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LOG950 Logistics

The Importance of National Trade Logistics Performance on Export in African Countries

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List of Abbreviations

CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
CIS	Commonwealth of Independent States
ECA	Economic Commission for Africa
GDP	Gross Domestic Product
GPS	Global Positioning System
GTIN	Global Trade Item Number
IMD	Institute for Management Development
LPI	Logistics Performance Index
OECD	Organization for Economic Co-operation and Development
OTIF	On-Time In-Full
RFID	Radio Frequency Identification
SITC:	Standard International Trade Classification
TEU	Twenty-foot Equivalent Unit
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
USD	United States Dollar
USR	Uniform Sampling Randomization
WTO	World Trade Organization

Abstract

African share in the world merchandise export has dropped dramatically from 7.3 percent (1948), 4.3 % (1973), 2.4% (2003) and 3% in 2014. Africa's low trade share in the global market is partly due to the region's poor performance in trade logistics. The aim of this study is to analyze African countries trade logistics performance based on the World Bank LPI and explore the effect of LPI and cost to export a TEU on African countries export in bilateral trade flows with the rest of the world.

The target population of the study is countries found in Africa. Descriptive analysis has carried to analyze LPI of Africa based on data from 47 African countries. The association between logistics performance and export value has explored based on augmented gravity model of international trade. For this purpose, 29 African countries (source) and 109 importing countries have included. OLS regression with robust cluster option has employed as an estimation strategy in the gravity model.

Relative to its trading partner regions, Africa experience the lowest LPI score particularly in terms of quality of trade and transport related infrastructures, and customs and border clearance. Africa is also one of the regions with the highest cost to export/import a TEU. Reduction in export cost will maximize African countries benefit from trade. The study gravity model estimates show that improvement in any of LPI components (customs clearance, infrastructures development, international shipments, competence and logistics service quality, tracking and tracing, and timeliness) can lead to significant growth of Africa countries export. However, the positive effect of LPI on export is lower for landlocked countries than it does for coastal countries.

This study includes new variables in existing augmented gravity model. This variable measure trade logistics cost i.e., the cost to export/import. The study strength concept development of trade logistics. African countries shall invest more on LPI input areas i.e., trade and transport infrastructure developments, customs and border clearance, competence and logistics service quality. Successful improvement in these areas will enhance African countries supply chain deliveries in terms of on-time delivery, tracking and tracing, and international shipments.

Keywords: Trade logistics, Export value, LPI Components, Landlocked

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Trade between countries is an old phenomenon. In modern time, international trade has become more common than earlier time and it is difficult to imagine today's world without international trade. Countries buy and sell goods and services to each other; it is because countries generally benefit from international trade gain (Krugman and Obstfeld 2003). Since absolute advantage theory, international trade theories has verified gain from trade. The gain from trade is not at the cost of other countries. The gain is as result of specialization which might be based on the comparative advantage for inter-industry trade and economies of scale to intera-industry trade (Smit 2010).

International trade enables countries to specialize in producing a narrow range of products in large-scale production. Then countries will export more from their efficient production which will allow trading countries to maximize their mutual benefits (Krugman and Obstfeld 2003). Specifically, there are two basic reasons for trade: first, a country will import products from other countries when the country cannot produce it or can produce the product but not enough to satisfy local demand. The second is when a country import products in which the country had the efficacy of producing those products, but with an aim of getting a lower price, greater variety of products and better quality (Sherlock and Reuvid 2008).

Following industrial revolution, world trade has grown higher than output. Countries export has grown with significant level except for the period between 1913 and 1950 as result of the two world wars and the great depression (Ul Haque et al. 1995). Global trade growth has continued with accelerated rate, from 1951 – 2004 global trade of merchandise including agricultural products, fuel and mining products and manufacturing products has grown on average by 5.9 percent per annum (WTO 2005).

There are many plausible reasons behind this growth. Technological advancement in transportation and communication together with investment and population growth has played remarkable role. After the second world war, political and economic cooperation's between countries with aim of reducing barriers to cross-border trade has also played a

pivotal role (WTO 2015). The efforts in reducing formal and informal barriers to cross border trade has implemented through international organizations, to create a free global market i.e., WTO. The global cooperation efforts leads to more integrated and interdependent global economy through globalization of production and markets (Hill 2008). Development of transport and communication technologies has been the main drivers of global economy integration (World Economic Forum 2013).

Since 80 percent of world trade by volume and 70 percent by value is transported by maritime transport (UNCTAD 2012), another prominent reason for an increase in global trade is as a result of cost reduction in international shipping in the second era of globalization during the latter half of the twentieth century. Substantial reduction in shipping cost is due to a significant technological change in shipping that includes: development of jet aircraft engines and containerization (Hummels 2007). Based on bilateral trade flows between OECD countries, specific causes for the growth of world trade has identified and their contribution has estimated. These includes income growth measured by GDP (67%), tariff rate reduction and preferential trade agreement (25%) and transportation cost reduction (8%) (Baier and Bergstrand 2001).

In the period of 1960 to 1990, countries export share has increased from 12 to 20 percent in industrial countries, from 16 to 28 percent in middle-income countries, and from 7 percent to 18 percent in low-income countries (Ul Haque et al. 1995). Between 1995 and 2011, world trade increase in volume and value is due to increase in the contribution of global supply chains to the global economy, entrance of new protagonist in global trade such as China, India, and diversification of export products (WTO 2015). The traditional trade pattern where developing countries supply primary products to industrialized countries and buy manufactured outputs has also changed. Now a days, countries trade almost similar products (Ul Haque et al. 1995). But, this is not true for Africa.

Trade is recognized as one of the means through which countries will meet sustainable growth and poverty reduction in developing countries. The volume and variety of export of Africa were relatively good in 1950s and 1960s. Unfortunately, from 1970s until 2000, most African countries export has experienced stagnation due to political and economic crisis (Kareem 2011). Compared to other regions, not only Africa's export share to abroad, but African trade within the region is low. For instance, the intra-regional trade of Africa accounts only 18% of total export value of the region in 2014 (WTO 2015). Even though

there are many plausible reasons for declining Africa's share in global trade and dominance of primary commodities to the region's export; transaction cost and quality of basic transport and communication infrastructures have a paramount contribution (Iwanow and Kirkpatrick 2009).

Like demography, investment, technological progress, energy and other natural resources; transportation cost is one of the determinant for countries international trade performance. The cost of transporting goods from producers to customers affects the volume and direction of trade and place of production sites (WTO 2013). In addition, logistics services such as time to export and import are important international trade factors, that will reduce export volume (Nordås, Pinali, and Grosso 2006).

The World Bank measures countries trade logistics performance since 2007. The measure is known as Logistics Performance Index (LPI). Countries have different performance in trade logistics. In accordance with 2014 measure, the gap between best and worst performer country is very high; with Germany, high performance (4.12) and Somalia low performance (1.77). Improving logistics performance is vital to enhance countries trade performance. Inefficient logistics will raise the cost of trading and cut potential to maximize international trade (Arvis et al. 2014). This study has explored the role of countries trade logistics performance on countries export.

1.2 Rationale for the study

Why do some countries have better performance on international trade than other countries? What are the critical factors behind such differences? One of the reasons for some countries become more profitable from international trade than others is their differences in cost. Some products manufactured overseas have less cost than others because of three major reasons. These are differences in manufacturing cost, differences in natural resources and temporary shortage and surplus (Stopford 2009). The difference in infrastructure service has also contributed to countries variations in development growth. Inadequate coverage and quality of infrastructure will affect countries trade competitiveness by increasing the cost of doing business. Quality infrastructure services on communication, energy, and transportation that includes: length and quality of road and railway network, air transport and ports have a positive contribution to increase county's growth and reducing income inequalities (Calderón and Servén 2004). Specifically, one of the reasons for countries' differences in international trade performance is countries' differences on logistics performance.

Differences in logistics infrastructure quality, transport time, processing time, freight transport and processing cost, policies, regulations, and procedures have a paramount impact on country's trade performance (Hausman, Lee, and Subramanian 2005).

Even though expanding manufactured export is one of the main goals of many developing countries, high level of variation has observed in output and export growth among the world developing countries. One group of countries benefits from large trade surpluses and the others equally suffer from large deficits (Ul Haque et al. 1995). Sub-Sharan Africa is known by its slow economic growth and poverty for the entire era of modern economic growth (Bloom and Sachs 1998). Africa's share in global market is very low, for instance, 1995 – 2010 it was less than 2 percent. A limited variety of export product and weak regional integration were two main drivers of low performance. African export has dominated by primary commodities such as fuel, mining products, and agricultural products. The share of Africa countries intra-regional trade is low, with 12 percent out of the total export of goods in 2013 (World Economic Forum 2013).

The World Bank Logistics Performance Index reveals countries logistics performance in international trade to find their challenges and opportunities for improvements. There is a huge logistics performance gap between top performer and low performer countries. For instance, based on 2014 countries Logistics Performance Index (LPI), Germany and The Netherlands are top performers with an overall score of 4.12 and 4.05 sequentially. On the other hand, Afghanistan, Democratic Republic of Congo and Somalia experience lowest performance with LPI of 2.07, 1.88 and 1.77 sequentially (Arvis et al. 2014). In related to this, a significant gap has also observed between these countries with regards to time required to export goods through complying all necessary procedures. In 2014, it takes 9 days for Germany and 7 days for The Netherlands. On the contrary, it takes 86 days for Afghanistan and 44 days for Democratic Republic of Congo (The World Bank 2016a). Using World Bank's LPI database is a logistical step for stakeholders who are concerned about addressing the key bottlenecks in countries trade logistics performance through comparative analysis across countries. The LPI encourages further study, particularly for countries whose trade logistics performance continues as low (Arvis et al. 2010).

The average logistics performance index for African countries in 2014 shows that, the region countries have low performance with an average score of 2.47. Lack of competition in trade logistics and poor infrastructure development on highways, railroads, and ports have

resulted in high freight rate and low-quality logistics service. In addition to production and border-related costs, high transportation cost has increased the cost of low value containerized cargoes of Africa. When we take some of the indicators of trade cost such as required number of days to export/import and cost associated with export/import, Africa countries have trading cost among those having the highest trading costs in the world (Portugal-Perez and Wilson 2008).

For instance, based on researcher compilation from World Bank data on time required to export goods through complying all necessary procedures from the year 2005 – 2014, it takes on average 32 days to export goods for African countries. The problem is severe for landlocked countries in Africa, where it takes on average 41 days for export in same years. The World Bank also computes the cost to export normal cargo with a TEU. The cost includes charges for documentation, customs clearance and technical control, customs broker fees, terminal handling charges and inland transport. For Africa countries, the average export cost per TEU from 2005 – 2014 was $1,812 per TEU. In the case of landlocked countries, their export cost per TEU was $2 937. On the other hand, for countries with top logistics performance, it costs $869 for Germany and $920 for Netherlands to export a TEU in the period of 2005 – 2014 (The World Bank 2016b, 2016).

Even though there are a number of factors that determine the level of export from one county to the others such as economic size, trading countries population, bilateral distance (Anderson 1979), economic growth, exchange rate, FDI inflows and government budget balance (Karbalaei, Md-Yusuf, and Ho 2014), various researchers have also acknowledged positive contribution of quality logistics service on countries international trade performance. While measuring the impact of different sources of trade costs on international trade, (Hoekman and Nicita 2011) have confirmed that improving countries logistics performance and reducing trading cost will have a higher contribution to trade benefits. In addition to cost reduction, development and improvement of physical infrastructures quality such as road, railways, airports, and ports will enhance developing countries trade competitiveness (Portugal-Perez and Wilson 2012).

However, based on the researcher knowledge, little research has done on measuring the direct effect of countries' trade logistics performance on their export, especially for African countries. Thus, this study addresses the following key questions:

- What is the performance of Africa under LPI components and cost to export/import a TEU?
- What is the effect of trade logistics performance on export?
- What is the effect of trade logistics costs on export?
- Does lack of direct access to the sea plays a significant role on the association between trade logistics performance and export?

1.3 Purpose of the Study

The main purpose of this study is to explore the role of countries trade logistics performance to their export. The value of export in bilateral trade flow, LPI, and cost to export/import a TEU are key statistics in this study. The study emphasizes on African countries, to improve the African share of global trade through identifying inefficient trade logistics areas for future improvements. In general, the study finding offer rational support for policy makers on the importance of improving trade logistics performance to enhance countries export competitiveness. In addition, the study will contribute to the existing body of literature on the topic. The specific aims of the study include:

1. Analyze trade logistics performance of Africa countries based on LPI components and cost to export and import a Twenty-foot equivalent unit (TEU).
2. Study and analyze the association between countries trade logistics performance and countries export value.
3. Analyze the association between countries trade logistics costs and countries export.
4. Examine the moderating effect of being landlocked on the association between trade logistics performance and export.

1.4 Scope of the Study

This research intends to study the association between countries trade logistics performance and export. The main focus of the study is trade logistics with cross-border flows of goods between Africa countries and the rest of the world. Countries export has measured by the value of export for aggregated products in bilateral trade flows. Countries logistics performance on international trade has measured by Logistics Performance Index and trade logistics cost. Trade logistics cost is limited to costs incurred by each country to export and import standardized cargoes by twenty feet equivalent unit container. Other variables which

have a direct impact on bilateral trade flows have controlled. These variables include Gross Domestic Product, bilateral distance, colonial history and common official language.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

International trade is a channel of integrating countries' economies across regions. Africa's export to the global market is dominated by primary products in raw materials form i.e., fuel and natural products account for two-thirds of Africa's export. With regards to trading partners, Europe remains African export main destination and Asia countries (mainly China) are second largest trading partners for African countries. The share of African export in the global market has reduced from time to time. The share has reduced from 4.9 percent in the 1970s to 3.3 percent in 2013 (United Nations Economic Commission for Africa 2015). What are the main reasons for declining African merchandise export share in the global market? The following section has investigated African export experience in the past and today.

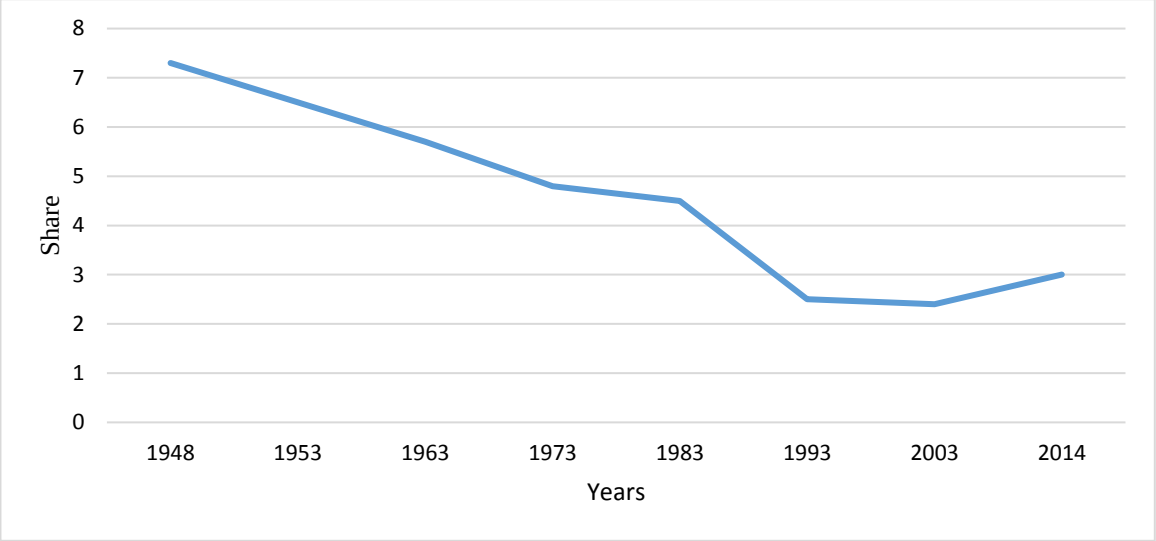
2.2 Africa's Export to Global Market

In 1960s, Africa future has become bright as many African countries become free from colonization. Africa had rapid economic growth in a period of 1960 – 73. Unfortunately, both political and economic issues have started to deteriorate in the 1970's when many of Africa country's leadership has become a dictator and autocrat. Since 1980s per capita GDP of Sub-Saharan Africa has become less than 1 percent. In 1999, 32 African countries are destitute than 1980 (Collier and Gunning 1999). Africa has experienced better economic performance, an average growth of over 5 percent in the past 15 years. Large emerging consumers and a growing labor force hold the promise of future opportunities. However, the ideal development path is still uncertain for Africa. Even though the service sector contribution to employment and GDP has an increasing share, manufacturing is staggering and agriculture's share of GDP is declining across the region (Forum 2015).

International trade has a significant role to countries economic growth. This has pronounced by the achievements of developing economies such as East Asia and North America. Global trade of Africa has dramatic fall, bilateral trade of Africa with industrialized countries is low (Coe David T. and Hoffmaister 1998). Figure 1 shows Africa merchandise export share in the world market. Even though most economies external trade has shown growth, African share in the World merchandise export has dropped dramatically from 7.3 percent in 1948

to 4.3 percent in 1973 and finally to 2.4 in 2003. Thus, African share in the world trade is not only low but has experienced dramatic fall. Small improvement has observed in past years, where Africa accounts 3 percent of global export of merchandise in 2014. Even though, many African countries continue as least competitive in international trade (WTO 2015).

