadian provinces by McCallum (1995). He stated bilateral trade intensity not only depends on bilateral trade costs (affected by spatial distance, language differences, trade restrictions, and the like), but also on GDP-share average weighted multilateral trade costs indices or “multilateral resistance terms” (affecting the prices of import-competing goods in the importing country, as well as export opportunities in the origin country). This means bilateral trade between partners is also influenced by resistance to country i 's shipment on all other possible trading partners, and resistance to shipments to country j 's from j 's possible trading partners. Some authors (Silva and Tenreyro [2006]) have therefore included a theoretical index called “remoteness” in the gravity equation to control for such trade resistance. This index measures the average distance of country i from all trading partners. Omitting these terms from the specification may result in an omitted variables bias on the remaining parameter estimates in the gravity model. Anderson and Van Wincoop (2003) and Feenstra (2004) therefore suggested a augmenting the traditional gravity equation with multilateral resistance terms is to include exporter and importer fixed effects leading to the gravity equation of the form

$$X_{ij} = \varphi_0 Y_i^{\varphi_1} Y_j^{\varphi_2} Z_{ij}^{\varphi_3} e^{\alpha_i} d_i + \alpha_j d_j \dots \dots \dots (4.1)$$

$\varphi_1, \varphi_2, \varphi_3, \alpha_1$ and α_2 are unknown parameters to be estimated, d_i and d_j are exporter and importer dummies and $\varphi_1 = \varphi_2 = 1$ (unit-income elastic). Other studies have explained bilateral trade by augmenting the traditional and the theory based gravity equations to other determinants of trade costs and volumes. (Behar and Manners 2008)

Anderson and van Wincoop (2003) use the observed variables in their model (distances, borders, and income shares) to obtain the multilateral trade resistance terms. Since the multilateral price indices are not observed and should be estimated, most researchers include a remoteness variable R as a proxy for these multilateral trade resistance indexes.

However some measures of R differ from the theoretically correct R in ways that may be problematic (Helliwell, 1998). A better measure according to Head (2003) of remoteness R is

$$rem_i = \sum_j \frac{dist_{ij}}{gdp_j / gdp_w} \dots \dots \dots (4.2)$$

Alternatively, Feenstra (2002) proposes introducing importer and exporter fixed effects to account for the specific country multilateral resistance term.

A wide variety of other variables may also affect trade costs and these have been included in the gravity equation for estimation. These include common language, common border, colonial relationships and logistics indicators.

4.3 Model for Empirical Estimation

In investigating the relationship between logistics and bilateral trade using the new index of logistics and its components (customs, infrastructure, domestic logistics, timeliness, transport, etc.) developed by the World Bank, this study estimates a logarithm-transformed logistics augmented gravity equation. It estimates the impact of improving logistics, trade facilitation and infrastructure on bilateral trade over a time period 2007 -2012. Turkson (2012) , based on a cross sectional data assessed the impact of logistics (individual and aggregate) measures on bilateral exports in developing countries by augmenting the gravity model with logistics. Behar and manners (2008) also modeled the relationship between exports and logistics using gravity equation, and included terms for whether or not the countries are landlocked, near a navigable river and land area.

The focus of this research is to find out how improving trade logistics impacts Sub-Saharan Africa's trade volumes between the years 2007 and 2012. There is the need therefore to estimate the gravity model in a panel setting. Some past studies have adopted setting a gravity model in a panel data setting (Brun et al, 2005, Behar and Manners, 2008).

Taking the log of equation 4.1 yields the model to be estimated as:

$$T_{ijt} = \alpha_0 + \alpha_1 Y_{it} + \alpha_2 Y_{jt} + \vartheta d_{ij} + \gamma_k Z_{ijt} + \beta_1 L_{it} + \beta_2 L_{jt} + \delta_1 t_{it} + \delta_2 t_{jt} + \varepsilon_{ijt}$$

.....4.3

Subscripts *i* and *j* refer to exporting and importing countries respectively,

(T_{ijt}) is the log of country i 's export to country j in year t and it depends on:

Y_{it} and Y_{jt} – log of GDP of country i and j in year t

d_{ij} - the distance between the two trading countries i and j

Z_{ijt} - a vector Z of controls- a proxy for other aspects of distance and other country characteristics of country i and j in year t

L_{it} and L_{jt} – the various logistics indicators for the exporter i and importer j respectively) in year t

t_{it} and t_{jt} the trade intensity index of the exporting and importing countries (respectively) in year t

ϵ_{ijt} - a well-behaved error term

K is the number of control variables in the vector Z ; $\alpha_1, \alpha_2, \alpha_0, \beta_1, \beta_2, \delta_1, \delta_2, \theta, \gamma, \alpha_1$ and α_2 are unknown parameters to be estimated and α_0 a constant.

All variables are specified in logs, except for the logistics index and trade intensity index.

Equation 4.4 assumes ϵ_{ijt} - is an iid error term, which is uncorrelated with the other explanatory variables in the equation. This assumption must hold for consistent estimation of the coefficients.

4.4 Description of Variables and Sources of Data

Although gravity equations have been successful in explaining trade with just the size of the economies and their distances, there is a vast amount of variation in trade they cannot

explain. Moreover, most studies on bilateral trade have accepted that geographical distance may be a poor approximation of all the economic barriers for international trade. In order to control these omitted variables this study have adds other variables to explain bilateral trade by a wide range of variables such as remoteness, adjacency, common language, colonial links and the various logistics indicators.