Figure 1: Africa Merchandise Export Share of Global Export (1948 - 2014)

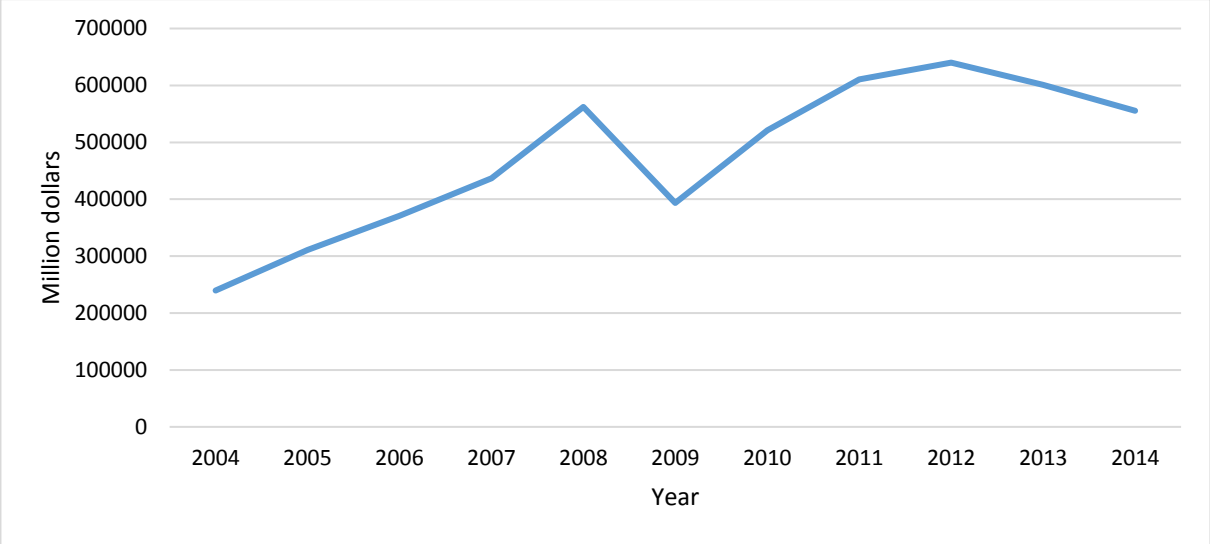


Source: Figure constructed with data from World Trade Statistics 2015

Different justifications have forwarded on the causes of slow economic growth. There are two extreme explanations of the causes of slow economic growth in Africa. Optimist views Africa's slow economic growth from 1970s to 1990 as result of its policies which have reduced its openness to foreign trade. The pessimist views Africa's problem as intrinsic and rooted in geography. Pessimist interpretation implies Africa is dependent upon international efforts to eradicate tropical diseases and develop transport infrastructures to connect their hinterlands with coasts (Collier and Gunning 1999).

Figure 2 shows Africa value of merchandise export from 2004 – 2014. Despite the financial crisis, Africa merchandise export has grown overtime. The economic crisis seriously affected the growing export of Africa in 2009. Merchandise export has reduced by 30% in 2009 relative to 2008 export. Despite Africa robust recovery in 2010, the region growth remains stagnant. The region has suffered from declining export since 2012.

Figure 2: Africa Merchandise Export (2004 - 2014)



Source: Figure constructed with data from World Trade Statistics 2015

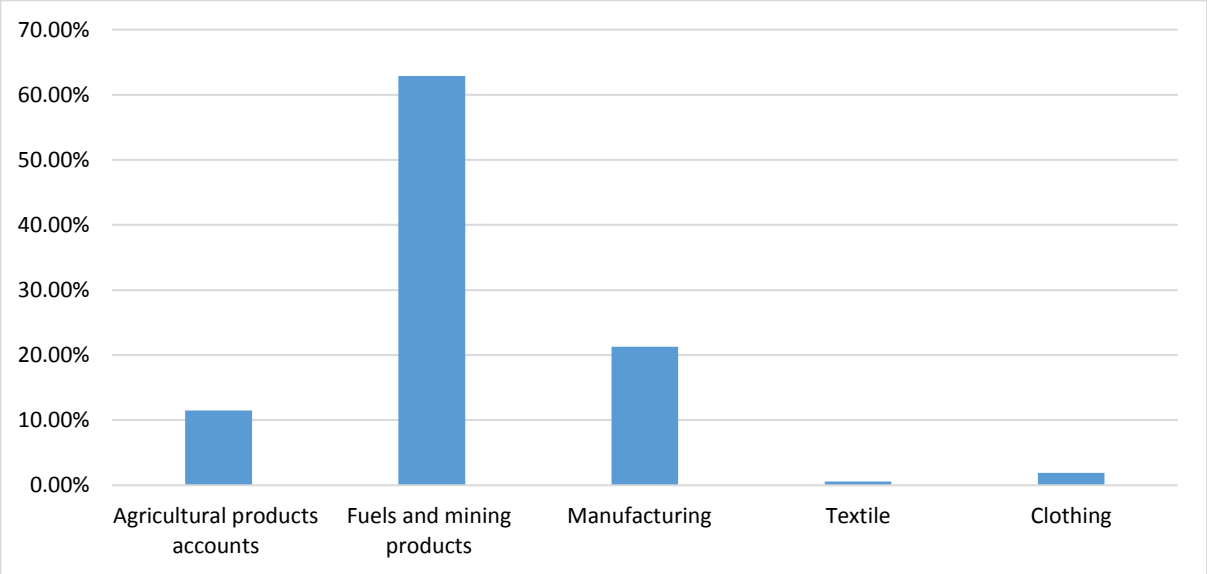
Various specific causes have identified for Africa's low trade share in the World trade, that include: specialization in primary products, low intra-regional trade (Siddiqi 2008, World Economic Forum 2013), poor infrastructures i.e., roads, railways and telecommunication, low industrialization and productivity, weak policies, geographical disadvantage or remoteness from larger markets (Siddiqi 2008). The other major impediment to Africa trade performance is high trading cost which includes border-related costs (tariff and non-tariff), behind border-related costs (corruption, governance, transparency and business environment) and transport cost (Portugal-Perez and Wilson 2008). In bilateral trade between Africa and EU, low and inadequate production capacity of Africa and lack of proper implementation of trade agreements are identified as main impediments for Africa export growth (Kareem 2011).

Most African countries face high transportation cost in international trade (Naudé and Matthee 2007). Relative to developed countries, developing countries in Africa pays more than 40 to 70 percent for international transport of their imports. The main reasons for high transportation cost in Africa are: trade imbalance, pending ports, and trade facilitation reforms (UNCTAD 2015), distance from major markets and ports, inability to meet enough economies of scale because of low trade volume, many countries found in Africa are landlocked, lack of sufficient investment in transport infrastructures, and trade and transport policies (Naudé and Matthee 2007). Solving these problems requires integrated approaches

such as making necessary investments and reforms on the region seaports, transit system and customs administrations (UNCTAD 2015).

For decades Africa's export trade has dominated by primary products which accounts about 40 – 50% of total export (Siddiqi 2008). Figure 3 shows merchandise export of Africa by major product groups, out of total export in 2014 agricultural products accounts 11.5%, fuels and mining products, 62.9%, manufacturing, 21.3% (WTO 2015). This information reveals the fact that Africa's export is limited to few types of primary commodities dominated by fuel and mining products. Thus, it is essential to transform Africa export from unprocessed primary commodities into diversified new products. Strengthen intra-regional trade will enhance Africa countries efficacy to export new products to new markets. Exporting new products to neighboring markets will increase products and market experience. This will shorten African learning time to export. Then new and old products will be exported to the rest of the world (Dick Nuwamanya 2012). Figure 3 also shows Africa's low share in manufacturing, clothing and textile. This could be resulted from low-level of industrialization in Africa.

Figure 3: Merchandise Export of Africa by major Products



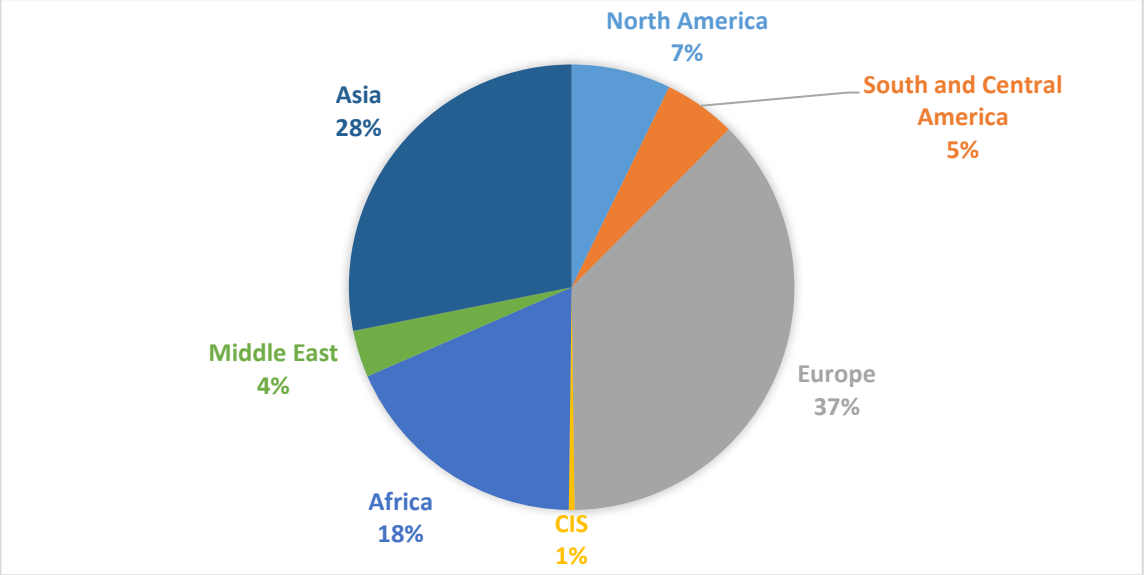
Source: Figure constructed with data from World Trade Statistics 2015

Africa has failed from industrialization due to its low private investment, perception of high risk of investment and low manufacturing productivity. African firms target small local markets, they are not able to achieve economies of scale, lack of competition and wide technology gap with the rest of the world, and high transaction cost relative to value added

are main reasons for lower industrialization. Even, having its natural resource endowments, Africa has become uncompetitive to natural resource extraction due to its poor delivery of public policies (Collier and Gunning 1999). Competitiveness of a country requires a set of viable industries that are capable of competing internationally, building balanced cost and productivity (Aiginger, Bärenthaler-Sieber, and Vogel 2013). Competitive industries which will create and sustain competitive advantage of a nation will be created by companies, not by government (Porter 1990a). This does not mean, government has not a role. In fact, government plays an important role in shaping the success countries competitiveness (Porter 1990a, Banerjee 2005). To accelerate industrialization in African, the region countries' governments shall create conducive business environment for competition along with supporting institutions with the purpose of raising productivity. Africa shall have globally competitive companies so as the region will have sustainable high share in the global market.

Relative to other regions, intra-regional trade is low in Africa which accounted (17.7%) of the region's total merchandise export in 2014. Trade within region plays a major role in other regions of the world, i.e., Europe 68.5%, Asia 52.3% and North America 50.2 % in 2014 (WTO 2015). The bottleneck for regional trade integration of Africa includes inadequate infrastructure, particularly in transportation and energy, institutional and regulatory environment and lack of full commitment in implementing regional integration efforts (World Economic Forum 2013), lack of sound economic policies and political tensions (Longo and Sekkat 2004). As a result of poor intra-regional integration and high transaction costs, African countries import agricultural products from other regions than their own region (World Economic Forum 2013). Figure 4 shows Africa's share of total merchandise export to different regions of the world. Europe is the largest recipient of Africa's export followed by Asia and North America in 2014.

Figure 4: Intera and Inter-Regional Export of Africa



Source: Figure constructed with data from World Trade Statistics 2015

With respects to destinations, EU has always been the most important market for Africa's export. Particularly some European countries have established commercial links with Africa following colonization. Many of this links had strengthened even after independence. In 1990 Africa exported 44% of the total continent export in value to EU countries. The political and economic crisis of most African countries has reduced the region export to EU from US$ 47 billion (1990) to US$ 39 billion (1993). Since 2000, Africa's export to EU has increased as a result of trade preference granted to most African countries to get access to EU market. In 2007, 33% of total export of Africa has supplied to EU (Kareem 2011). As it is presented in the above graph, Africa export to EU has accounted 37% of total export in 2014 (WTO 2015).

The other bottleneck for African export is long transit time which is associated with high uncertainty in road transport, that have economically and statistically significant negative effect on the region's export. Based on 2010 estimates, a one day increase in inland transit time in Africa countries will reduce export on average by 7 percent. Trade facilitation efforts shall give higher emphasis to improving transport infrastructure and related factors (Freund and Rocha 2010). The overall low quality of investment environment which encompasses institutional, regulatory framework and execution of policies, adequacy and quality of infrastructures has raised the cost of doing business in Africa. The cost of energy and infrastructure service, i.e., power, transport, and communication constitute also large part of trading cost (Ndulu and Chakraborti 2007).

In terms of transport cost, African vehicle operators have high variable costs than fixed cost, i.e., the variable/fixed ratio is 70/30 in Central and West Africa, 60/40 in East Africa. High variable costs are result of high fuel consumption, old model, low capacity, and poor maintenance. Fixed cost is low due to cheap labor and purchase of used trucks (Teravaninthorn and Raballand 2009). Complexity of customs and trade regulations and procedures imposes another hindrance on firms in Africa (Ndulu and Chakraborti 2007). Such procedures influence trucks utilization rates and rise opportunity cost of delay (Teravaninthorn and Raballand 2009). Hence, OECD has recommended to African governments to adopt an integrated approach which will decrease local constraints and exploit global market opportunities (Siddiqi 2008).

2.3 National Trade Logistics Performance

As per Council of Logistics Management 1998 definition, Logistics is a part of Supply Chain Management, concerned with management of the efficient flows of goods, service and related information from the point of origin to the point of consumption with aim of satisfying customers' requirements. Logistics management is responsible for coordinating and optimizing logistics activities such as transport management, materials handling, warehousing, inventory management, as well as integrate logistics operations with other functions including marketing, manufacturing, and finance (Douglas, Martha, and Janus 1998).

According to WTO Doha Round classification, logistics service has organized into three set of activities. The first set of activities include transportation management and supply chain consulting services which are grouped under core freight logistics services. The second set of activities is known as freight related logistics services which comprise transportation services that are essential to the movement of goods through different modes of transportation. Non-core freight logistics services i.e., fleet maintenance and repair, packing services, computer and related services represented the third set of activities (Saez et al. 2010).

The existence of international competitions has increased importance of logistics not only at firm level but rather at national level. Macro level logistics competencies have become one of important reason that differentiates between high and low competitive countries. Countries logistics infrastructures including different modes of transportation and associated

communication and information technologies, customs rules, tracking and tracing competencies are important facilitates for countries international trade performance (Burmaoglu and Sesen 2011).

A competitive network of global logistics is backbone of international trade (Arvis et al. 2010). Improvement of trade logistics performance will enhance countries, international trade largely (Saslavsky and Shepherd 2012, Korinek and Sourdin 2011). From evidence on 2007 and 2010 LPI, countries that are at same level of per capital income, those countries with best logistics performance experience extra growth of 1 percent in gross domestic product and 2 percent in trade (Arvis et al. 2010). Recent technological developments in transportation and communication enable companies to have decentralized production tasks which have now performed in different locations. The connection among these tasks requires efficient logistics (Kunaka, Mustra, and Saez 2013). Improvement in trade logistics performance has a greater impact on development of integration in international production networks. Particularly in components and parts trade in international production networks. That is why Asian – Pacific region where international production is highly developed, is more sensitive to trade logistics performance (Saslavsky and Shepherd 2012).

Trade logistics refers to a number of processes and services that are involved in delivering goods from one country into another. These include customs clearance and administration, transportation, tracking and tracing, organization and management of international shipments and information technology infrastructure. Trade logistics is determined at a national level (Korinek and Sourdin 2011). Improved trade logistics performance will increase trading countries company's abilities to respond international orders at the right time with lower costs, i.e., right time delivery will reduce inventory costs (Saslavsky and Shepherd 2012).

Logistics has become as one core pillars of economic development of countries through connecting people and firms to market opportunities so that countries will achieve higher levels of productivity gains (Arvis et al. 2016). As a result, suitable trade and transport facilitation policies can be developed if there is a correct understanding of national logistics performance (Rantasila and Ojala 2012). Implementing national level logistics performance measurement is essential to improve efficiency of logistics performance, infrastructure services and regulations (Rantasila and Ojala 2012). Managers and researchers could find a

set of performance measures by considering important performance dimensions (Chow, Heaver, and Henriksson 1994).

2.4 National Trade Logistics Performance Indicators

Logistics performance is defined as a subset of larger notation of performance. Logistics performance measurement shall constitute most of performance dimensions thought to be important in short and long time horizons (Chow, Heaver, and Henriksson 1994). Performance measurement in logistics is essential for effectively managing logistics operations in globally competitive business environment. The pre-requisite for such performance measurement is, determining key performance indicators that will have a direct impact on logistics performance in terms of productivity and competitiveness (Gunasekaran and Kobu 2007).

In order to facilitate policy reforms around the globe, World Bank measures countries logistics performance. The Bank logistics measures are two kinds, domestics LPI and international LPI. The domestic LPI assess domestic environments to figure out logistics constraints within countries. It is not related to border or posts. International LPI measures countries trade logistics performance, by using a comprehensive measure of the efficiency of countries logistics on international trade. The index is very important to find national logistics challenges for improvement and exploit opportunities for growth. The LPI consist of six indicators: customs and border management, infrastructure, services quality, timeliness, international shipments, and tracking and tracing (Arvis et al. 2014). Here after, LPI in this research refers to the international LPI.