Gross Domestic Products (GDP): Gross Domestic Product is the market value of all officially recognized final goods produced within a country in a year or a given period of time. It is therefore seen as the size of an economy. The economic sizes of the exporting and importing countries, Y_i and Y_j , are measured with gross domestic product. The data was sourced from the World Development indicators. Average GDP and GDP per capita from 2007 to 2012 measured in constant (year 2000) US dollars will be used in this study. The estimated coefficients are usually close to the predicted value of one. Other studies have predicted coefficients different from one but with no theoretical interpretation.

Including the $\ln Y_i$ and $\ln Y_j$ as regressors, tend to inflate the R^2 of the regressions. Also since exports and imports are part of GDP, there is a built accounting relationship between T_{ijt} , Y_i and Y_j . Some studies have tried to deal with this simultaneity by using instrumental variables for GDP (such as population) or to impose the theoretical prediction of unitary elasticities.

A panel data estimation method applied on the logarithmic transformed model will enable easy interpretation of the estimated parameters since parameters of an equation estimated

in logarithms are elasticities. For example, the estimated parameter for the GDP in a gravity equation estimated in logarithms is the elasticity of trade to GDP. Data on GDP of the various countries is obtained from the World Development Indicators (WDI) online database of the World Bank.

Distance (D_{ij}): Distance is an important element in the traditional gravity equation, as it remains an important factor in determining bilateral trade. According to Anderson and Van Wincoop (2004), aside from trade policy barriers trade costs are still large, and even between highly integrated economies. Typically, this study proxy trade costs with bilateral distance and other additional variables. They reflect the hypotheses that transport costs increase with distance and that they are higher for landlocked countries and islands but are lower for neighboring countries. Countries tend to trade less with countries that are further away from them, after accounting for country size (Behar and Manners) hence neighbors tend to be more important trading partners.

Brun et al (2005) and Coe & Hoffmaister (1999) have use random effects, fixed effects and other estimators to confirm distance is still important in trade. Distance is almost always measured using the “great circle” formula. This formula approximates the shape of the earth as a sphere and calculates the minimum distance along the surface. The measure of bilateral distance used is calculated by CEPII used and it captures distance between countries based only distances between major cities of the two countries.

Trade intensity index (tii): The trade intensity index (T) is used in most trade literature to determine the value of trade between two countries based of their importance in world trade. It is defined as the share of one country's exports going to a partner divided by the share of world exports to the partner. Yamazawa (2002) calculates the trade intensity index (tii) of a country i 's export with a country j as

$$I_{ij} = \frac{X_{ij}}{X_{i.}} / \frac{X_{.j}}{X_{..}}$$

Where $X_{i.}$, $X_{.j}$ and $X_{..}$ represents the total export of country i , total export of country j and the total volume of world trade respectively.

Tii takes the value of unity in a most simple gravity model. When tii exceeds one, trade is very intensive between country pairs and when it is less than one, trade is less between the two countries.

The control variable **Z** represents all other dummy variables which could deter or facilitate the bilateral trade flows (like common border, common language, and colonial ties).

Common Border: This study includes a dummy variable to identify countries that share a border either adjacent, or contiguous. A number of studies have shown that that trade is higher as a result of sharing a border. John McCallum (1995) McCallum's examined trade patterns of Canadian provinces and countered that borders matter very much because the typical Canadian province trades 20 times more with other provinces than with American states of a given size and distance. This variable takes value 1 if trade partners share a common border. The effect of this variable on trade is expected to be positive.

Common Language: The inability to communicate and cultural differences will increase transaction costs - a trade impeding effects of distance; hence we would expect that countries that speak the same language would trade more. A reason for this common language effect is probably the shared history that caused the two countries to share a language.

Colonization and Colonial Links: The two aspects are based on whether one country is said to have been colonized by the other country in the past or they have had a common colonizer. Measures of colonial links or a common colonizer also are positively correlated with trade. Including them as controls reduces the language effect to an extent. Colonization could be described as a relationship between two countries, independently of their level of development, in which one has governed the other over a period of time and has therefore contributed to the current state of institutions in the colonized country. In both cases, the expected relationship with trade is positive since a colonial relationship could reduce cultural differences between two countries. Data for these variables are also sourced from CEPII.

The Logistics Performance Index and Its Indicators (L): The Logistics Performance Index (LPI), which has been has produced by the World Bank every two years since 2007 measures trade logistics performance globally till 2012. It aims to measure and help

stakeholders understand the challenges of logistical barriers to trade and is supplemented with data on the performance of key components of the logistics chain.

The LPI data (a joint venture of the World Bank logistics service providers, and academics) is built around a survey of logistics professionals based on ratings by freight forwarders on key logistics issues—such as customs clearance efficiency, infrastructure quality, and the ability to track cargo. In this paper all the components of the LPI are used. They are the efficiency of customs, ease and affordability of international shipment, quality of trade- and transport-related infrastructure, competence and quality of logistics services and the ability to track and trace consignments and timeliness. A higher LPI score implies a better quality logistics environment, thus it is expected to be positively related to trade. Data is sourced from the World Bank online database.

4.5 Estimation Technique

The estimation of gravity equation within a panel framework is generally based on the estimation of stochastic version of the Anderson's model with the only difference being that we assume the estimation in a time frame, where t is a time index. A panel-based approach is therefore more desirable as it has the advantage of mitigating the bias generated by heterogeneity across countries. It is known that cross-section OLS estimation will ignore any of heterogeneous characteristics related to bilateral trade relationship. For instance, a country would export different amounts of the same product to the two different countries, even if their GDPs are identical and they are equidistant from the exporter. Since the cross-section OLS estimates clearly fail to account for these heterogeneous factors, they are likely to

suffer from substantial heterogeneity bias. Consequently over the last years, researchers such as Egger (2000), Rose and van Wincoop (2001), Glick and Rose (2002), Brun et al. (2002), and Melitz (2007) have turned towards panel data. Estimating a panel data rather than cross-sectional data naturally controls for the unobserved fixed effects. In a panel country-pair, heterogeneity can be controlled for by using country pair fixed effects. Furthermore the panel framework recognizes how the relevant variables and indicators evolve through time while identifying the specific time or country effects.

A panel data regression differs from a regular time-series or cross-section regression in that it has a double subscript on its variables, i.e.

$$Y_{it} = \alpha + X_{it}\beta + \mu_{it}, \quad i = 1, \dots, N; t = 1, \dots, T \dots \dots \dots (4.5)$$

with i denoting households, individuals, firms, countries, etc. and t denoting time. The i subscript, denotes the cross-section dimension, t denotes the time-series dimension, α is a scalar, β is $K \times 1$ and X_{it} is the i th observation on K explanatory variables.

Most of the panel data applications utilize a one-way error component model for the disturbances, with

$$U_{it} = \mu_i + v_{it} \dots \dots \dots (4.6);$$

Where μ_i denotes the unobservable individual-specific effect and v_{it} denotes the remainder disturbance which varies across time and individual. In this case, μ_i are specific factors that affect trade but they are not related with GDP, distance or other factors included in the model.

A large proportion of empirical studies have used either fixed effects model, Random effects model or the Hausman Taylor model based on one the assumptions about the individual effects.

4.5.1 Fixed Effects Model (FE)

This is a panel data model where individual heterogeneity term is correlated with the regressor X_{it} . Here the μ_i represents a country's heterogeneity is assumed fixed parameters to be estimated and the remainder disturbances stochastic with v_{it} , independent and identically distributed. The X 's are assumed independent of v_{it} for all i and t ; i.e. $\text{COV}(X_{it}, \mu_i) \neq 0$.

The fixed effect model employs two methods of transformation to eliminate correlation effects. These are the within transformation and the first difference transformation.

Within Transformation: For each unit I , average equation over time

$$y_i = \beta x_i + \mu_i + v_{it}, \text{ where } y = \frac{\sum_{i=1}^T y_{it}}{T} = \dots \quad (\text{a})$$

Since μ_i does not change over time, it appears in both 4.5 and 4.5 a. subtracting 4.5a from 4.5, the equation ...4.5b is obtained to be estimated by OLS

$$(y_{it} - y_i) = \beta (x_{it} - x_i) + (v_{it} - v_i) \dots \quad (\text{b})$$

The within estimator of β obtained is free of endogeneity since correlated effects are eliminated. This transformation however eliminates all the time-invariant variables in the model.

The first-difference transformation:

$$y_{it-1} = \beta x_{it-1} + \mu_i + v_{it-1} \dots\dots\dots (c)$$

$$(y_{it} - y_{it-1}) = \beta (x_{it} - x_{it-1}) + (v_{it} - v_{it-1}) \dots\dots\dots (d)$$

The equation is lagged by one time period and the new equation (c) is subtracted from the original equation 4.5 and estimated. The resulting estimator β from (d) is also free of endogeneity. The fixed effects model is an appropriate specification if we are focusing on a specific set of N countries. However if N is large, the equation will include too many individual dummies.

4.5.2 Random Effects Model (RE)

In the RE model can be used if the μ_i is assumed random. Here μ_i is a random effect and is the permanent component of the error term while v_{it} is the idiosyncratic component of the error term. In other words, assuming random effects implicitly means that the distribution of the unobserved heterogeneous component is distributed as a random variable with given mean and variance. In addition, X_{it} is independent of the μ_i and v_{it} , for all i and t , that is, the random effects model imposes no correlation between the individual effects and the

regressor. It implicitly assumes that the unobserved heterogeneous component is strictly exogenous.

The random effects model is an appropriate specification if we are drawing N individuals randomly from a large population and T is small.

4.5.3 Hausman Taylor Model

When a fixed effect (FE) model is assumed the fixed effect and first difference methods provide consistent estimates only for time-varying regressors, not for time-invariant regressors.

The ordinal FE estimation automatically deletes the time-invariant regressors which are of relevance for the study's analysis, In this case, the Hausman-Taylor estimator (Hausman and Taylor, 1981), a transformed fixed effect model with instrument variables (IV) is employed. This method does require some time-varying and time-invariant exogenous variables and is able to identify the coefficients of the time-invariant variables

4.6 Diagnostic Tests

4.6.1 Hausman Test: Fixed Effects versus Random Effects Model

The decision as to which model is better hinges around the assumption we make about the likely correlation between the individual, or cross-section specific, error component μ_i and the X_{it} regressors. If it is assumed that μ_i and the X 's are *uncorrelated*, RE model may be appropriate, whereas if μ_i and the X 's are *correlated*, FE model may be appropriate. Where

N is very large, regressions like (4.5) may not be feasible, because $(N - 1)$ dummies are included in the regression and $(N - 1)$ extra parameters will be estimated. Too many dummies may aggravate the problem of multicollinearity. This fixed effects (FE) least squares, also known as least squares dummy variables (LSDV), also suffers from a large loss of degrees of freedom. In addition, this FE estimator cannot estimate the effect of any time-invariant variable such as distance and remoteness.