Logistics service has a dual role in trade. Improvement in logistics performance will have a direct impact on goods traded, on the other hand, high logistics costs are major barriers for trade (Kunaka, Mustra, and Saez 2013). It is important to increase responsiveness and reduce cost simultaneously. Logistics is one of the largest cost components for international trade, in 2003 global logistics expenditures represent 13.7% of total world Gross Domestic Products. On the other hand, world GDP can be increased by improving developing countries logistics efficiencies (Bowersox, Calantone, and Rodrigues 2003). Reducing logistics costs will lead to lower trading cost at national as well as international level and generally increase gains from trade.

It is clearly observed that World Bank's international LPI is not a complete measure, specifically one of the most important part, which is logistics cost is not assessed through the index. Improving trade logistics performance without reducing cost will impede trade logistics from having significant contribution in increasing countries trade competitiveness. Hence, operational trade logistics cost measure has also included in this study as well as indicators proposed by World Bank. Meaningful picture for each of national trade logistics performance indicators has described in respective to different theoretical evidences in the following paragraphs:

1. Customs and Border Management

Border lines separate sovereign states territories such as land borders, sea borders, and air border. Sovereign states whose border has crossed has right to impose rules to allow entry of people, vehicles, and goods. Persons are checked from immigration and crime perspectives. Customs duties shall be imposed on crossing goods. Even though many of these rules are subject to international agreements, the sovereign state whose border has crossed exercise exclusive rights to introduce rules about border crossing. The customs clearance takes place at border stations or checks points to make sure that the traffic crossing the border fulfills the nation's legal requirements (Miller et al. 2012).

Traditionally, customs and border management agencies serve as 'gatekeepers'. Their responsibilities in tax collection, preventing international terrorism, protecting public health and cultural heritage continues in the new era as well. The role has widened to include trade facilitation in improving cross-border movement of goods (Doyle 2010). Cumbersome border procedures increase transaction costs and delays to clearance of export, imports, and transit cargoes. Such difficulties will hamper countries international trade competitiveness. Bilateral and regional trading agreements will simplify customs and border management procedures. Effective Information Communication Technologies are important for integration of customs and border management operations and performance improvement (McLinden et al. 2011).

2. Infrastructures

Infrastructure refers to capital that includes transport-related facilities, telecommunications, water and wastewater facilities, energy generations and distribution. Infrastructure development is considered as a prerequisite for development (Straub 2008). Trade and transport infrastructures are divided into two: hard and soft. Hard infrastructures include

physical infrastructures (ports, airports, railroads, roads) and information and communication technology. Soft infrastructures are related to institutional aspects and business and regulatory environment (Portugal-Perez and Wilson 2010). Transport infrastructure also includes availability of elements such as vehicles, shipping containers, pallets, terminal facilities for landing, loading and unloading, intermodal facilities to connect different modes of transport: signaling and traffic control for system functioning (Korinek and Sourdin 2011).

3. International Shipments

Shipment is defined as the tender of cargoes at one time from one shipper to one consignee on one bill of lading (Maritime Administration 2008). In the case of international freight transport, the origin and destination of cargoes are located in different countries (Waters and Rinsler 2014). Selecting international shipper for cross-border trade requires considering different factors in selecting the right mode of transport and carrier. These factors include availability of possible alternatives, volume, and weight of cargoes, the value of goods, perishability, urgency and risk (RGX 2016). In today's world, it is very difficult for companies to be competitive without reducing costs incurred throughout the supply chain and continually improving quality of goods and services simultaneously. Based on analysis of articles published in period of 1994 – 2013, third-party logistics service providers' selection criteria have evaluated. Out of eleven criteria identified for 3PL selection, cost is most commonly applied criteria followed by relationship, services, and quality (Aguezzoul 2014). In growing power of 3PL in supply chain, integrated ports have become an essential part of supply chain in international shipments. Most important criteria applied for port selection from freight forwarders perspectives have identified and ranked as follows: port efficiency (speed and reliability), shipping frequency, adequate infrastructure, location, port charges, quick response, reputation for cargo damages (Tongzon 2009).

4. Service Quality

Understanding customers' requirements and expectations in terms of logistics performance and implementing the most efficient actions is required to reach customer satisfaction (Bottani and Rizzi 2006). Quality logistics service plays an important role in facilitating international trade of goods that are transported by sea and air. High-quality trade logistics service in terms of infrastructure, customs procedures, logistics competence, and tracking and tracing enhance country's export by reducing cost and delay. This is especially

important for countries that are geographically disadvantaged i.e., landlocked countries, and countries far from major markets (Korinek and Sourdin 2011). The performance of trade supply chain predictability and reliability has determined by a set of factors: quality of trade-related infrastructures, quality, and availability of private sector service and efficiency of trade procedures (McLinden et al. 2011). In an empirical research, logistics service quality attributes have presented through five dimensions: reliability, responsiveness, competence, empathy, and tangibility. This study shows a strong positive impact of logistics service quality on satisfaction and loyalty of customers (Kilibarda and Andrejic 2012).

5. Tracking and Tracing

In accordance with GS 1 definitions, tracking is defined as the ability to follow the path of a traceable item through the supply chain as it moves between parties i.e., knowing where objects are now. Tracing goes further, tracing refers to the ability to find origin, attributes, or history of a particular traceable item located within the supply chain by using its code i.e., where were my objects last Sunday afternoon? (Ryu and Taillard 2007). Supply chain partners can track and trace information on their shipments across the logistics chain through technologies i.e., GPS, GTIN, RFID, Barcode. Real-time tracking and tracing are essential to manage integrated logistics networks and to increase customer service. The generic tracking and tracing service is sending a message to a tracking database when a product arrives at a predefined place in logistics network. Such messages contain information on the location of arrival and arrival time (Shamsuzzoha and Helo 2011). Sharing relevant information with all partners of the supply chain enables shippers to assure end-to-end visibility of shipments. This, in turn, will improve the performance of supply chain (Kaipia and Hartiala 2006).

6. Timeliness

A party must carry out its obligations if a time has fixed, at that time or within a reasonable time after the contract has concluded if time is not fixed (UNIDROIT 2010). On time delivery is neither early nor late delivery (Harrison and Hoek 2014). One of the main logistical goals in many service level agreement is achieving on time in full deliveries (OTIF). The key components of OTIF delivery include delivery with: complete quantities ordered, exactly to customer's requested date and time, no delivery problems (shortage, damage) and correct and complete delivery documentation (Rushton, Croucher, and Baker 2010). On time complete delivery conforming to order specification is one of the competitive

dimensions used by companies (Harrison and Hoek 2014). Country's ability to export on time is one of source of the comparative advantage as important as factors of production in international trade. Particularly timeliness is more important for intermediate goods. The location of production facilities has an impact on timely delivery of parts and components (Gamberoni, Lanz, and Piermartini 2010). On the other hand, delay is barrier to trade. Based on an estimate on the days it takes to transport containerized cargoes from the factory to ship in 126 countries, on average each extra day a product delayed from scheduled shipment will reduce trade by at least 1 percent. A larger effect can be observed on the export of time sensitive goods i.e., perishable agricultural products and transit cargoes of landlocked countries (Djankov, Freund, and Pham 2010).

2.5 Trade Logistics Cost

In an increasingly interdependent global trade, trade costs are one determinant of bilateral trade, investment and geographical distribution of production (Arvis, Duval, et al. 2013). Trade cost refers to the difference between producer price in exporting country and consumer price in importing country (OECD and WTO 2015). Trade cost includes all costs incurred in delivering products to final users. This cost includes transportation cost, border-related costs (i.e. tariff and non-tariff barriers, information cost, legal and regulatory cost) and distribution costs (Anderson and Van Wincoop 2004). Logistics costs are costs incurred to move goods which can be categorized into three: administrative, transport and inventory cost. Firms in countries with unreliable supply chain keep up higher inventory to protect consequences of less predictable deliveries. Such inefficient operations will increase logistics cost (OECD and WTO 2015).

CHAPTER 3

CONCEPTUAL FRAMEWORK AND RESEARCH HYPOTHESIS

3.1 Introduction

This chapter deals with the conceptual framework and hypothesis formulation. The conceptual model shows: dependent, independent and control variables; structure of the study variables dependence and interaction effect of a moderator. The hypothesis section has elaborated well the direct association between trade logistics performance and countries export. The effect of direct access to sea on the association between LPI and export has also analyzed well.

3.2 Conceptual Framework

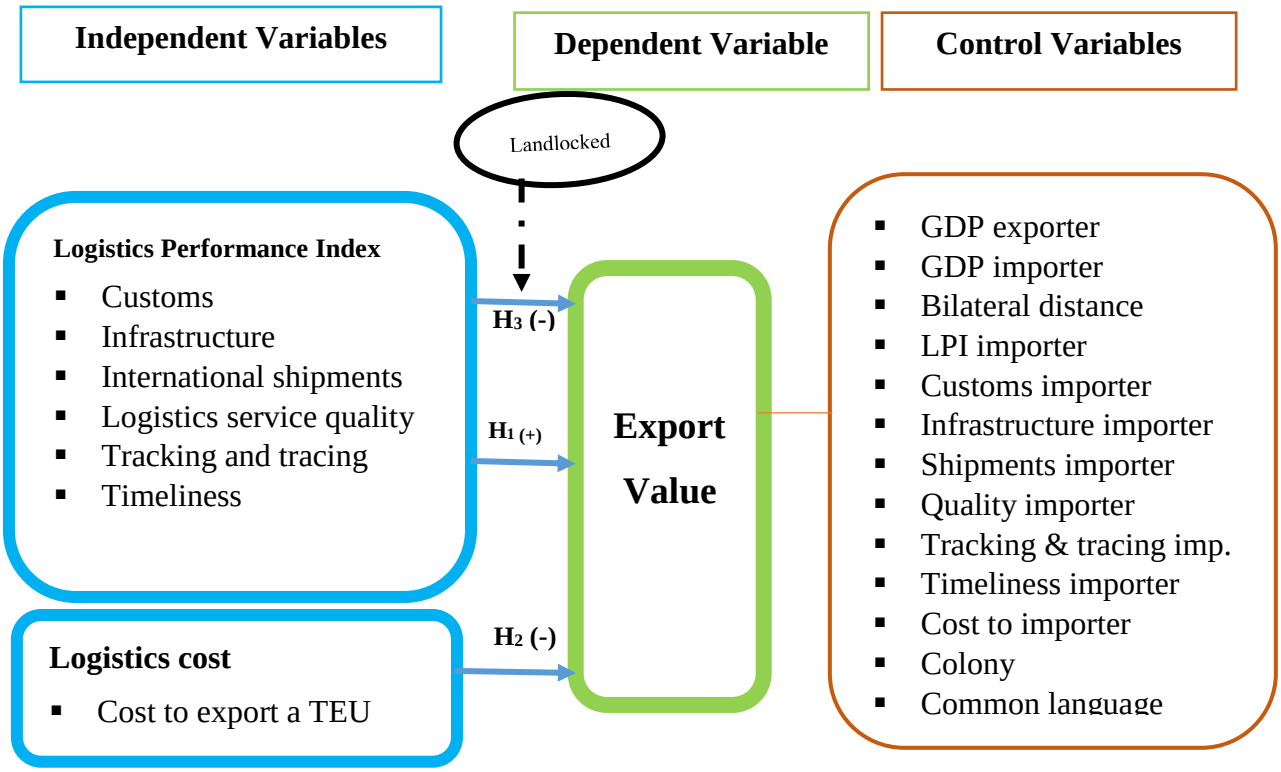
This study aims at investigating the strategic role of countries trade logistics performance on their export. Specifically, the study has two main aims: the first one is analyzing African countries trade logistics performance based on the World Bank trade logistics performance measure (LPI) and trade logistics cost i.e., cost to export a TEU and cost to import a TEU. The second aim is to explore association between trade logistics performance and export value. A gravity model of international trade is best method to explain bilateral trade flows between countries. Bilateral trade is highly determined by bilateral distance, economic size, population, and trade cost (Anderson 1979). Countries with bigger economic size and geographical proximity will have higher bilateral trade. Gravity model has further elaborated well in this study econometric model part (section 6.2). In addition to traditional gravity model variables, logistics have also a pivotal role in trade flows between countries.

The study conceptual framework has presented with the following figure. The conceptual framework explains the study relevant variables and their relationships. The dependent variable is countries export value in bilateral trade for aggregated products. The independent variable is trad logistics performance. Trade logistics performance has divided in two: trade logistics operational performance (LPI) and trade logistics cost. The direct effect and interaction effect of trade logistics performance has explained visually in figure 5. The direct effect of LPI on export has represented by solid line with arrow. On the other hand, the dotted line with arrow represents interaction effect between trade logistics performance and absence of direct access to the sea or landlocked.

Trade logistics operational performance has measured by LPI. Broadly, LPI measures infrastructure developments, competence and logistics service quality in trade logistics. Trade logistics performance measured by LPI will have a positive effect on countries export value (H_1). Specifically, LPI measures: efficiency of customs and border clearance; quality of trade and transport related infrastructures such as roads, railways, ports, information technology; competence of logistics service providers i.e., transport operators, customs brokers, and quality of logistics service i.e., tracking and tracing and on-time delivery. On the other hand, higher trade logistics cost will reduce export earnings. Thus, Trade logistics cost will have a negative effect on export (H_2).

Trade logistics cost has measured by the cost to export and import containerized cargoes. The cost to export consists of all official cost incurred to deliver a TEU from exporting African countries most populous cities to their port of loading. Cost to import refers to costs incurred to deliver a TEU from port of discharge to importing countries most populous cities. Hence, as it has depicted by the figure below, direct effect of trade logistics performance on countries export has hypothesized with H_1 and H_2.

Figure 5: Conceptual Framework



The study has also investigated the interaction effect of lack of direct access to the sea on the strength of association between trade logistics performance and export value. Some countries have direct access to the sea; others are landlocked, which does not have direct access to the sea. Landlocked countries shall get access to the sea for import/export through their coastal neighbors. The interaction effect of trade logistics performance and lack of direct access to the sea on countries export has hypothesized and presented with H_3. Thus, comparative analysis would be conducted on the effect of trade logistics performance on countries export depending on whether the country is coastal or landlocked.

As it has proved by several studies with gravity model, bilateral trade between countries is highly determined by economic size (GDP), geographical proximity, population, and trade cost. In addition to these core gravity model variables, recent studies have evidence on the impact of other variables on bilateral trade between countries i.e., trade logistics. Hence, bilateral distance, both exporter and importer countries GDP and population, common language and colonial history are included in this research model as control variables. In considering the relevance of trading partners logistics performance in bilateral trade flows, destination countries trade logistics performance i.e., LPI and cost to import has also included in this study conceptual framework.

3.3 Research Hypothesis

3.3.1 Trade Logistics Performance and Export

Increasing complexity of global business has offer opportunity for logistics to play a pivotal role in determining countries international trade performance (Martí, Puertas, and García 2014). For instance, improving performance on trade-related logistics such as infrastructure developments, logistics service, port efficiency and information system are critical to enhancing country's performance with regards to trading products on time and at low-cost (Arvis et al. 2007). Time to market is a very important competitive factor and a barrier to trade. Lengthy export and import procedures may reduce companies chance of entering into export market for time sensitive products, i.e., cloth, consumer electronics and affects the volume of trade (Nordås, Pinali, and Grosso 2006).

Improvements in trade logistics performance will have significant contribution to increase countries volume of export. While investigating EU countries logistics performance improvement (2005 – 2010) using the World Bank LPI and its six dimensions, trade logistics is found with significant positive effect on bilateral trade flows. However, trade logistics is

more important to exporter countries than importing countries (Puertas, Martí, and García 2013). Based on gravity model estimates on the role of logistics in international trade for emerging regions, i.e., Far East, East Europe, Africa, Middle East, South America, all LPI components have significant positive impact on increasing international trade for both import and export (Martí, Puertas, and García 2014).

Based on analysis of countries merchandise trade, improvement in trade logistics performance will enhance overall trade of countries which are found at all level of developments. Specifically, components of trade logistics performance: customs procedures, tracking and tracing, overall infrastructure and logistics competence positively impacts bilateral merchandise trade (Korinek and Sourdin 2011). This study is a logical extension of earlier related studies. In addition, much effort is not exerted on analyzing trade logistics performance taking in to account the entire African countries. Thus, this study investigates the strategic role of effective and efficient trade logistics on African countries export. Having these facts, the following hypothesis has developed.

Hypothesis 1: Trade logistics performance has a positive effect on export

3.3.2 Trade Logistics Cost and Export

Improving logistics performance index will result in to a significant contribution to trade performance (Hoekman and Nicita 2011). Correspondingly, reducing domestic trading cost would have statistically significant impact on boosting trading gains especially in terms of export (Hoekman and Nicita 2011). Developing countries have higher trading cost than developed countries (Anderson and Van Wincoop 2004, Arvis, Duval, et al. 2013). Based on the estimate of 178 countries trade cost in international trade of agricultural and manufacturing goods for 1995 – 2010, trade facilitation, transport, and logistics performance are very important part of trading cost than geographical distance. It is well-known from the standard gravity model of international trade, trade cost has significant effect on reducing bilateral trade flows (Arvis, Duval, et al. 2013). There is evidence from a growing number of research findings on the negative impact of higher trade cost on trade performance. Trade logistics cost is part of trading cost. Based on these facts the following hypothesis has develop.

Hypothesis 2: Trade logistics cost has a negative effect on export

3.3.3 Trade Logistics Interaction with Lack of Direct Access to the Sea

Economists consider technological progress and access to market as engines of economic development. Technological innovations through research and development are very important to increase countries productivity gains from specialization. These gains are highly materialized when producers have access to larger markets to sell their products and buy inputs (Hausmann 2001). Even if there is a reduction in tariff and institutional obstacles to cross-border investment and trade, geography of economies plays an important role in shaping distribution of variations in per capital income across countries (Redding and Venables 2004).

Policy is not primary problem for many poor countries in Africa, but geography is. Many African countries are geographically handicapped, some country's geographical location is far from the sea, others are landlocked (Hausmann 2001). There are 16 landlocked countries in Sub-Sharan Africa, which have together total population of more than 200 million, nearly 30 percent of Africa total population. Landlocked refers to geographical situation of a country without direct access to the sea and their international trade of import/export is dependent on their access to the sea through neighboring countries (transit neighbors) (World Bank Group 2014). Landlocked countries are dependent on political stability, infrastructure and institutional quality of neighboring transit countries to reach overseas market (Portugal-Perez and Wilson 2008).

Based on United Nations Convention on the Law of Sea-Part X, landlocked countries shall get access to the sea through territory of transit states by using all means of transport i.e., railways and road vehicles. The transit cargoes shall not be subject to any taxes, duties, and other charges. Rather landlocked countries pay for specific services with cargoes flows and for use of means of transport on transit states. Both countries, landlocked and transit shall have agreement on terms of service and payments (UN 1982).

In past, the average level of economic development of landlocked countries was 20% lower than coastal countries. Being landlocked does not necessarily lead to slow economic growth or poverty. However, in economic context being landlocked reduces connectivity and increase cost of access to the sea. Landlocked countries' have higher trading cost i.e., over 1.5-times higher than their corresponding coastal countries (World Bank Group 2014).

Landlocked countries have higher trading cost for administrative practices, documentation, terminal handling, and inland transport (Portugal-Perez and Wilson 2009). Landlocked countries are characterized by a higher cost per container, larger number of documents, and a longer time required to import or export compared to transit coastal countries (World Bank Group 2014). Transport cost of landlocked countries depends on the cost of its neighbor transit country transport infrastructures. Hence, 'neighbor matter'. Being resource scarce landlocked country along with a transit country with poor transport infrastructure link to port, with social, economic and political problems will worsen landlocked country's problems (Collier 2007). Evidence shows that landlocked countries logistics costs, other than transportation, constitute a very high percentage of their total sales (World Bank Group 2014).

Lack of direct access to the sea is a large overall constraint for countries international trade connectivity. International trade supply chain connectivity is dependent on quality of transport infrastructures, customs service and border control which will intern affect logistics performance. There is persistent logistics performance difference among countries in accordance with their ability to direct access to the sea, i.e., landlocked countries LPI score is lower than their corresponding coastal countries (World Bank Group 2014). Landlocked countries in Sub-Sharan Africa have experienced with higher inland transport cost and times delay in moving export cargoes to sea port. The causes for such bottlenecks are complex interactions with multiple policies and physical characteristics with their transit neighbors, inland transport with long times, high level of uncertainty and low road density (Christ and Ferrantino 2011). Based on these facts, the interaction effect of LPI and lack of direct access to the sea on export has hypothesized as follows.

> *Hypothesis 3: The positive effect of LPI on export is significantly stronger for coastal countries than it does for landlocked countries.*

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter gives a description of the research methods applied in this study. This study has carried based on secondary data. The specific methodological issues address in this chapter comprises target population and sample, nature and source of data required to answer the research questions, data collection method, and method of data analysis that includes descriptive and inferential techniques which enable the study to come up with concrete findings. The research method employed by the World Bank to get LPI has also discussed.

The subject of this study is countries found in Africa. The research measures the effect of countries trade logistics performance on countries export. As a result, country's export is a dependent variable. Export has measured by the value of African countries export for aggregated merchandise to the rest of the world in bilateral trade flows. Countries trade logistics performance is an independent variable, measured by Logistics Performance Index and countries trade logistics cost. Cost has measured with a cost to export and import a TEU. This research model controlled all other variables that will have a direct impact on bilateral trade flows. The World Bank LPI survey has conducted since 2007, this study has conducted based on 2014 LPI. Data on countries export value, cost to export and import a TEU and control variables i.e., GDP, distance, and trade cost has taken for the same year to LPI.

4.2 Population and Sample

This study had investigated the role of trade logistics performance on countries bilateral trade flows with specific emphasis on African countries export. There are 58 countries in Africa (Appendix 1) (UN 2014). Africa has the highest rate of population growth among the world major areas. 16 percent of the global population, 1.2 billion people lives in Africa (UN 2015). Thus, the study population includes world countries which have been part of the World Bank 2014 LPI survey. In this research, all African countries which have been part of 2014 LPI are considered as exporter countries or country of origin in bilateral trade flows. All world countries which have been part of the World Bank 2014 LPI survey are considered as importing countries. However, African countries are not included in the destinations part.

This research meets two main aims: (1) investigate performance of Africa in trade logistics to find the main trade logistics area in which Africa experience inefficiencies based on LPI, and cost to export and import a TEU (2) explore the association between trade logistics performance and export value. In order to meet the first aim, all African countries which have been part of 2014 LPI survey and those countries that have cost to export/import a TEU data at World Bank database are included in the study. Totally, 47 African countries, 34 coastal and 13 landlocked had become part of the study for LPI Analysis. For cost to export and import, totally 54 African countries, 38 coastal and 16 landlocked countries are included. In addition, all the world countries from different regions are also considered as a benchmark. The second aim requires different sampling.

To explore the effect of trade logistics performance on African countries export, total 29 African countries, 19 coastal and 10 landlocked countries have included in the gravity dataset. The choice is purposive, those countries with available basic data have selected i.e., LPI result and bilateral trade report to UN Comtrade database for 2014. On the destination side, all world countries which have 2014 LPI are selected as importing countries. Total, 109 importing countries are included as an export destination for African countries. Thus, the gravity dataset comprises 29*109 = 3,161 bilateral trade flows carried out in 2014.

4.3 Nature and Source of Data

The dependent variable export value is continuous quantitative data, in U.S. dollar. The cost to export and import per TEU are quantitative continuous independent variables. This research key variable, LPI is basically ordinal variable measured with scale (1 – 5), but it has converted into continuous by principal component analysis and other techniques used by World Bank research analysis. GDP and distance are also scale variables. Finally, control variables such as colony, language and landlocked are dichotomous variables.

With regards to data source to investigate LPI of African countries and for estimating the study gravity equations, necessary data have retrieved from different credible public international organizations databases. The bilateral trade flow which is the value of export from African countries to their trading partners has used from UN Comtrade, the largest depository of international trade data. The bilateral export value comprises aggregated commodities or all commodities classified under Standard International Trade Classification Revision 4 (SITC Rev.1). The focus of this research, LPI for both exporting and importing countries have retrieved from World Bank database. Data on cost to export and import, GDP

and Population for both exporting and importing countries are also retrieved from the World Bank. For controlling the relative trade cost, KM distance between source and destination countries capital cities has taken as a proxy for the center of economies for countries. Data for distance, common official language, colonial relationship and landlocked has obtained from CEPII. Furthermore, all necessary theories, concepts, and empirical findings have gathered from secondary sources such as textbooks, journal articles, conference papers, official statistics, and web pages. The summary of data source for the study variables has presented in the following table.

Table 1: Data source

Variables	Data source
Export value	Database: UN Comtrade URL: https://comtrade.un.org/data/
LPI	Database: World Bank LPI URL: http://lpi.worldbank.org/
GDP	Database: World Bank Data URL: http://data.worldbank.org/indicator/NY.GDP.MKTP.CD
Population	Database: World Bank Data URL: http://data.worldbank.org/indicator/SP.POP.TOTL
Cost to export Cost to import	Database: World Bank Data URL: http://data.worldbank.org/indicator/IC.EXP.COST.CD
Distance Official language Colony Landlocked	Database: CEPII URL: http://www.cepii.fr/cepii/en/bdd_modele/bdd.asp

4.4 The World Bank LPI Methodology

The 2014 LPI survey is similar with earlier three measures, the data is collected using online structured survey. The 2014 survey has carried out between October and December 2013.

The survey has conducted by the World Bank in collaboration with academic and international institutions and private companies engaged in international logistics. LPI survey uses standardized questionnaire which comprises domestic and international parts. For the domestic part, respondents provide quantitative and qualitative details on the logistics environment, time and cost in the country where they work. For the international part (International LPI), respondents conduct a qualitative evaluation of country's logistics performance with six key areas. A scale 1 (lowest) to 5 (highest) has used in rating performance (Arvis et al. 2014, Busch 2015). Since the focus of this research is international logistics, the methodological details on the International LPI have elaborated well below.

Sample: The 2014 survey has answered by 1,000 respondents from 143 countries. The survey takes a representative sample for developing and developed countries. Each respondent rates up to eight countries in addition to his/her country. A web engine has designed to incorporate Uniform Sampling Randomization (USR) approach. The statistical web program selects respondents in accordance with high trade volume between countries. USR will rise up countries with lower trade volume to include underrepresented countries (Arvis et al. 2014).

Respondents: Respondents are logistics professionals such as multinational freight forwarders and main express carriers. Respondents are from both large companies and small and medium companies. Large companies are those with at least 250 employees which accounts 23 percent of 2014 respondents. The remaining are from small and medium companies. Senior professionals have also participated in the study, 47% senior executives, 15% area or country managers and 21% department managers. The criteria used by respondents to select eight overseas countries varies by the characteristics of the country where the respondent is located. These includes most important import and export markets of the country where the respondent is located, whether the respondent is from coastal, landlocked, low-income, middle-income, and high-income countries (Appendix 2) (Arvis et al. 2014).

Construct: The LPI survey question 10 – 15 describes about international logistics performance. The six component questions are presented as follows:

1. Rate the efficiency of clearance process (i.e., speed, simplicity, and predictability of formalities) by border control agencies including customs in …, rated from "very low" (1) to "very high" (5) in survey question 10.

2. Evaluate the quality of trade and transport related infrastructures (e.g. ports, railroads, roads, information technology) in ..., rated from "very low" (1) to "very high" (5) in survey question 11.
3. Assess ease of arranging competitively priced shipments to…, rated from "very difficult" (1) to "very easy" (5) in survey question 12.
4. Evaluate the overall level of competence and quality of logistics service (e.g. transport operators, customs brokers) in …, rated from "very low" (1) to "very high" (5) in survey question 13.
5. Rate the ability to track and trace your consignments when shipping to …, rated from "very low" (1) to "very high" (5) in survey question 14.
6. When arranging shipments to the countries listed below, how often do they reach to the scheduled or expected delivery time, rated from "hardly ever" (1) to "nearly always" (5) in survey question 15 (World Bank 2013).

Analysis: The international LPI is a summary indicator of trade logistics performance that combines data from six performance components. The missing values for some components are replaced by the country mean response for each question adjusted by its standard deviation. Principal Components Analysis has used to produce a single aggregated result with a strong pattern in a data set. The overall LPI is a weighted average score of its six indicators (Arvis et al. 2014).

4.5 Method of Data Collection and Analysis

Conducting cross countries survey is expensive and time-consuming, they are usually done by governments and international organizations. Likewise, this study employed survey data collected by The World Bank and countries trade statistics reported to United Nations, trade statistics division. Data related to countries history are produced by CEPII, a French research center in international economics. A systematic literature review from empirical and theoretical evidence have collected and organized to understand the research problem well and support analysis.

This research unit of analysis are countries found in Africa. In addition, world countries which are serving as an export destination for Africa are also included as an importer for Africa countries export. Descriptive statistics i.e., mean have used to summarize and organize the data and find international trade logistics areas where Africa experience lowest performance. The effect of trade logistics on export has explored based on gravity model of

international trade. The estimation has carried by using multiple linear regression. Finally, tables, graphs, and charts have used to present the research findings.

CHAPTER 5

MEASUREMENT OF VARIABLES

5.1 Introduction

As the common saying, 'If you can't measure, you are not doing it', proper management and continuous performance measurement of a system that supports country's export will assure competitive advantage of a nation. The performance measurement may focus on inputs or outputs or outcomes. It is very important to measure outcomes, which concerns on effects, i.e., increase in trade flows and national income (International Trade Centre 2003). This research aims to investigate the effect of country's trade logistics performance on countries export, specifically for African countries. Thus, best-fit measure for the research dependent variable is county's annual total export value with their trading partners. Logistics performance has measured by using qualitative measures (logistics performance index) and quantitative measures (trade logistics cost). Hence, the dependent variable is export value. Logistics performance index and logistics cost are independent variables. Each of these measures has discussed well as follows.

5.2 Dependent Variable: Export

Out of different international competitiveness measures identified from theoretical and empirical evidence, export is the most important indicator in measuring nation's competitiveness in international trade (Porter 1990a). Several scholars have recommended export as one of key indicator for measuring countries international trade performance such as (Adams, Gangnes, and Shachmurove 2004, Fagerberg 1988, IMD 2014). World Trade Centre measure countries trade performance and competitive position using trade performance indicators, the value of countries total export is one of the measures (International Trade Center 2007). Considering the aim of this study which has focused on investigating the role of trade logistics on countries international trade flows, export value has selected as proper measure of countries international trade flows. The export values used in this study is monetary value (USD) of all merchandise exported from each exporting country included in the study to their trading partners in 2014.

5.3 Independent Variable: Logistics Performance Index

Comprehensive and multidimensional national level logistics performance indicators are critical to prepare and implement effective policies. In this regard, The World Bank has developed and implemented a sound, comprehensive measure, of a particular country logistics efficiency in international trade since 2007. This measure is known as logistics performance index (LPI), which has facilitated numerous policy reforms through providing relevant information for policy makers, private executives and any other stakeholders on countries abilities to manage logistics operations in the global business environment. Logistics performance indicators are revised based on theoretical and empirical research findings and practical experience of logistics professionals engaged in global logistics. Generally, LPI measure countries trade logistics performance (Arvis et al. 2007, Arvis et al. 2016).

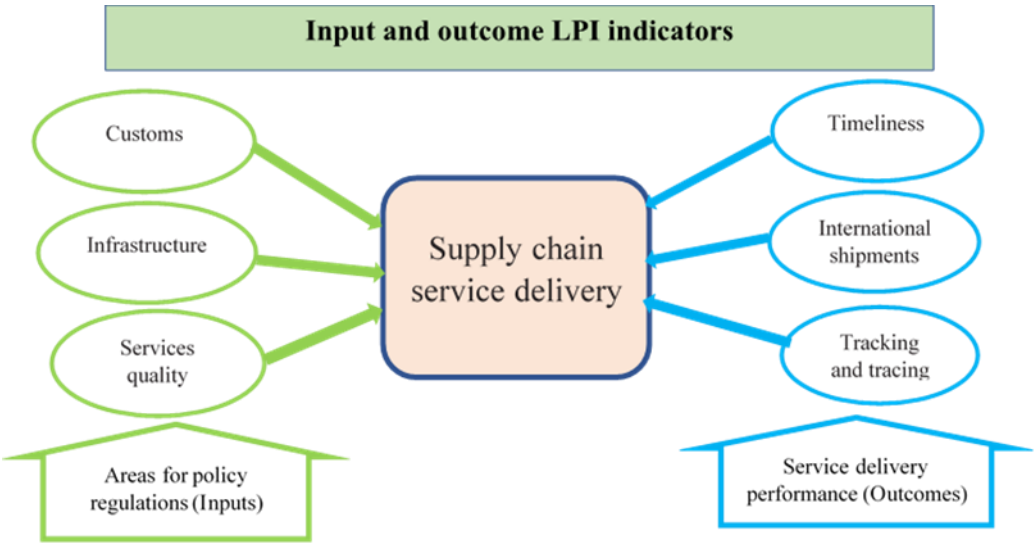
LPI has developed based on a worldwide survey of companies which are responsible for transporting goods and trade facilitation across borders i.e. multinational freight forwarders. The LPI uses a standard questionnaire with two parts: international and domestic. The cross countries survey has conducted by using logistics professionals involved in international freight forwarding. For the international part, respondents assess countries national logistics performance through six dimensions that capture the most important aspects of logistics environment. The International LPI provides a clear understanding of national logistics performance of world countries on cross-border trade and transport facilitation, infrastructure planning and development, service provision, supply chain reliability and service quality. International LPI is a qualitative survey that uses a scale of 1 – 5 for each dimension, where the lowest score refers to worst performance and highest score refers to best performance. Specifically, 1 refers to very low, 2: low, 3: average, 4: high, 5: very high. LPI produces a single weighted average index (overall index), based on a standard statistical technique applied to compare different regions, countries, and income groups (Arvis et al. 2012, Arvis et al. 2014, Arvis et al. 2016).

In 2007 LPI has applied to measure countries trade logistic effectiveness and efficiency with seven indicators, that includes customs procedures, infrastructure, ease of shipment, logistics service, ease of tracking, domestics logistics cost and timeliness (Arvis et al. 2007). LPI has used repeatedly: 2007, 2010, 2012, 2014 and 2016 (Arvis et al. 2016). Minor changes had

made in 2012, LPI indicators have revised into six dimensions to include environmental factors (Arvis et al. 2012).