Nonetheless, if the individual or cross-sectional units in the sample are regarded as random drawings and if we had enough evidence to suspect that the correlation is zero, then the random effects model is appropriate, because it provides more efficient estimators,

This decision to determine the choice between the FE and the RE model will be made based on a test developed by Hausman (1978). The test statistic has an asymptotic χ^2 distribution with degrees of freedom equal to the number of regressors.

Under the null hypothesis of zero correlation, the RE model is more efficient. However, if the null is rejected, the conclusion is that RE model is not appropriate and hence only the FE model provides consistent estimators, in which case statistical inferences will be conditional on ε_i in the sample.

4.6.2 Heterogeneity

The fact that the countries under study possess unique economic, social and geographical characteristics means there is a possibility of heterogeneity among the countries - individual country-specific effects which must be considered in the estimation process.

The presence of renders the ordinary least squares (OLS) estimator inappropriate for

estimation; since it gives biased and inconsistent estimates even if the error term is not serially correlated. However the use of panel data (over time bilateral trade data) ensures the advantage of mitigating the bias generated by heterogeneity across countries. Thus in this study, country-pair heterogeneity will be controlled for by using country-pair fixed effects.

4.7 Conclusion

In summary, the panel equation for the estimation is specified from the logistics augmented gravity model. It is likely for issues such as endogeneity, heteroscedasticity, and some other estimation problems are likely to be associated with the estimation equation. These problem are avoided since the Equation to be estimated assumes ε_{ijt} - an iid error term, which is uncorrelated with the other explanatory variables in the equation. The iid assumption rules out reverse causation. This assumption must hold for consistent estimation of the coefficients.

The next chapter undertakes the Hausman test to ascertain whether to estimates using fixed effect, random effects. The appropriate technique will be used in order to obtain consistent and efficient estimates of the effect of trade logistics, infrastructure and facilitation on bilateral trade. The estimations and discussion of the results is also presented in the next chapter.

CHAPTER FIVE

RESULTS AND DISCUSSION

5.1 Introduction

This chapter presents the estimation and discussion of the results. The chapter is in four main sections. The first section provides descriptive analysis of the main variables that influence the volume and direction of trade in SSA. It is followed by Section 5.3 which presents the results of the Hausman diagnostic tests. The discussion of the empirical findings is presented in Section 5.4; followed by the concluding remarks in Section 5.5.

5.2 Summary Statistics

The summary statistics apply to the forty-two (42) countries within the SSA region over the period 2007 –2012. The statistics comprise of the mean, the standard deviation and the minimum and maximum values of the variables.

The statistics show \$49.6 million as the average of bilateral trade among Sub Saharan African countries. A high standard deviation of US\$2.44 in bilateral exports reflects a wide disparity among importing and exporting countries in the SSA region. Among the exporting countries the country with the highest GDP records US\$ 460 billion while the lowest records only US\$ 0.144 billion. Average GDP of importing countries stands at US\$40.4 with the same minimum and maximum as exporting countries.

Table 5.1 Summary Statistics for Main Variables (2007 – 2012)

Variable	Mean	Std. Deviation	Minimum	Maximum
Export	49.6	2.44	1	4730
GDP <i>i</i>	40.4	90.5	0.144	460
GDP <i>j</i>	32.1	75.3	0.144	460
Trade intensity index <i>i</i>	44.04805	202.1246	.000000591	5703.464
Distance (weighted)	2979.852	1841.603	35.59131	9770.943
Aggregate LPI <i>i</i>	2.485908	0.3506123	1.60996	3.671317
Aggregate LPI <i>j</i>	2.427332	0.3347851	1.338373	3.671317
Cost To Export <i>i</i>	2376.637	1451.977	577	8525
Cost To Import <i>j</i>	1839.75	855.7976	660	5491

Source: Author's Estimation, 2014

GDP in US\$ billions

Export in US\$ millions

Average GDP per capita of SSA countries is US \$1959.603 and US\$ 2176.189 for exporting and importing countries respectively between 2007 and 2012. There also exists

a large inequality with some countries GDP per capita as low as \$162 while a few of the SSA countries have a higher value of \$24035.71. The mean score of the aggregate measure of the LPI of 2.48 and 2.43 for exporting and importing countries respectively shows a relatively similar level of good un conducive for a high amount of trade within the region. This aggregate LPI reflects the value of all the other indicators

While in some countries cost to export cost is low as \$577 per 20-foot standard container, others in the region incur as much as \$8525 to export. This wide difference does not pave way for adequate trade within the region. Within the region it takes an average of 30 days for a SSA country to export goods to other SSA countries it also takes an average of 39 days to import goods among SSA countries within the region. However it takes as long as 102 days for some countries to import goods most of which are landlocked and have lowest levels of GDP. A similar trend is observed for the number of documents needed to be processed before goods are imported and exported. On the average a SSA country needs to process approximately 7 and 9 documents to export and import respectively.