The six dimensions are classified in to two, input and outcome. Customs, infrastructure and service quality are areas for policy regulations. Timeliness, international shipments and tracking and tracing are outcomes represented by service delivery performance (Arvis et al. 2016). This classification has visualized in figure 6.

Figure 6: Logistics Performance Index



Source: (Arvis et al. 2016)

In addition, each of the World Bank LPI dimensions are summarized as follows:

1. **Customs:** analyze the efficiency of customs clearance and border management, i.e., speed, simplicity, and predictability of formality (Arvis et al. 2016). Customs agencies and other authorities such as industry and agriculture ministers will intervene in the clearance processes (Arvis et al. 2007).
2. **Infrastructure:** refers to the quality of trade and transport related infrastructures that include roads, railways, ports, airports, warehousing, intermodal facilities, information, and communication technologies (Arvis et al. 2010). Proper delivery of goods requires an efficient and on-time exchange of information. This makes integration of communication and information technologies essential in international trade (Arvis et al. 2007).
3. **International shipments:** analyze the flow of goods with regards to easiness of arranging competitively priced international shipments (Arvis et al. 2016).

4. **Service quality:** assess competence and quality of logistics service, e.g., customs brokerage, trucking and forwarding. Logistics service quality is critical to assure reliable supply chain to producers and exporters (Arvis et al. 2012). Supply chain performance is dependent on the quality of services provided by different stakeholders that include transport operators, customs brokers, and public agencies which are responsible for border procedures (Arvis et al. 2007).
5. **Tracking and tracing:** refer to the ability to track and trace consignments (Arvis et al. 2016).
6. **Timeliness:** analyze the frequency with which shipments reach consignees within scheduled or expected delivery times (Arvis et al. 2016).

5.4 Independent Variable: Cost to Export/Import

This study has investigated part of trade logistics cost, cost to import and export a TEU. The World Bank conducts cross-country cost measurement to export or import a twenty-foot equivalent unit (TEU) container in USD and publishes an average annual figure. The annual average cost figure has computed by taking all charges required for completing the procedures for exporting or importing goods. Specific charges included in cost calculations are administrative fees for customs clearance and technical control, documentation, customs broker fees, inland transport and terminal handling charges. The computed cost does not include tariffs or trade taxes.

While conducting this survey World Bank makes assumptions about traded goods and business survey. The product travel is in a dry-cargo, 20-foot, full container load: it is normal cargo nor does it include military items, does not need refrigeration or any other special environmental and safety standards other than accepted international standards. The assumptions for business surveyed and goods traded include: domestically owned private limited companies which are located in the county's most populous city with more than sixty employees, which does not work in the industrial zone for export and the company should export at least 10% of its sales (The World Bank 2016b, 2016).

5.5 Control Variables

There are a number of factors that figure out the success of countries international trade from cultural to political and economic factors. Trading countries differences in institutional quality and cultural values and norms have effects on a number of trade flows (Linders et

al. 2005). The nature of countries political relations has also an impact on international trade flows. Trading countries positive political relations will lead to higher trade flows among such countries (Morrow, Siverson, and Tabares 1999). In measuring the effect of trade logistics performance on countries export, this research has used, importers logistics performance with LPI dimensions, economic size measured by GDP for both exporters and importers, geographical distance between trading countries, common official language, colonial relationship, and direct access to the sea as control variables. The scientific justifications behind selecting these variables have discussed well in this research gravity model section (refer to section 6.2.1).

CHAPTER 6

FINDING AND ANALYSIS

6.1 Introduction

This chapter presents the finding, analysis, and interpretation that will answer the research questions. The chapter has classified with three main sections. In the first section, the study econometric model and estimation strategy has discussed. Statistical assumptions test results have presented in the second section. The third section presents the finding and analysis of the study. The finding consists of descriptive analysis on Africa trade logistics performance, direct effect of trade logistics performance on exports, and interaction effect of lack of direct access to the sea on the strength of association between LPI and export.

6.2 Econometric Model

6.2.1 Gravity Model

Over the last half century, gravity model has applied to study the impact of various trade-related policies on countries bilateral trade flows. In its basic form, gravity equation has applied to explain bilateral trade flows between countries as a function of economic size and trade cost. Jan Tinbergen (1962) was a pioneer in proposing gravity model of international trade based on Newton law of universal gravitation. According to Newton's law, larger objects are closer to each other, so that they have a greater force of gravity between them. In trade between countries, gross domestic product (GDP) of trading countries have used as a substitute for the mass of two objects (Feenstra 2015). Thus, the amount of trade between countries is directly proportional to country's economic size and higher trading costs such as distance will reduce bilateral trade flows (Head 2003).

The first theoretical foundation of gravity equation has given by Anderson 1979. The assumptions made in the basic gravity model are, the flow of goods between country i and j, traded goods are a function of trading countries income and population, goods are differentiated by place of origin and transport cost has approximated by distance. Anderson specifies the basic gravity equation as $M_{ijk} = \alpha_k \, Y_i^{\beta k} \; Y_j^{\gamma k} \, N_i^{\varepsilon k} \, N_j^{\epsilon k} \, d_{ij}^{\mu k} \, U_{ijk}$ where, M_{ijk} is monetary value of good or factor k exported from country or region i to j, Y_i and Y_j are trading countries incomes, N_i, N_j are populations in trading country i and j, d_{ij} is distance between the two trading countries or regions and U_{ijk} is error term. This equation can be

estimated by using cross-sectional data and sometimes by using pooled data (Anderson 1979).

Gravity equation estimates have improved by controlling the relative trade costs which affect bilateral trade flows. In full context, trade cost goes beyond transportation cost. It includes all costs incurred in delivering goods from local production to foreign customers. That include tariff barriers, information cost, legal and regulatory costs, contract enforcement cost and cost associated with the use of different currencies (Anderson and Van Wincoop 2004). Hence, additional dummy variables are included in the basic gravity equations as a proxy for trade cost. These include dummies for sharing a common border and landlocked countries. Presence of common cultures and business environments as a result of trading countries historical background are very important to capture information cost i.e., colonial relationship and common official language (Bacchetta et al. 2012).

Gravity model has applied to estimate the value of bilateral trade between countries. In addition to core variables such as GDP and distance, gravity equations can contain other variables that will influence bilateral trade flows, such as trade policy and institutional variables (Portugal-Perez and Wilson 2009). Numerous researchers have applied gravity model to explore the effect of logistics on bilateral trade flows. Among these, (Hausman, Lee, and Subramanian 2005) uses augmented gravity model which has incorporated the effect of direct shipping cost, time, variability in time and complex procedures on international trade competitiveness. They have found new variables that are directly related to logistics performance having statistically significant relationship with the level of bilateral trade; (Freund and Rocha 2010) applied modified gravity equation to explore the effects of different delays such as documentation, inland transit, ports, and customs on Africa's export; (Portugal-Perez and Wilson 2009) used gravity model to study the role of trade facilitation and trade cost for Africa using LPI and Doing Business trading cost.

Bilateral trade gravity equations can be estimated for either panel of countries or cross-section of countries (Bacchetta et al. 2012). Cross-section data are data on one or more variables which are collected for several sample units at the same points in time (Gujarati 2003). The second aim of this research is exploring the effect of logistics performance on export. Having the above theoretical and empirical evidences, there is no best fit model for this research except gravity model of international trade in order meet the second aim of this research. More recently, importance of trade logistics performance measured by the World

Bank LPI on countries bilateral trade flows has explored through considering European countries export competitiveness. Several gravity equations have estimated using LPI components as proxy variables for trade facilitation (Puertas, Martí, and García 2013). This research has used gravity equations developed by Puertas et.al., to test this research hypothesis in the context of Africa. Having all variables of Puertas et.al., 2014 gravity equations, cost to export and import a TEU has added. The interaction effect of trade logistics performance with direct access to the sea has also explored to find out the difference between coastal and landlocked countries. Considering the above points, this research gravity equations have presented as follows:

$$\log(Y_{ij}) = \beta_0 + \beta_1 \log(D_{ij}) + \beta_2 \log(GDP_i) + \beta_3 \log(GDP_j) + \beta_4 \log(N_i) + \beta_5 \log(N_j) + \beta_6 \log(LPI_i) + \beta_7 \log(LPI_j) + \beta_A(W) + U_{ij} \quad (1)$$

Where

Y_{ij}= Value of export from country i to country j

$i =$ Exporter countries (1, 2, …… 29)

j = Importer countries (1, 2, …… 109)

D_{ij} = Geographical distance between trading countries

GDP_i = Exporter countries gross domestic product

GDP_j = Importer countries gross domestic product

N_i = Exporters countries population

N_j = Importer countries population

LPI_i = Exporter countries logistics performance index

LPI_j = Importer countries logistics performance index

W = Set of dummy variables (official language, colony, landlocked)

U_{ij} = Error term

According to above equation, value of export from country i to country j, is a function of economic size of exporting and importing countries, trading countries population, distance between trading countries capital cities and logistics performance of both exporting and importing countries. Dummy variables for official language and colonial history have used as a proxy for trade cost as well as distance. In accordance with this research object, a dummy variable for direct access to the sea (landlocked) has included to investigate the interaction effect of direct access to the sea with trade logistics performance, on country's export. In modeling gravity equations and conducting estimation, it has recommended to

develop a separate equations for each LPI components to avoid multicollinearity among trade logistics performance indicators (Puertas, Martí, and García 2013). As a result, separate equations have derived for each LPI components and cost to export and import as follows.

$$\log(Y_{ij}) = \beta_0 + \beta_1 \log(D_{ij}) + \beta_2 \log(GDP_i) + \beta_3 \log(GDP_j) + \beta_4 \log(N_i) + \beta_5 \log(N_j) + \beta_6 \log(Customs_i) + \beta_7 \log(Customs_j) + \beta_A(W) + U_{ij} \quad (2)$$

$$\log(Y_{ij}) = \beta_0 + \beta_1 \log(D_{ij}) + \beta_2 \log(GDP_i) + \beta_3 \log(GDP_j) + \beta_4 \log(N_i) + \beta_5 \log(N_j) + \beta_6 \log(Infrastructure_i) + \beta_7 \log(Infrastructure_j) + \beta_A(W) + U_{ij} \quad (3)$$

$$\log(Y_{ij}) = \beta_0 + \beta_1 \log(D_{ij}) + \beta_2 \log(GDP_i) + \beta_3 \log(GDP_j) + \beta_4 \log(N_i) + \beta_5 \log(N_j) + \beta_6 \log(Shipments_i) + \beta_7 \log(Shipments_j) + \beta_A(W) + U_{ij} \quad (4)$$

$$\log(Y_{ij}) = \beta_0 + \beta_1 \log(D_{ij}) + \beta_2 \log(GDP_i) + \beta_3 \log(GDP_j) + \beta_4 \log(N_i) + \beta_5 \log(N_j) + \beta_6 \log(Quality_i) + \beta_7 \log(Quality_j) + \beta_A(W) + U_{ij} \quad (5)$$

$$\log(Y_{ij}) = \beta_0 + \beta_1 \log(D_{ij}) + \beta_2 \log(GDP_i) + \beta_3 \log(GDP_j) + \beta_4 \log(N_i) + \beta_5 \log(N_j) + \beta_6 \log(Tracking_i) + \beta_7 \log(Tracking_j) + \beta_A(W) + U_{ij} \quad (6)$$

$$\log(Y_{ij}) = \beta_0 + \beta_1 \log(D_{ij}) + \beta_2 \log(GDP_i) + \beta_3 \log(GDP_j) + \beta_4 \log(N_i) + \beta_5 \log(N_j) + \beta_6 \log(Timeliness_i) + \beta_7 \log(Timeliness_j) + \beta_A(W) + U_{ij} \quad (7)$$

$$\log(Y_{ij}) = \beta_0 + \beta_1 \log(D_{ij}) + \beta_2 \log(GDP_i) + \beta_3 \log(GDP_j) + \beta_4 \log(N_i) + \beta_5 \log(N_j) + \beta_6 \log(Cost\_exp_i) + \beta_7 \log(Cost\_imp_j) + \beta_A(W) + U_{ij} \quad (8)$$

Where:

Customs = Customs clearance and border management

Infrastructure = Trade and transport related infrastructures

Shipments = International shipments

Quality = Competence and quality of logistics service

Tracking = Tracking and Tracing

Timeliness = On-time delivery

Cost_exp = Cost to export a TEU by country i (exporter countries)

Cost_imp = Cost to import a TEU by country j (importer countries)

6.2.2 Estimation Strategy

In international trade gravity model estimation, it is common to have zero reported bilateral trade between countries in year t, even in aggregated trade data (Shepherd 2013a). Recent researches on gravity model have explored alternative approaches to handle zero bilateral trades. The most common traditional method was to add a small positive number to all trade flows to make the logarithmic transformation of zero trade observations definable (Burger, Van Oort, and Linders 2009). However, this approach is problematic since it does not have any theoretical and empirical justification (Linders and de Groot 2006). The second alternative for addressing zero bilateral trade is to use a Heckman sample selection model.

Heckman has proposed two-step procedure. In the first stage, probit function has used to estimate the probability of the occurrence of bilateral trade. Second, probit estimators are used to calculate inverse mill's ratio, which has used to measure selection bias. Then the mill's ratios are used as another regressor in the original model (Heckman 1979). However, this research data test reveals the existence of heteroscedasticity in the dataset, which violates one of the basic regression assumptions. The right countermeasure for this problem is using robust and cluster option (Refer to section 6.3.3).

Even if this problem had solved theoretically, but not yet incorporated into Stata. Unfortunately, stata command does not allow Heckman two-step and robust option simultaneously. This lead to making estimation using different alternatives. Different estimates have made, using OLS with robust cluster (distance) and Heckman two-step. While comparing the two estimates, the significance level is almost equal, but there is a minor difference in the regression coefficients. In terms of precision of estimates, OLS robust cluster estimates have narrower confidence interval and smaller standard errors. Because of its higher precision and its ability to keep homoscedasticity, ordinary least squares (OLS) with robust cluster(distance) has employed for this research.

In analyzing relevance of trade facilitation in emerging regions exports (i.e., South America, Middle East, Far East, Africa and Post-Soviet Nations), LPI has used as a good proxy for trade facilitation. The research has carried based on gravity model of international trade and OLS has applied as an estimation strategy (Marti, Puertas, and García 2012). In analyzing the impacts of selected trade facilitation measures on international trade (Paulo Costacurta de Sá 2015) has employed gravity model with OLS to estimate a pooled cross section model.

This study finding confirms that in general, trade facilitation measures will help countries to improve their trade performance.

6.3 Statistical Assumptions Violation Tests

6.3.1 Introduction

In order to estimate the above linear gravity model, testing Ordinary Least Square assumptions and take corrective action for possible inadequacies is very essential. Fulfilling the asymptotic properties of OLS will result in estimates that are unbiased, consistent and efficient. For this research, the required assumption i.e., Multicollinearity, Homoscedasticity, and Normality have tested consecutively. STATA version 13 has used as computer software to test the assumptions and make estimations. All variables except dummies are expressed in natural logarithms for all models.

6.3.2 Multicollinearity Test

The first statistical assumption tested is rejection of multicollinearity in data. Regression estimates of gravity model above (equation 1), shows coefficients of key variables with wrong signs, high standard error, and low significance level. These are symptoms of multicollinearity (Greene 2003). This research data multicollinearity test has presented in the following table.

The Variance Inflation Factor (VIF) has presented in table 2. Variables presented in the left side of the table shows some independent variables that are highly correlated with other variables. There is a high correlation between, importers GDP and importers population. In addition, the estimates for equation 1 shows, some insignificant variables i.e., importers GDP and exporters population. The existence of high pairwise correlation, incorrect signs, and inflated standard error is known as near collinearity, which requires including only one of these variables (Baum 2006). Thus, population of importer and exporter countries are dropped from the model. New VIF calculation presented in the right side of the table 2 shows, VIF less than two so that the multicollinearity problem has solved. Similar problem has observed in all equations. Hence, population has reduced from further analysis. Multicollinearity test result for the remaining gravity equations (2 – 8) has presented in appendix 3. All equations have VIF less than 2. Thus, all equations are free from multicollinearity problems.

Table 2: Variance Inflation Factor

Variable	VIF	1/VIF
GDP Importer	8.4	0.119
Population Importer	5.22	0.192
LPI Importer	3.83	0.261
GDP Exporter	3.22	0.311
Population Exporter	2.14	0.468
LPI Exporter	1.7	0.587
Landlocked	1.19	0.839
Distance	1.11	0.905
Colony	1.09	0.919
Offical language	1.08	0.930
Mean VIF	2.9	

Variable	VIF	1/VIF
GDP Exporter	1.85	0.542
GDP Importer	1.72	0.581
LPI Importer	1.71	0.585
LPI Exporter	1.69	0.593
Landlocked	1.12	0.892
Colony	1.09	0.920
Distance	1.08	0.928
Official langauage	1.07	0.936
Mean VIF	1.41	

Source: Researcher estimation

6.3.3 Assumption of Homoscedasticity

Based on assumption of homoscedasticity, each predictor variables variance of residuals should be uniform. If the errors are not equal, it is problem of heteroscedasticity. The popular technique for detecting heteroscedasticity is Breusch-Pagan test (Baum 2006). The graphical method and Breusch-Pagan test indicate the presence of heteroscedasticity in this research model, which violates one of the basic assumptions. One source of heteroscedasticity is the presence of outlier, observations with very small or large values from the rest of countries. This problem can be mitigated by dropping outliers from analysis (Gujarati 2003). These research outliers have detected by using the fitted model standardized residuals. In accordance with the rule of thumb[1], 83 observations with standardized residuals greater than 2, smaller than -2 are dropped. Even though, the Breusch-Pagan test and other tests applied for this research data have rejected the null hypothesis of homoscedasticity at any confidence level (Table 3).

Gravity model deals with observations that are obviously heterogeneous because of several reasons. The assumption of homoscedasticity of the error term is likely to be violated (Bacchetta et al. 2012). There are two effective remediation of heteroscedasticity in gravity context, robust option, and cluster. The robust approach produces standard errors that are

[1] The Pennsylvania State University, 2017. Identifying Specific Problems Using Residual Plots. Retrieved from: https://onlinecourses.science.psu.edu/stat501/node/279 (Accessed on: 3-23-2017).

robust to arbitrary patterns of heteroscedasticity in the data (Bacchetta et al. 2012, Shepherd 2013a).

Table 3: Test of Heteroscedasticity

	chi2	P-Value	
Breusch-Pagan test	41.01	0.0000	
Cameron & Trivedi's decomposition of IM-test	162.55	0.0000	Heteroskedasticity
	14.53	0.0689	Skewness
	9.97	0.0016	Kurtosis
	187.06	0.0000	Total

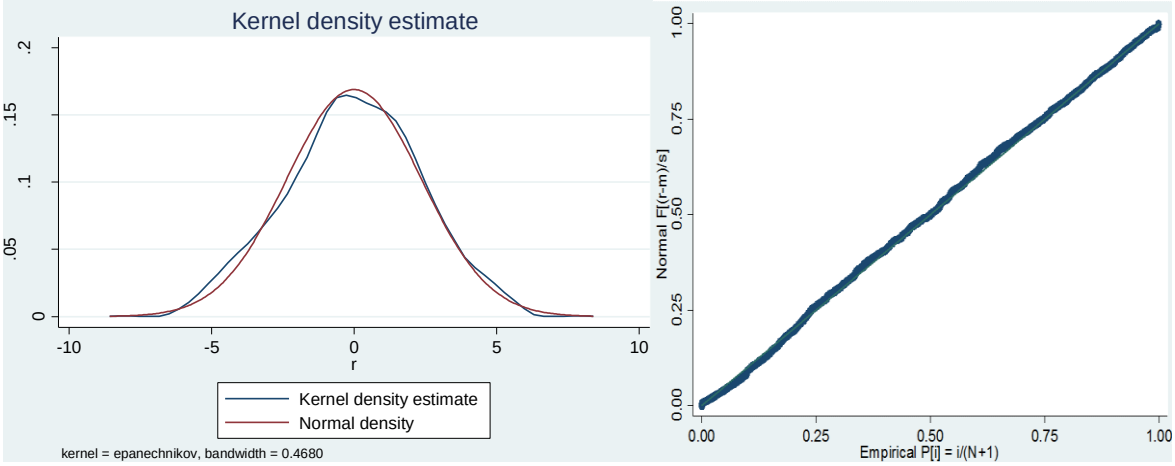
Source: Researcher estimation

An unequal variance may rise from the correlation of error with country pair observations. This problem can be corrected by using clustering by country pair through taking a variable which is unique to each country pair and identical for both directions of trade. The best option is a cluster (distance) (Shepherd 2013a). The robust approach has employed by influential researchers that estimate gravity equations while studying the relevance of logistics for international trade competitiveness, such as (Hausman, Lee, and Subramanian 2005, Hoekman and Nicita 2011, Portugal-Perez and Wilson 2009). Thus, robust and cluster (distance) option has employed in this research model.

6.3.4 Normality Test

The other assumption of linear regression is a normal distribution of residual with zero mean and constant variance. Figure 7 shows results obtained from Probability – Probability plot and Kernel density estimation with normal density for equation 1. Kernel distribution of the data shows that, this model data is normal with minor deviation. Probability – Probability plot shows that, observed residual values lies on the diagonal lines. Normality test results for all remaining equations has carried and the results has presented in appendix 3. All the study gravity models fulfil normality assumption. Thus, the plots confirmed that the dataset is normally distributed.

Figure 7: Normality test



6.4 Trade Logistics Performance of Africa

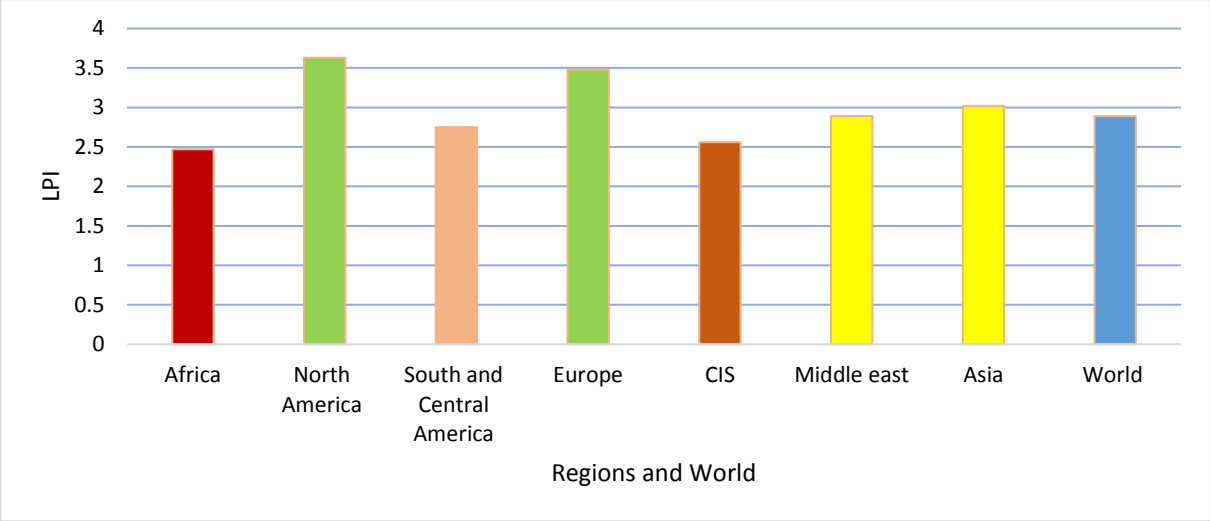
6.4.1 Introduction

One of the main aim of this research is to explore trade logistics performance of Africa in terms of the World Bank Logistics Performance Index and cost to export/import a TEU. Specific issues addressed in this section include: logistics performance of Africa under each LPI components, cost to export/import a standard container and comparison between Africa trade logistics performance with other regions of the world. Comparative analysis of Africa and other regions of the world have conducted based on World Trade Statistics classification of the world countries (Appendix 4). To come up with the intended goals, data has summarized by mean and graphs has used for data presentation. The result, analysis, and interpretation have presented in the following subsections.

6.4.2 Comparative Position of Africa in Trade Logistics Performance

Majority of Africa economies has continued as least competitive in global competitiveness. Africa competitiveness as a region is behind other regions including Southeast Asia and Latin America and the Caribbean (World Economic Forum 2013). While comparing Africa's trade logistics performance with other regions, Africa has the lowest overall logistics performance from all other comparable regions (Figure 8). Overall Africa countries LPI is less than the world countries average overall LPI. The top performer regions are North America and Europe consecutively.

Figure 8: World Regions Overall LPI



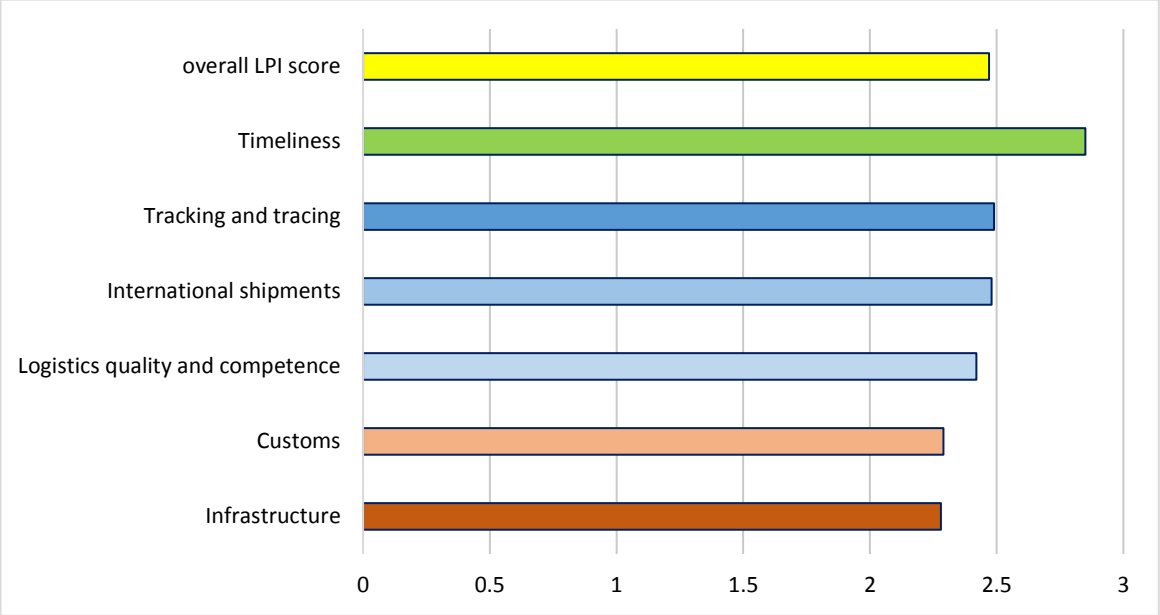
Source: Figure Constructed with data from World Bank, 2014 LPI

6.4.3 Logistics Performance Index of Africa

Based on the World Bank's Logistics Performance Index (LPI), Africa as a region has scored bad. The overall trade logistics performance of Africa is low. With regards to each country performance, South Africa has good overall logistics performance (3.43, maximum score). Conversely, Somalia (1.77, Minimum score) and DRC (1.88) have very low overall logistics performance. All the rest African countries have low overall logistics performance, that is at least 2 but less than 3. Even though the region has scored less than 2.5 in five out of six LPI components, there is a wider gap in performance among different components. Figure 9 presents Africa trade logistics performance under each LPI dimensions ordered with their scores. The lowest performance has observed in terms of quality of trade and transport related infrastructures (railways, roads, ports, warehouse, intermodal facilities, ICT) and customs and border management. The region has also low performance in terms of competence and quality of logistics service, ease of arranging competitively priced international shipments, and ability to track and trace consignments. On the other hand, the region has relatively improved trade logistics performance in terms of on-time delivery of shipments. Based on these facts, African countries shall improve their trade logistics performance in all LPI dimensions. Priority shall be given to promote investment in trade and transport related infrastructures and improving customs clearance and border management.

There are different factors which have contributed to low logistics performance of Africa. In terms trade and transport related infrastructures, though North Africa economies have better infrastructure availability, overall Africa has characterized by slow infrastructure development experience far from other regions. Supply of adequate amount and quality transport and communication infrastructures are insufficient. This has become one of the major impediment for developing trade and improving the competitive position of Africa (World Economic Forum 2013).

Figure 9: Logistics Performance Index of Africa



Source: Figure Constructed with data from World Bank, 2014 LPI

In many parts of Africa, the road quality is below the international standards, i.e., 29.7% of road networks are paved. Many African highways have unjustifiable blocks along transit corridors which result to more delays (Kingombe 2014). To overcome these problems, it is essential for African countries to develop adequate and efficient infrastructures to enhance African economies productivity in global trade (World Economic Forum 2013). Hard infrastructures involving ports, airports, roads and rail links are focal points for trade facilitation. However, soft infrastructures such as transport regulations, customs, and border procedures can also play more than a secondary role (Shepherd 2013b). Hence, improvement in trade and transport related infrastructures will have a double effect, it will improve other trade logistics areas and increase overall logistics performance.

Many African countries are behind international standards with regards to timeliness and efficiency of the overall customs clearance process. The main reasons are, burdened

bureaucratic procedures, inefficient communication between agencies, corruption at the border, lack of transparency of border administration (World Economic Forum 2013), excessive physical inspection and longer time required to get customs declaration. Also, most Africa regional treaties and customs unions lack sound implementation mechanisms and poor cooperation among countries (McLinden et al. 2011). Complex border procedures and bureaucratic bottlenecks reduce county's abilities to reach the global market. In some Africa economies, revenue losses from inefficient border procedures have estimated to exceed 5 percent of their GDP (World Bank and International Finance Corporation 2013).

Countries with low logistics performance can cut their red tape, non-transparent rules, and physical inspection through implementing comprehensive border management reform consisting of all relevant sectors and agencies (Arvis et al. 2012). Border management reform has led to initiatives such as *Single window system* so that traders can submit all required export, import, and transit information at one time through computerized system; *Coordinated border management* which include, co-located facilities, close interagency cooperation, information sharing and delegation of administrative authority; *One-stop border post* where neighboring countries coordinate export, import and transit processes, so that traders makes a single stop to exit one country and to enter another (McLinden et al. 2011).

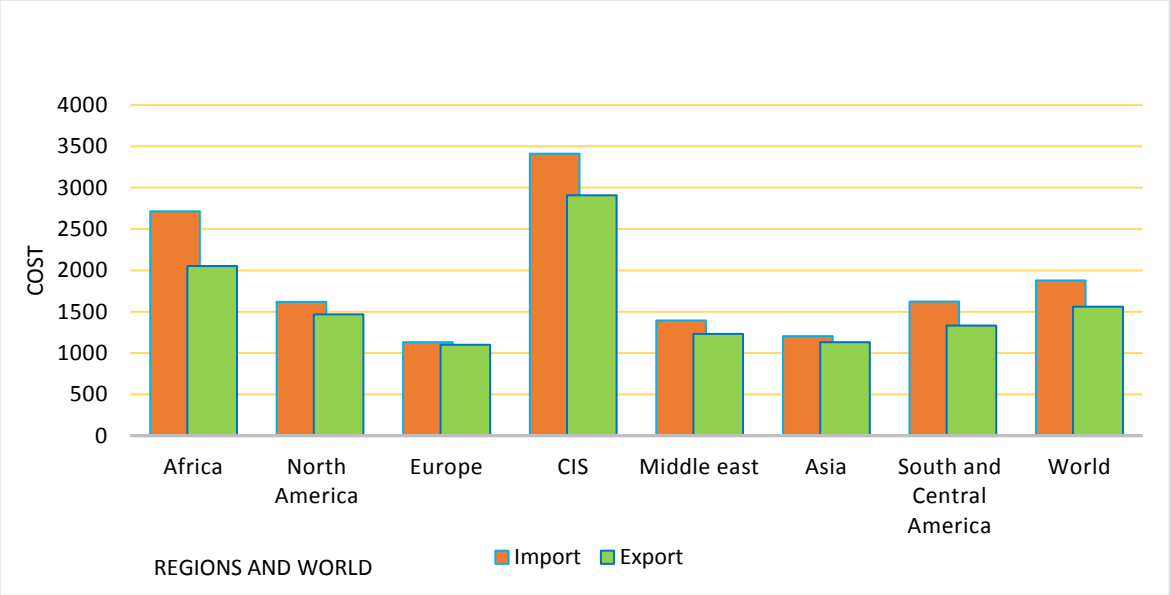
6.4.4 Comparative Position of Africa in Trade Logistics Cost

Comparing African trade logistics costs with other comparable regions is one means to checks the region's competitive position with regards to trade costs. Figure 10 shows the world regions average cost to export/import a TEU. African cost to export/import is the second largest next to Commonwealth of Independent States (CIS). Europe has the lowest cost to export/import a TEU. Relative to Europe, African trade logistics cost per TEU is 140% higher for import and 84% higher for export. Thus, based on these facts, Africa is one of the world regions with the highest trade logistics cost.

Different factors have contributed to high trade logistics cost of Africa. The variable transportation cost is excessively high in Africa as a result of high fuel cost and lubricants, aged trucks, poor road condition, opportunity cost for delays at border (Teravaninthorn and Raballand 2009). Transaction lot size is also one of the determinants of unit transportation cost. Natural resources in row form account two third of African export (ECA 2015) with an undiversified composition which includes fuel and mining products (63%), agriculture

products (11%) and manufacturing (21%) in 2014. Africa export share in the global market is very low with only 3% of world merchandise in 2014 (WTO 2015). Based on these facts we can understand that the share of containerized export cargoes is very low in Africa. African small-scale farmers and small/medium enterprises supply a small amount of goods. As a result, shippers use small vehicles and experience prolonged delays for cargo consolidation to meet full containers loads. Due to these facts, high trade logistics cost of Africa is partly due to poor scale economies in transportation (Kunaka 2011).