5.3 The Hausman Test

The Hausman test determines whether the fixed or random effects models fit the data for estimation. The results in Table 5.2 confirm the appropriateness of fixed effects model by rejecting the null hypothesis that the regressors and individual effects (heterogeneity) are not correlated at the 5 percent level of significance. If the results produced an insignificant P-value, then it would have implied the inappropriateness of the random effects model. However the test results shows a significant P-value, and Prob > chi2 value of 0.000 which

is less than .05, thus the fixed effects model is preferred. However the FE estimator which wipes out the time invariant using the within transformation provide consistent estimates only for time-varying regressors. Thus the study concentrates on the parameter estimates obtained under the fixed effects and Hausman-Taylor estimators. Hausman-Taylor estimators control for time and bilateral fixed effects.

Table 5.2 Hausman Test for Fixed Effects versus Random Effect.....distance?

	(b) FE	(B) RE	(b-B) difference	SqrtDiag[(V_b-V_B)] S.E
Log of GDP _{it}	.6620863	.9205874	-.2585011	.2127803
Log of GDP _{jt}	.7513939	.7011222	.0502717	.2251057
Log of cost to Exp	-2.02784	-.9363577	-1.091483	.3374424
Log of cost to Imp	.7288445	-.2936458	1.02249	.258132
Trade intensity Index	.002021	.0021671	-.0001461	.0000921
ALPI _{it}	.2046791	.8502405	-.6455614	.0937133
ALPI _{jt}	.4758766	.5207103	-.0448337	.0794894

Difference in coefficients not systematic (Random Effect)

Ho:

$$\chi^2(7) = (b-B)'[(V_b - V_B)^{-1}](b-B)$$

$$=121.46$$

Prob>chi2 = 0.0000

Source: Author's Computation Using Stata 13

5.4 Discussion of Empirical Results

5.4.1 Summary of Findings

Based on the Hausman Taylor estimations, the regression results can be summarized as follows:

1. There is a positive impact of logistics performance of both exporter country on volumes of bilateral trade among countries in Sub-Saharan Africa. Thus an improvement in trade logistics, facilitations and institutions will boost exports and therefore increased volumes of trade between Sub-Saharan countries
2. On the disaggregated measure of logistics performance index, there is some heterogeneity on their individual impacts on volumes of bilateral trade. The coefficients for individual measures generally confirm that logistics of exporting

countries in SSA have a greater impact on bilateral trade than it logistics of the importing country.

5.4.2 Aggregate LPI

Table 5.3 shows the estimated coefficients for fixed effect and Hausman Taylor estimation techniques using the aggregate LPI of both importing and exporting country in SSA. The first model FE is the robust fixed effects estimation. The second column indicates robust fixed effects estimates controlling for time effects. The third column indicates fixed effect estimation controlling for country pair effects. The fourth column indicates estimated results from the Hausman Taylor estimation controls for both times and county pair effects and includes the RTA dummy. This study discusses the Hausman Taylor estimation which is the preferred model.

The results reveal significant coefficients of aggregate LPI to indicate that there is a positive impact over time of logistics performance on bilateral exports for both importer and exporter in SSA. These are typical of results from other similar empirical studies (Behar and Manners, 2008, Hoekman and Nikita, 2008, Turkson, 2012)

In line with theory of the gravity model, results show that the exporter and importer country's GDP s and distance, are found to be important determinants of bilateral trade, positively and negatively respectively. The Hausman Taylor estimator produces coefficients of bilateral distance, trade intensity index, common border and Language, and common currency that are important determinants of bilateral trade in SSA. Wilson et al (2005) and Egger (2005) estimated the gravity equation adopting the Hausman Taylor

estimation of to ascertain how some variables of interests which are time invariant variables impacted on the other coefficients.

*Gross Domestic Product:*The GDP of both importing and exporting countries has a positive relationship with bilateral trade as expected. This implies that the countries will trade more with each other higher as GDP increases. (Anderson 1979, Bergstrand 1985) and wide range of literature have empirical success of the gravity model proving that the two countries' GDPs largely explaining bilateral trade patterns. For both importer and exporter countries, GDP has a significant and positive impact on bilateral trade across both models. The difference between the GDP coefficients of the FE and HT estimates imply that there is a significant difference in the magnitude of the impact of GDP on bilateral trade when the invariant variables are included in the estimation. A higher coefficient of the exporter GDP close to unity indicates that SSA export by almost the same rate at which their GDP increases

Bilateral Distance: The Hausman Taylor estimation (HT) on the other hand produces negative coefficients of the log of bilateral distance as expected, implying that distance still remains a vital factor that hinders the volume of bilateral trade.

This is in conformity with findings of similar literature, (Heokman and Nicita, 2008), Good logistics quality and trade infrastructure can reduce the effects of distance on trade.

Aggregate Logistics Performance Index: Results from the HT estimations provide both significant and positive coefficient of ALPI (1.313) for the exporters to indicate that an improved LPI score has a high tendency increase export by a higher margin within the region. These results are in line with results of previous literatures which estimated a logistic augmented gravity model (Turkson 2011, Behar and manners, 2008). This can be explained by the fact that SSA countries trade (imports) with each other are mostly light manufactures mostly hence the level of the countries aggregate LPI score do not have much impact on its bilateral trade volumes.

A positive coefficient of RTA shows that an improvement of the LPI score will increase bilateral trade of SSA as an RTA. Since SSA exports are predominantly primary commodity, a positive coefficient means that the improvement of the LPI score of SSA.