Figure 10: Cost to Import/Export a TEU by the World Regions



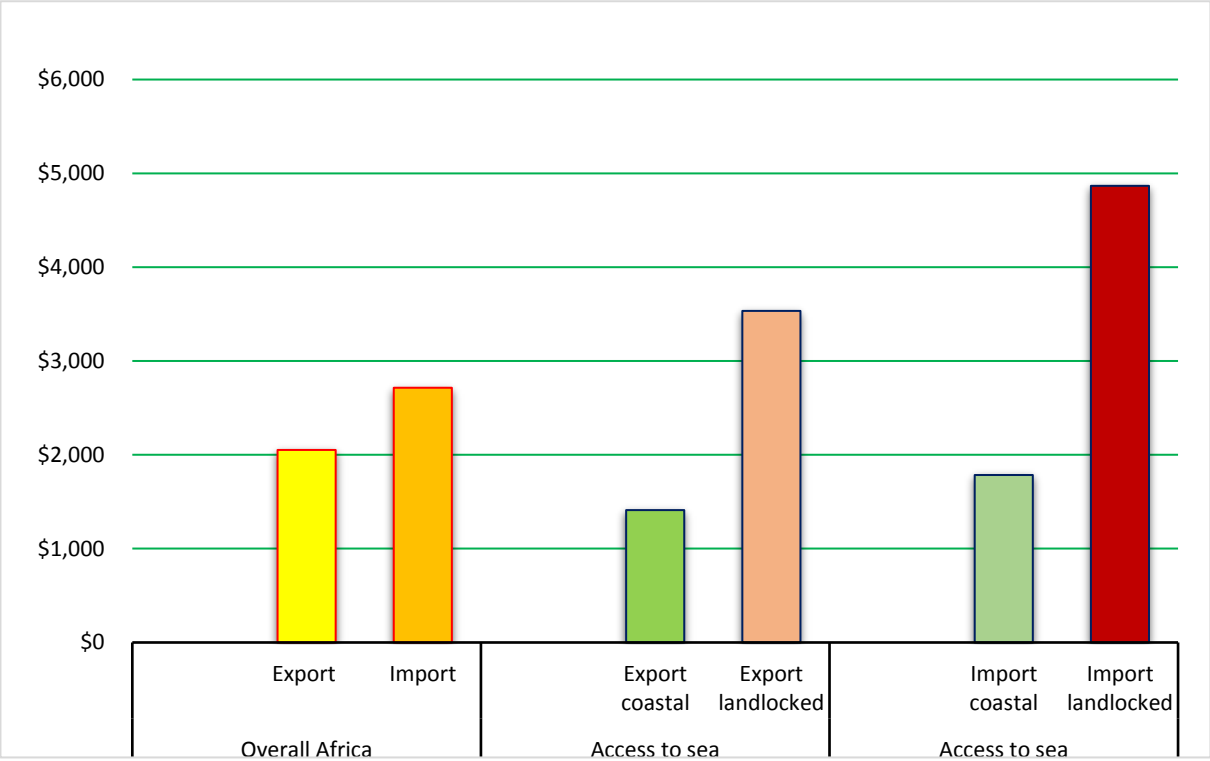
Source: Figure Constructed with data from World Bank, Cost to Import/Export a TEU

6.4.5 African Cost to export/import per TEU

Transportation cost in Africa is higher than most parts of the world. The cost is higher for landlocked countries which are incurring on average 14 % of their export cargoes value. The cost is even higher for some countries. For instance, Malawi (56%), Chad (52%) and Rwanda (48%) of their export value is transportation cost (Kingombe 2014). Figure 11 shows the cost to export/import standardized cargoes for overall Africa, landlocked and coastal Africa countries in 2014. On average, each African country incurs a cost of $2 715 to import standardized cargoes with a TEU. This cost is incurred to move a TEU from arrival port to hinterland destination. The cost includes terminal handling charges, administrative fees for customs clearance and technical control, documentation, customs broker fees and inland transport. The average export cost per TEU is $2 052 to move cargoes from inland most populous cities to loading sea ports. The data show that cost to import is higher than the cost to export a TEU.

A wide difference has observed across African countries on the cost to export/import between landlocked and coastal countries. Landlocked countries incur $3 534 to export and $4 867 to import a TEU. Based on the data presented in figure 11, landlocked African countries pay 150% higher for export and 170% higher for import, than coastal African countries. Thus, Africa landlocked countries incur a significant high trade logistics cost. Some of the reasons arising trade logistics cost of landlocked countries are: long-distance transportation to get access to the sea through transit neighbors, delays in ports, warehousing, loss on exchange rate fluctuation when costs are paid in convertible currencies (Uprety 2006), complex interactions among multiple policy and physical features with their transit neighbors (Christ and Ferrantino 2011).

Figure 11: Africa Countries Cost to export/import a TEU



Source: Figure Constructed with data from World Bank, Cost to Import/Export a TEU

6.5 Hypothesis Test: Trade Logistics and Export

6.5.1 Introduction

The second aim of this study is to explore the association between national trade logistics performance and export, taking African countries as an exporter. Identifying the strategic role that national trade logistics performance will play on bilateral trade flows requires, studying the effect that national trade logistics performance will have on the region's

countries bilateral trade flows with their trading partners in other regions. Regression estimation results and interpretation of the research gravity equations have presented in the following sections.

6.5.2 Effect of overall LPI on Export

The regression estimation has carried based on the research equations. This research first gravity equation (equation 1) estimation has presented in table 4. The result shows how the study explanatory variables affect export value in bilateral trade flows. The independent variables include are bilateral distance, GDP, LPI, official language, colonial relationship and landlocked.

Table 4: Effect of LPI on Export (Hypothesis 1)

Linear regression

Num. of obs.	1791
F (8, 1660)	397.14
Prob. > F	0.000
R-squared	0.5705

(Std. Err. Adjusted for clusters in distance)

Trade	Coef.	Robust Std. Err.	t	P>t	[95% Conf. Interval]	
Distance	-1.098	0.104	-10.54	0.000	-1.303	-0.894
GDP Exporter	0.727	0.058	12.55	0.000	0.614	0.841
GDP Importer	0.848	0.041	20.57	0.000	0.767	0.928
LPI Exporter	6.255	0.640	9.78	0.000	5.001	7.510
LPI Importer	4.593	0.471	9.76	0.000	3.669	5.516
Official language	0.716	0.150	4.78	0.000	0.422	1.010
Colony	1.149	0.258	4.45	0.000	0.642	1.656
Landlocked	-1.592	0.126	-12.59	0.000	-1.84	-1.344
Constant	-26.482	1.709	-15.49	0.000	-29.835	-23.129

Source: Researcher estimation

$$Export\ value = -26.482 - 1.098\log(D_{ij}) + 0.727\log(GDP_i) + 0.848\log(GDP_j) + 6.255\log(LPI_i) + 4.593\log(LPI_j) + 0.716(language) + 1.149(Colony) - 1.592(landlocked) + e$$

The above regression model summarizes table 4 estimation results. The model shows estimates for the study variables: dependent variable which is export value (Trade); gravity model variables that include bilateral distance, exporter GDP, importer GDP, common official language, colonial relationship; estimates for the study key variables i.e., LPI and the last variable measures the effect of lack of direct access to the sea on export.

Gravity model estimation results from table 4 shows, model summary statistics R-square, 0.57. This means this model explanatory variables explains 57 percent of the observed

variations in bilateral export value from African countries to the rest of the world. It is a good model to explain trade flows of African countries to global market. The model produces standard errors that are robust to arbitrary patterns of heteroskedasticity. The correlation of errors that may exist between country pair observations has controlled by clustering country pair with bilateral distance. The F test is highly statistically significant, which means the regression model is fitted to the data. Thus, the study explanatory variables statistically significantly predict the flow of trade from country i to j. All explanatory variables in this model: bilateral distance, GDP, LPI, common language, colony and landlocked have signs as expected.

The negative impact of distance on bilateral trade flows began to rise in 1950 and has remained persistent. In examining 1467 distance effects estimated in 103 papers, a mean elasticity of 0.9 has found. This shows on average bilateral trade is inversely proportional to distance (Disdier and Head 2008). This research finding also supports this remark. The coefficient on geographical distance is negative and statistically significant ($b_1 = –1.098$, $p < 0.01$). This means a 1 percent increase in bilateral distance will reduce trade by 1.1 percent. This implies that countries with longer geographical distance will trade less because of higher transportation cost. On the other hand, geographically proximity tend to boost trade between countries. In terms of economic size, both importer and exporter GDP have significant positive effect on bilateral trade flows. A 1 percent increase in exporter GDP will tend to increase export value by 0.7 percent and when importer GDP increase by 1 percent bilateral trade will increase by 0.8 percent and this effect is statistically significant at the 1 percent level. This implies that countries with bigger economic size will trade more.

In addition to distance, common official language and colonial relationship capture trade costs i.e., information search cost. Countries with a common language and colonial ties are more likely to have similar business practices. Firms want partners that are working in countries with a similar business environment (Bacchetta et al. 2012). In line with earlier researchers, this study finds positive coefficients for common official language and colonial relationship. Both variables have high-level statistical significance ($p < 0.01$). With regards to language, country pairs that share common official language have higher trade flows. Trading countries pairs that were once in a colonial relationship has a bilateral trade which will increase by 1.2 percent than those that do not. Hence, countries which share common history i.e., common language and colonial relationship will have higher trade flows. Lack of direct access to the sea or being geographically landlocked have a statistically significant

negative effect on export value. Landlocked countries have trade reduced by 1.6 percent relative to coastal countries.

Both exporters and importer countries logistics performance have statistically significant positive coefficients. Even though both exporters and importers logistics performance experiences different level of contribution for bilateral trade flows, export LPI coefficient ($b_4 = 6.3$, $p < 0.01$) is higher than importer LPI ($b_5 = 4.6$, $p < 0.01$). Thus, improvement in both exporters and importers trade logistics performance will have a significant effect of increasing bilateral trade flows. Even though LPI is relevant for both source and destination countries in bilateral trade flows, LPI is more relevant for export countries. It is essential to analyze the importance of trade logistic performance on bilateral trade flows in terms of each of LPI components.

6.5.3 Effect of LPI Components and Cost on Export (Hypothesis 1 and 2)

Further evidence on the effect of trade logistics performance on African countries export has secured, under each LPI dimensions. Having this, estimation has made for each of LPI components and trade logistics cost based on the research equations. Each gravity equations (equation 2 – equation 8) estimates have presented in Appendix 5. The study explanatory variables coefficients with their significance level have summarized in table 5. The variables include bilateral distance, exporter GDP, importer GDP, LPI components, a cost to export and import, common official language, colonial relationship and landlocked. The R-square and F-test for all equations show that the regression models are a good fit of the dataset.

In all LPI components regression estimates (Table 5), the coefficient on distance is negative with very high level of statistical significance. One percent increase in distance tends to reduce trade by about 1 percent. It is common to find distance variable coefficient within the range of 0.7 – 1.2 in various gravity applications (Athukorala 2012). Thus, countries with geographical proximity will tend to trade more. GDP of both exporter and importer countries have statistically significant positive effects on bilateral trade flows as expected, with coefficients that range from 0.8 – 1.1. With regards to other variables used as a proxy for trade cost i.e., common official language and colonial relationships have significantly positive effects on bilateral trade flows. On the other hand, lack of direct access to the sea has a negative effect on trade flows. Interpretation of these variables is similar to the above model (equation 1).

The results of regression estimate under each of LPI components proves, the relevance of all logistics performance index dimensions on bilateral trade flows. All LPI components have positive effects on bilateral trade flows with high-level of significance ($p < 0.01$). These components are: efficiency of customs clearance and border management (customs), quality of trade and transport related infrastructures (infrastructure), arranging competitively priced international shipments (shipments), competence and quality of logistics service (quality), ability of tracking and tracing shipments (tracking) and frequencies with which shipments arrives on time (timeliness). Exporter and importers countries trade logistics performance under each LPI components confirmed that enhancement on trade logistics performance is relevant to increase bilateral trade flows. Among export LPI components: on-time delivery of consignments, trade and transport related infrastructures and competence and quality of logistics service have the strongest effect on African countries export.

With respect to this research main hypothesis, the effect of trade logistics performance (LPI) on bilateral export value, exporters overall LPI has significant positive coefficient ($b_4 = 6.3$, $p < 0.01$) (Table 4). This means LPI has statistically significant positive effect on export. In terms of LPI components, all export LPI components have a positive effect with $p < 0.01$, (Table 5). Thus, this research hypothesis 1 has supported with convincing evidence. This finding implies that an improvement on trade logistics performance such as on-time delivery, trade logistics infrastructures developments, and logistics service quality will have a statistically significant effect of increasing African countries export.

In the above gravity model: distance, common official language, and a colonial relationship have used as a proxy for trade cost. In addition to these costs, a specific part of trade logistics cost incurred by each country to export/import a TEU has included in this study. This cost includes administrative fees, customs broker fee, inland transport and terminal handling charges. Based on equation 8 results in table 5, a cost to export a TEU by exporter countries has a statistically significant negative effect on bilateral trade flows. The cost to import a TEU (importer countries) has also a significant negative effect on bilateral trade flows. This implies that increase in trade logistics cost will reduce bilateral trade flows. The research hypothesis 2 states, a negative effect of trade logistics cost on export. Both export and import logistics cost have a negative effect on countries bilateral trade flows. Thus, hypothesis 2 has supported with strong evidence ($p < 0.01$). This finding implies that reduction in trade logistics cost will have statistically significant effect on improving African countries export.

Table 5: Effect of LPI Components on Bilateral Trade Flows

Trade	Equ(2)	Equ(3)	Equ(4)	Equ(5)	Equ(6)	Equ(7)	Equ(8)
Distance	-1.137***	-1.091***	-1.077***	-1.109***	-1.015***	-1.104***	-1.060***
GDP Exporter	0.867***	0.832***	0.891***	0.787***	0.812***	0.807***	1.045***
GDP Importer	0.924***	0.836***	0.903***	0.851***	0.857***	0.893***	1.071***
Customs exporter	3.318***						
Customs importer	3.124***						
Infrastructure exporter		4.424***					
Infrastructure importer		3.651***					
Shipments exporter			3.627***				
Shipments importer			5.054***				
Quality exporter				4.387***			
Quality importer				4.106***			
Tracking exporter					3.620***		
Tracking importer					3.872***		
Timeliness exporter						5.113***	
Timeliness importer						3.852***	
Cost to export							-0.537***
Cost to import							-1.131***
Official language	0.759***	0.709***	0.791***	0.707***	0.714***	0.825***	0.881***
Colony	1.197***	1.174***	1.169***	1.242***	1.243***	1.301***	1.636***
Landlocked	-1.654***	-1.513***	-1.325***	-1.616***	-1.465***	-1.527***	-0.756***
Constant	-26.509***	-25.485***	-30.095***	-25.461***	-26.206***	-28.852***	-17.405***
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R-squared	0.56	0.57	0.56	0.56	0.55	0.55	0.55

Note: * denote test statistical significance 1% level

6.5.4 Regression with Interaction Effect (Hypothesis 3)

In studying the effect of trade logistics on countries export, a moderator variable which affects the strength of the relationship has added. This moderator variable is a lack of direct access to the sea or landlocked. In this section, interaction effect of LPI and being geographically landlocked has analyzed. The estimation result of this study gravity model with interaction effect has presented in Table 6. This study gravity model variables i.e., distance, GDP, common official language, and colonial history have signs as expected with high level of statistical significance. The model R-square (0.57) and F test shows that the model is fitted with the data.

The research hypothesis 3 describes, the difference on the effect of logistics performance on export depending on whether the country is coastal or landlocked. To explore the effect of LPI with/with-out direct access to the sea first, an interaction term (Landlocked **x** LPI export) has created by multiplying the two variables, LPI export with landlocked. Landlocked is dichotomous variable with two values, 1 for landlocked and 0 for coastal. Then regression

estimates have obtained by including the direct effect of X variables and interaction term as predictor variables. In terms of model, the interaction term has added in this research gravity model 1. Having estimates presented in table 6, the following regression model has formulated:

$$Export\ value = -26.365 - 1.09\log(D_{ij}) + 0.75\log(GDP_i) + 0.85\log(GDP_j) + 5.29\log(LPI_i) + 4.68\log(LPI_j) - 1.64(landlocked) - 3.67(LPI * Landlocked) + 0.74(Language) + 1.1(Colony) + e$$

Table 6: Interaction Effect of LPI and Landlocked on Export

Linear regression

Num. of obs.	1791
F (9, 1660)	351.57
Prob. > F	0.000
R-squared	0.5726

(Std. Err. Adjusted for clusters in distance)

Trade	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
Distance	-1.085	0.104	-10.4	0.000	-1.29	-0.881
GDP Exporter	0.748	0.058	12.98	0.000	0.635	0.861
GDP Importer	0.851	0.041	20.67	0.000	0.770	0.931
LPI Exporter	5.290	0.668	7.92	0.000	3.980	6.599
LPI Importer	4.675	0.469	9.97	0.000	3.755	5.595
Landlocked	-1.637	0.130	-12.63	0.000	-1.891	-1.383
LPI x Landlocked	-3.673	1.111	-3.3	0.001	-5.853	-1.493
Official language	0.742	0.151	4.92	0.000	0.446	1.038
Colony	1.135	0.258	4.4	0.000	0.630	1.641
Constant	-26.36497	1.707	-15.44	0.000	-29.71383	-23.01612

Source: Researcher estimation

The above regression model shows the effect of the study explanatory variables on bilateral trade flows. This study gravity model variables affects bilateral trade as expected. The distance between trading countries has significant negative effect on bilateral trade or export value. On the other hand, exporter countries economic size (GDP export), GDP import, common official language and colonial relationship have significant positive effect on export. With regards to lack of direct access to the sea direct effect, landlocked countries export value reduces by 1.6 percent relative to their coastal neighbors. This means, being geographically landlocked will reduce trade gains. This research key variable, both exporter LPI and importer LPI have significant positive effect on export. However, earlier analysis

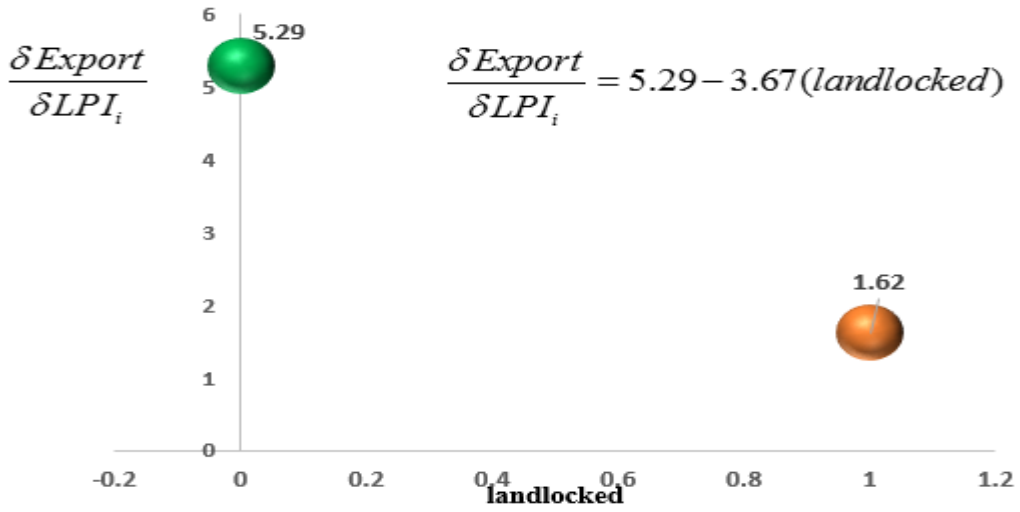
conducted based on LPI shows that coastal countries have higher trade logistics performance than their landlocked corresponding countries (World Bank Group 2014).