Table 5.3 Fixed Effects and Hausman Taylor Estimations: Aggregate LPI

Log of Exports	FE	FE1	FE2	HTAYLOR
Log of GDP <i>it</i>	0.662*** (0.243)	0.438 (0.342)	0.664*** (0.248)	1.325*** (0.154)
Log of GDP <i>jt</i>	0.751*** (0.237)	0.493 (0.325)	0.746*** (0.240)	0.758*** (0.165)
Log of bilateral distance				-2.203*** (0.279)
Trade intensity index	0.00202*** (0.000654)	0.00201*** (0.000676)	0.00202*** (0.000655)	0.00198*** (0.000225)
Log of cost to export	-2.028*** (0.454)	-2.724*** (0.523)	-2.000*** (0.458)	-1.064 (0.881)
Log of cost to import	0.729** (0.291)	0.342 (0.300)	0.728** (0.292)	-1.073* (0.634)
Aggregate LPI_{it}	0.205 (0.197)	-0.0420 (0.228)	0.210 (0.200)	1.313** (0.521)
Aggregate LPI_{jt}	0.476*** (0.178)	0.320* (0.189)	0.461** (0.181)	-0.351 (0.919)
Contiguity				1.071***

Common official Lang				(0.306)
				0.763***
Common Currency				(0.204)
				0.801**
RTA				(0.388)
				0.833
				(0.538)
Constant	-11.92**	7.992	-12.02**	-5.303
	(5.349)	(13.64)	(5.387)	(10.47)
Observations	3,857	3,857	3,857	3,857
R-squared	0.059	0.064	0.061	
Number of Bilatid	1,098	1,098	1,098	1,098

*** p<0.01, ** p<0.05, * p<0.1

Country *i* and *j* represent exporter and importer respectively

has a significant impact in trade within the region and with other regions. As indicated by Turkson (2011), logistics in the developing countries tend to have a greater impact on trade flows than logistics in the developed countries which is mostly the destination country of most SSA exports, as the nature of primary commodities are largely unprocessed agricultural and perishable commodities the exporting country requires adequate logistic to preserve its quality.

Trade Intensity Index: In line with apriory expectations, positive and significant coefficients of the HT estimations show that the trade intensity index is an important determinant of bilateral trade within SSA trade. A very low value of *tii* (0.002) across models does reflect the fact that relatively less amount of trade relations between SSA

countries between SSA countries. It also reflects the higher incidence of geographical and distance barriers and unfavorable trade agreements between countries of the region. Thus, the positive value indicates the most remote countries of SSA characterized with all forms of barriers, are more likely to trade with other countries in the region.

Common Currency: The Hausman Taylor estimation results indicate a statistical significance of common currency in determining bilateral trade among SSA countries and as other literature have found, a positive coefficient imply that SSA countries with that share common currencies trade more with each other. The use of a common medium of exchange since it reduces the costs associated with forex services or currency conversion.

*Contiguity(Adjacency):*The results show a positive and significant coefficient of contiguity as expected, implying common border has an important impact on bilateral trade flows in the region. It also implies that county pairs that share a common border within the SSA will record higher levels of bilateral trade than those that do not share a common border.

Common Official Language: The impact of country pairs sharing a common language on bilateral relations is reflected in the positive coefficients of the variablethe Hausman Taylor estimation. The estimation results also reflect a significant coefficient which implies that sharing an official language that have a great impact on the levels of bilateral trade between two countries in the region. Since language of communication between citizens of two countries is very important factor in facilitating trade. Most trade literature

in the past has confirmed this significance of county pairs sharing a common official language on bilateral trade.

5.4.3 Disaggregated Logistics LPI

The results in table 5.4 show the Hausman Taylor estimates of the gravity model specifications including each individual measures of LPI. All individual LPI coefficients except timeliness and logistics competence and quality are significant in explaining bilateral trade among SSA countries, while the importers individual LPI are significant while all the individual logistics performance indices for the exporter except timeliness have a positive impact on bilateral trade.

Table 5.4 Hausman Taylor Estimation: Disaggregated Logistics Performance Index

	Customs Efficiency	International Shipping	Logistic Competence	Infrastructure	Tracking and Tracing	Timeliness
Log of Exports						
Log of GDP <i>it</i>	0.835*** (0.258)	1.478*** (0.171)	1.391*** (0.196)	1.068*** (0.346)	1.362*** (0.229)	0.799*** (0.174)
Log of GDP <i>jt</i>	0.789*** (0.281)	0.764*** (0.162)	0.749*** (0.229)	0.737* (0.415)	0.671*** (0.236)	0.751*** (0.178)
Log of Distance	-2.169*** (0.514)	-2.161*** (0.282)	-2.177*** (0.410)	-2.162*** (0.767)	-2.178*** (0.365)	-2.200*** (0.311)
Trade intensity index	0.00197*** (0.000218)	0.00199*** (0.000225)	0.00197*** (0.000219)	0.00196*** (0.000216)	0.00197*** (0.000221)	0.00198*** (0.000223)
Log of Cost to Export	1.180 (1.259)	-1.737** (0.813)	-0.799 (1.050)	-0.660 (1.900)	-1.652* (0.987)	0.328 (0.634)
Log of Cost to Import	-1.130 (1.034)	-1.027 (0.752)	-1.015 (0.800)	-0.923 (1.519)	-1.092 (0.793)	-1.033* (0.624)
LPI Measure <i>it</i>	1.747*** (0.429)	0.831** (0.359)	0.0844 (0.372)	1.898*** (0.319)	0.921* (0.556)	-0.421 (0.268)
LPI Measure <i>jt</i>	0.404 (0.624)	-0.231 (0.588)	-0.143 (0.537)	0.421 (0.618)	-0.959 (0.813)	-0.205 (0.517)
Contiguity	1.112* (0.582)	1.073*** (0.308)	1.104** (0.461)	1.121 (0.873)	1.097*** (0.407)	1.084*** (0.344)
Common Off. language	0.758** (0.385)	0.759*** (0.206)	0.760** (0.305)	0.757 (0.577)	0.762*** (0.270)	0.766*** (0.229)
Common Currency	0.758	0.800**	0.767	0.748	0.775	0.788*

RTA	(0.735) 0.872 (0.991)	(0.392) 0.931* (0.544)	(0.583) 0.863 (0.790)	(1.103) 0.882 (1.479)	(0.515) 0.867 (0.703)	(0.436) 0.827 (0.599)
Constant	-13.67 (14.18)	-4.052 (9.438)	-5.582 (12.25)	-6.119 (20.39)	2.496 (9.638)	0.138 (8.929)
Observations	3,857	3,857	3,857	3,857	3,857	3,857
Number of Bilatid	1,098	1,098	1,098	1,098	1,098	1,098

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ 1%, 5% and 10%

Country *i* and *j* represent exporter and importer respectively

With regards to the magnitude of impacts of the individual logistics on bilateral trade, the quality of infrastructure and customs have the highest impacts on level of bilateral trade for exporter countries in SSA with international shipments and tracking and tracing following up closely whiles logistics competence and quality and timeliness having the least impact.

The coefficients for individual measures generally confirm that logistics of exporting countries in SSA have a greater impact on bilateral trade than it logistics of the importing country. This can be attributed to the fact that most SSA countries exports mostly primary commodities which rely largely on the state of infrastructure and customs procedure. Majority of SSA countries on the other hand import largely manufactured goods whose durability is not compromised by delays caused by poor quality transport infrastructure and customs related delays. Poor quality of transport infrastructure, inefficient customs or

border procedures and ease and affordability of international shipments contribute largely to transport cost and delays which lead to an overall high trade costs experienced by the SSA region. A high margin and positive coefficient of infrastructure (1.898) is conformity with past literature that have studied the relationship between infrastructure and trade [(Limao and Venables, 2001, Nordas and Piermartini, 2004, Bougheas et al (1999)].

With regards to SSA importing countries, results show that infrastructure and customs efficiency have the most influence on bilateral trade. This is expected since most SSA ports and borders are congested and characterized by long and hectic administrative procedures. These are channeled into high cost through documentation time and fees, customs clearance fees, and terminal handling charges. in order to clear goods.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary, conclusions and policy recommendations based on the findings of the study. It also provides policy recommendations based on the findings as well as the limitations of the study and suggested areas for further research.

6.2 Summary and Conclusion

Trade between countries is not only dependent on the economic size and endowments but also on many other factors like costs and this is seen as “friction” associated with trade, or the set of economic forces that tends to reduce trade. The need for the SSA region to become competitive globally has become necessary to be able it harness new opportunities for development purposes. With this key objective, the region has to tackle its main

problem of high cost of trading. According to the World Bank Doing Business database 2013, the SSA region records the highest costs of trade as compared to other developing regions such as LAC, SAS, MENA and EAP and this has hindered the flow of trade within the region. Improving trade logistics performance has become therefore one of the important development policy objectives of SSA nations in recent times.

The incidence of high costs of trading has been the main impediments SSA faces with respects to trading among its countries and internationally. Poor logistics qualities, inadequate infrastructure and ineffective institutions associated with most SSAs continue to increase trade costs and reduce volumes of trade. The LPI scores for the various years published by the World Bank in 2007, 2009 and 2012 have pointed out very significant differences among regions and countries. It has shown how various countries and regions are performing and this serves us a guide as to how far behind some regions like SSA are and what needs to be done.

Most SSA countries lag behind in all six areas of the LPI while others have poor performance in just one or two indicators. Both instances however may have an enormous impact on overall trade competitiveness of the region. Most countries that recorded very low scores are the very least developed countries and landlocked ones such as Chad, Sudan and the Central African Republic. Recent researches into determinants of bilateral trade have modeled the basic gravity model augmented by additional variables representing various sources of friction (Hoekman and Nicita, 2008; Behar and Manners, 2008; and Turkson, 2012). Behar and Manners(2008) studied logistics and exports, focusing on only

logistics as a whole. Nordås&Piermartini, 2004, Wilson et al, 2005; Djankov et al, 2006 have also shown evidence of variations in the effects of some individual components of the LPI. Turkson (2011) further investigated both aggregate and individual components of the LPI based on heterogeneity by estimating a cross sectional data.

This study focuses on logistics costs as a source of additional trade cost which represents friction of bilateral trade. It also updates past studies by using bilateral trade data from 2010 to 2012 and draws additional trade costs figures and LPI data set recently compiled by the World. The study therefore sought out to estimate logistic augmented gravity model to analyze the impact of improvement in trade logistics performance on the volume of bilateral trade between countries in SSA over a period.

This study adds to the deliberation in the literature by undertaking the panel estimation of the gravity equation augmented with LPI and other trade facilitation variables of trading countries of SSA, for the period 2007 to 2012. It sought to identify the effect of the aggregate and individual measures of the Logistic Performance Index on the volume of bilateral trade among countries in SSA.

Estimated results show that over the six years under review, improvements in the scores of the performance index scores which reflects developments of trade related infrastructure and institutions and facilitations has a positive impact on bilateral trade among countries in SSA. The result illustrates that the efficiency of customs procedures, transport related infrastructure, logistics services, information and communication systems, port efficiency

are all critical in determining whether any two country can trade in goods and services on time and at a lower cost.

6.3 Policy Recommendation

The integration of the SSA region's economy into global economy through trade and investment flows is crucial for the welfare, job creation prospects, poverty reduction and economic growth of the region. Under the right circumstances and conditions, international trade can be an important engine of economic growth and poverty alleviation; hence the recent focus of many developing countries has been on taking action to facilitate trade. Countries with higher trade costs are more likely to miss the opportunities of globalization; therefore this study emphasizes to policy makers, the need for an enabling macro-economic environment in the SSA for vibrant trading activities to take place.

Findings in this literature indicates that factors contributing to higher trade costs in SSA including delays and costs in customs clearances; high transportation and communication costs are policy-induced factors. Reducing trade costs through infrastructural development, and improving levels of quality service in the relevant institutions would boost trade, increase foreign direct investment (FDI), and thus to economic growth of countries in sub Saharan Africa.

This study will assist policy makers in key development strategies. In this regard more weights should be placed on certain indicators of logistics measures such as the ease and

affordability of international shipping the efficiency of customs procedures and border managements and the quality of trade and transport infrastructure; which have more influence in reducing trade costs and increasing trade among Sub Saharan African countries. Many SSA countries still require significant investments in basic infrastructure like ports, airports, roads, and rail-links; hence there is the need for the mobilizing of funds for initial investments and more importantly for continuous maintenance of these facilities.

The goal of most SSA countries is to boost the private sector, it is therefore of immense importance for governments to implement policies that enable firms to thrive. The competitiveness of firms depends on the quality of logistic environment in which it operates since they mostly bear the costs of freights, port and handling charges, agent's fees and other side payments. Traders and firms also bear the costs on the unpredictability of deliveries to final consumers thereby increasing overall cost of doing business.

Secondly the results of study suggests that policy makers should focus on trade policies on trade facilitations that directly affect trade costs and have a bigger impact on trade volumes within the region. These include trade-related infrastructural development as well as improve information technological applications to customs operation, border managements and transport regulations. This is to ensure the reduction of unofficial payments that have made by importers and exporters and curb the incidence of corruption.

The region should be more proactive in negotiating multilateral Agreement on Trade Facilitation to ensure clarity on the relevant aspects of WTO/GATT articles that enhance

customs cooperation. There should also be effective implementation of the multilateral agreement that is; the Trade Facilitation Agreements (TFA) which directly affect the region and its sub regions, to help promote more efficient customs and border procedures to allow goods to cross borders more quickly and more cheaply between trading partners. Also governments should ensure that development assistance as a part of RTA such as the EPA be implemented efficiently to boost trade.

Most goods traded in SSA are mostly primary and agricultural goods and hence well-functioning institutions and improved transport infrastructure will enable farmers and agricultural producers to access entirely new markets, in other regions and internationally. Moreover if distribution channels work effectively, transport costs are lowered and this enables a greater proportion of the consumer price can be returned to the producer, thereby increasing incomes among some of the poorest members of society, improving affordability of food, and helping address problems of hunger. Consumers also benefit by gaining access to lower priced goods as basic foodstuffs will move within countries more quickly and at lower cost. This contributes to increased welfare benefit and poverty reduction.

The findings which reveal the direct relationship between logistics performance and the level of bilateral trade in SSA can be used to help direct resources to their most effective uses to improve a country's logistics operations. It should also compel both private and public institutions that have direct or indirect influence in transport sector infrastructure

and on ports operations develop innovative approaches to help tackle the challenges of high transport and commercial transaction costs, and weak institutional capacities facing many countries in SSA, as a means of increasing their country's ability to compete in the global economy and attract foreign direct investment (FDI).

6.4 Limitations to the Study and Further Areas of Research

The study did not take into consideration zero flows of trade between country pairs in the estimations. Like majority of other empirical studies, the study adopted the approach which is to drop the pairs of countries with zero-valued trade flows from the dataset and estimate the log-normal gravity model. Consequently dropping all zero-valued trade flows leads to biased results as very vital information on the levels of trade between these county pairs are omitted from the analysis this will place a greater weight both in terms of magnitude and statistical significance on the other observations and coefficient estimates (Burger et al 2009, Linders and Groot, 2006).

Also tariff important variable that determines bilateral trade was not included in the estimation due to unavailability up-to-date data for all the countries in the sample.

Further areas of study that includes the zero values of trade between SSAs would make very meaningful contributions to the existing literature and therefore should be considered by future studies.

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APPENDIX**List of the Forty–Two (42) Sub–Saharan Africa Countries in the study by Region**

East Africa	Middle Africa	Southern Africa	West Africa
Burundi	Angola	Botswana	Benin
Ethiopia	Cameroon	Lesotho	Burkina Faso
Kenya	Chad	Namibia	Cape Verde
Madagascar	Congo Dem. Rep.	South Africa	Cote d'Ivoire
Malawi	Congo Rep. Equatorial	Swaziland	Gambia ,The
Mauritius	Guinea	Zambia	Ghana
Mozambique	Gabon		Guinea
Rwanda	Sudan		Guinea-
Seychelles			Bissau
Uganda			Liberia
Zimbabwe			Mali
			Mauritania
			Niger
			Nigeria
			Senegal
			Sierra Leone
			Togo

Source: United Nation's Classification of Countries