Exporter countries LPI have significant positive effect on export ($b_4 = 5.29$, $p < 0.01$). On the other hand, the interaction between being geographically landlocked and LPI have negative coefficient with high-level of statistical significance ($b_7 = -3.67$, $p < 0.01$). The presence of such statistically significant moderation effect evidence the variations of LPI effect on countries export depending on whether the country has direct access to the sea or landlocked. To show the level of the difference, partial derivative of LPI on export in the presence of interaction with landlocked has developed. The derivative with the result has presented as follows:

$$\frac{\delta Export}{\delta LPI_i} = b_4 + b_7(landlocked)$$
$$= 5.29 - 3.67(landlocked)$$

Based on the above derivative result, 1% increase in LPI will increase coastal countries export by 5.29%, however, 1% increase in LPI will increase export by 1.62% for landlocked countries. This implies the effect of LPI on countries export is weaker for landlocked countries than coastal countries. Specifically, LPI of landlocked countries increase export but at a level of 3.67% lower relative to LPI impact for coastal countries. This shows that the positive effect of LPI on export is lower for landlocked countries than it does for their coastal neighbors. Thus, the research found strong evidence that supports hypothesis 3. To substantiate this finding, change of export with respect to the change in LPI with the presence of moderation effect has visualized in figure 12.

Figure 12: Interaction Effect between LPI and Landlocked on Export



The above graph demonstrates an increase in export because of higher logistics performance for both landlocked and coastal countries. However, the effect of logistics performance on export is higher for coastal countries than landlocked countries. This result assures the fact that, the positive effect of LPI on countries export significantly differ depending on countries abilities for direct access to the sea. Dummy variable landlocked has two values, 1 for landlocked and 0 for coastal. Specifically, a one percent increase in LPI will increase export by 5.29 percent for countries with direct access to the sea or coastal countries and a one percent increase in LPI will increase export by 1.62 percent for countries without direct access to sea or landlocked countries.

This study has employed regression analysis which comprises main effects and interaction effect. The overall assessment of goodness of fit for the regression model 1 (Table 4) has found to be significant with R-square = 0.571 and F (8, 1660). The regression with main effect and one more interaction term has analyzed in this section. The interaction is a result of multiplication between two variables which are already included in model 1. The regression with an interaction term (Table 6) has confirmed that this model provides an adequate description of the dataset with R square 0.573 and F (9, 1660). While comparing the two model summaries, the presence of interaction has resulted in a minor change on the variation with R square change of 0.002 and F-value change of 8.7, F (1, 1660).

6.6 Linkage between LPI and Cost to Export

Trade cost drives from several sources. But it is not limited to bilateral factors such as distance, common language, common history and border sharing. Specific factors related to products country of origin or destination are also main sources. Among these, logistics performance inefficiencies i.e., delay, reliability, border control and transit system increase trading cost (Arvis, Ben, et al. 2013). In accordance with the World Bank 2014 LPI survey data, regions with highest trading cost also experience lower average score on Logistics Performance Index (Jouanjean, Gachassin, and te Velde 2016). Trade logistics measured by cost to export a TEU is part of trading cost in trade between countries.

Table 7 presents estimation result for the association among few of this research independent variables. As it has elaborated well in the earlier sections, the cost to export consist of costs incurred to deliver a TEU from each country business center to the sea port of loading has a negative effect on bilateral export. In this section, the association between cost and LPI has examined. In regression analysis presented in table 7, cost to export a TEU has considered

as a dependent variable. The predictor variables are LPI and landlocked. The R – square and F test statistics confirmed that the model is fitted. The result reveals that LPI has a negative effect on cost to export a TEU. Specifically, one percent increase in LPI will in turn reduce the cost to export a TEU by 1.1 percent ($b_1 = –1.1$, $P < 0.01$).

Table 7: Linkage between LPI and Cost to Export

					Number of obs =	3078
					F(2, 3075)	918.84
					Prob > F	0.000
					R-squared	0.3741
Cost to export	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
LPI Exporter	-1.067	0.087	-12.2	0.000	-1.239	-0.896
Landlocked	0.709	0.017	41.2	0.000	0.676	0.743
Constant	8.130	0.082	99.02	0.000	7.969	8.291

Source; Researcher estimation

In addition to the relationship between LPI and cost to export, the association between being geographically landlocked and cost to export a TEU has explored as well. The result shows that, a cost to export a TEU and landlocked have a statistically significant positive association. This implies that being geographically landlocked will increase cost to export a TEU relative to coastal countries.

CHAPTHER 7

DISCUSSION OF FINDINGS, IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

7.1 Summary and Discussion of Findings

African share of the world trade is very low. The region share in the global total export has declined over time, from 7.3% (1948) to 4.3% (1973) to 2.4% (2003). Even though the region merchandise export has shown some improvements in past years however, it remains low i.e., 3% in 2014 (WTO 2015). Various reasons have identified for low trade performance of Africa, that include specialization in primary products and low intra-regional trade (Siddiqi 2008, World Economic Forum 2013). In 2014 out of total Africa's export, 72% is constituted by primary products i.e., fuel and mining products, and agricultural products. Relative to other regions, trade between African countries is also at low-level, which accounts 18% of the region's total merchandise export in 2014 (WTO 2015). The other hindrance for Africa's trade is related to international logistics such as poor trade and transport related infrastructures developments (Siddiqi 2008), high trading cost that includes border-related costs, high transportation cost and behind border cost (Portugal-Perez and Wilson 2008). Thus, trade logistics is one of the major impediment of Africa export.

Generally, this research aims to strengthen the strategic role of trade logistics in reviving Africa's export to global market. The study achieves to main aims. The first aim analyzes trade logistics performance of Africa and comparative position of Africa in trade logistics relative to its trading partner regions. This analysis has conducted based on Africa and other regions LPI and costs to export/import containerized cargoes in 2014. In the second phase, the association between trade logistics performance and export value has explored. Further analysis has carried under the interaction effect of being geographically landlocked on the strength of the association between trade logistics performance and export.

While comparing world regions average score of overall LPI, Africa experiences the lowest score, 2.47. In terms of LPI six dimensions, the region scores lowest performance on quality of trade and transport related infrastructures and customs clearance. Specifically, African countries trade logistics performance has summarized with the region's average scores on LPI components: infrastructure (2.28), customs (2.29), logistics quality and competence (2.42), international shipments (2.48), tracking and tracing (2.49) and timeliness (2.85). The

region main challenge in trade logistics remains quality infrastructure service and customs clearance and border management.

There are several factors behind low performance of Africa with regards to logistics infrastructures quality. This would include inadequate amount and low-quality supply of transport and related infrastructures (World Economic Forum 2013) and unjustifiable blocks along transit corridors which bring extended delays (Kingombe 2014). In Sub-Sharan Africa, accumulation of infrastructure assets and quality of service delivery are weak relative to these countries spending. This is true, because of problems in project selection, inefficient procurement practices, and corruption. Such malpractices will rise the capital cost of projects and reduces infrastructure service quality (Ajakaiye and Ncube 2010). This implies that African countries shall invest more resources to improve the region trade logistics performance to enhance African economies in global trade. Priority shall be given for infrastructure developments such as railways, ports, warehouses, ICT and intermodal facilities.

African low performance in customs clearance and border management is the result of burdened bureaucratic procedures, inefficient communication between agencies, lack of transparency and corruption at border administrations (World Economic Forum 2013), excessive physical inspection and poor regional cooperation (McLinden et al. 2011) and other factors. Sound implementation of border management reform that encompasses all relevant stakeholders will cut the red tape and unnecessary physical inspections (Arvis et al. 2012). It is also important for African countries to start single window system, where customers give all the required information at one time.

Trade logistics cost of Africa has measured by cost to export and import normal cargoes in a TEU. Average cost to export a TEU from each African country most populous city to port of loading is 2 052 USD and 2 715 USD for import. Relative to Europe, Africa cost per TEU is 84% higher for export and 140% higher for imports. High trade logistics cost of Africa is partly due to excessively high variable transportation cost which drives from, aged trucks, poor road condition, large amount of fuel consumption, delays (Teravaninthorn and Raballand 2009) and poor scale economies in transportation because of small lot sizes (Kunaka 2011).

In addition, a wide gap has observed among African countries based on their abilities of direct access to the sea. Relative to their corresponding coastal neighbors, landlocked African countries incurs 150% higher for export and 170% higher for imports for a containerized cargo. Some of the reasons that drive high logistics cost in landlocked African countries are; high transportation due to long distance in crossing their land and their transit neighbors to access sea, delays at ports and warehousing (Uprety 2006).

The second aim of this study emphasized on the role of trade logistics to improve Africa's export. This aim has attained by exploring, the association between trade logistics performance and bilateral export. The direct effect and interaction effect of trade logistics performance i.e., LPI and cost to export a TEU on African export have tested through three hypotheses. Several estimations have carried out depending on the research equations. The overall goodness fit for all models is good with R square that ranges 0.55 – 0.57. P-value associated with F-statistics is very small (0.000) for all estimates. Thus, the research independent variables reliably predict the flow of trade from country i to country j. Gravity model variables i.e., bilateral distance, GDP, common official language, and colonial relationship affect export as expected. This finding agrees with gravity model theoretical frameworks and other earlier studies. Table 8 portrays the summary of the study hypotheses and test results. The study findings support all hypotheses (H_1, H_2, H_3) with convincing evidences.

Table 8: Summary of Hypothesis Testing Results

Hypotheses	Coefficient	t-value	Findings
H_1: Trade logistics performance has a positive effect on export.	6.255***	9.78	Supported
H_2: Trade logistics cost has a negative effect on export	-0.537***	-4.33	Supported
H_3: The positive effect of LPI on export is significantly stronger for coastal countries than it does for landlocked countries.	-3.673***	-3.3	Supported

Note: * denote test statistical significance at 1% level

The first hypothesis of the study describes the positive effect of trade logistics performance on African countries export earnings. The specific measures used to test this hypothesis are overall LPI and bilateral export value for aggregated products. The results of model

estimation lead to the conclusion that LPI is important in bilateral trade flows. The regression coefficient of overall LPI is significant and positive, this means LPI have a positive effect on African countries bilateral export flows ($b_4 = 6.255$, $p < 0.01$). Hence, this hypothesis has supported with strong evidence.

In a related study carried at the global level, a similar result has obtained. The study shows a 1 percent increase in LPI of a typical lower middle-income exporter country, will boost bilateral export by 6.9 percent (Korinek and Sourdin 2011). Agreement with this finding, in developing Asian economies the share of intra-regional trade for non-oil products will increase from 53 percent (2010) to 58 percent in 2030. In this research estimates, LPI has significant positive coefficients for both exports and imports. Thus, quality of trade logistics has a remarkable contribution in developing intra-regional trade (Athukorala 2012).

Based on this research model 1 results (Table 4), exporters and importers logistics performance have a positive and significant effect on bilateral trade flows, however, coefficient estimate for exporter LPI ($b_4 = 6.255$) is higher than importer LPI ($b_5 = 4.593$). This implies that logistics performance is more important for exporter countries than importers in bilateral trade flows. This finding is in line with other findings of similar studies. In analyzing the impact of LPI to emerging economies trade competitiveness (Marti, Puertas, and García 2012), find out LPI of both exporter and importer countries having statistically significant positive effects on bilateral trade flows. Furthermore, logistics has higher relevance for exporter countries than importers.

Further evidence on the effect of trade logistics performance on export has secured under each LPI dimensions, in keeping the aim of this research. A separated gravity equation has estimated for each LPI components and cost to export. Analysis of the findings of all equations variables: gravity variables, exporters LPI, importer LPI, and costs has carried in chapter six. Further discussion has made here in terms of exporters performance on each of LPI variables. The summary of export LPI has presented in table 9. All LPI dimensions have a positive effect on export with high-level of statistical significance ($p < 0.01$).

While comparing the effect of export LPI dimensions, timeliness has the largest effect on bilateral export flows. This implies that an improvement on on-time delivery of shipments has a greater effect on African countries export. The second strongest effect on Africa trade flows concerning trade logistics rises from the quality of trade and transport related

infrastructures developments. Competence and quality of logistics service have the third strongest effect on export flows. Thus, out of six LPI components: on-time delivery of shipments, trade logistics infrastructures developments and logistics service quality were most important components for African export in bilateral trade flows.

Ease of arranging competitively priced shipments is one of an important dimension of trade logistics performance. This research has also confirmed a significant positive effect of ease of arranging competitively priced international shipments ($b_4 = 3.627$, $p < 0.01$). Efficacy of tracking and tracing international shipments has also an important contribution for African export flows ($b_4 = 3.62$, $p < 0.01$). Effective tracking and tracing services will have a significant role in sustaining supply chain reliability. Normally, all trading companies engaged in import/export needs continuous monitoring and updated information about their cargoes. Firms which are operating in countries which lack proper tracking and tracing services will face challenges on their stock policies. (Burmaoglu and Sesen 2011). Thus, African countries shall improve their performance on tracking and tracing services to assure reliable supply chains that will reduce uncertainties such as delay.

Efficiency of customs clearance and border management measure procedures and practices in terms of speed, simplicity, and predictability when dealing with customs and other border management agencies. Efficient customs have also significant positive effect on African countries export ($b_4 = 3.32$, $p < 0.01$). Generally, this research finding proves relevance of all LPI components to African countries export.

Table 9: The Effect of LPI Components on Export

Customs export	3.318***
Infrastructure export	4.424***
International shipments export	3.627***
Service quality export	4.387***
Tracking and tracing export	3.620***
Timeliness export	5.113***

Note: *, denote test statistical significance at 1% level

In line with this finding, based on 2010 LPI, (Martí, Puertas, and García 2014) reveals the importance of LPI components for all regions, particularly for Africa. All LPI components have significant positive coefficients on African countries export flows. Thus, LPI components have higher relevance for African countries exports. In addition, 2010 LPI also

shows that; international shipments, timeliness, and competence and quality of logistics service have greatest impacts on African exports. In analyzing the role of LPI in EU countries exports over the period of 2005 – 2010, logistics was more important for exporting countries than importing. The improvements in countries logistics performance result in significant increases in their volume of exports (Puertas, Martí, and García 2013).

The direct effect of being geographically landlocked has measured by including dummy variable. Being geographically landlocked have a negative effect on bilateral trade with very high level of significance ($b_8 = -1.6$, $p < 0.01$) (Table 4). Specifically, African landlocked countries export has reduced by 1.6 % than their corresponding transit coastal countries. This implies that being landlocked will reduce export with a significant amount. Based on trading cost comparison between sample world countries and the World major trading countries from 2000 – 2010, landlocked countries trading cost was over 1.5 times than their corresponding coastal neighbors which are offering transit service (World Bank Group 2014).

The second hypothesis of this research test the effect of trade logistics cost on bilateral trade flows. Here, trade logistics cost has measured by costs incurred to export a TEU from African countries most populous cities to their port of loading. According to the regression estimates presented in table 5, the effect of cost to export a TEU is negative and statistically significant. A 1 percent increase in cost to export a TEU will reduce export by 0.54 percent. Hypothesis 2 which states the negative effect of trade logistics cost on export, has supported with strong evidence. This finding suggests that reducing cost to export will have significant contribution to increase African countries export earnings.

The last hypotheses test the interaction effect of lack of direct access to the sea on the strength of association between the study key variables (LPI) and export value. Hypothesis 3 describes, the effect of LPI on export depending on whether the country is coastal or landlocked. Based on the regression estimates (Table 6), positive effect of LPI on export is lower for landlocked countries than it does for coastal countries. Specifically, one percent increase in LPI will increase coastal countries export by 5.3 percent however, this effect is highly reduced for landlocked countries. A 1 percent increase in LPI will increase export by 1.62 percent for countries without direct access to the sea. Hence, this research hypothesis 3 has supported. This implies that the effect of LPI on countries export earning is weaker for landlocked countries than it does for coastal countries.

Finally, an interesting finding has obtained from the association between the study key independent variables i.e., cost to export and LPI. In this case, the dependent variable is cost to export a TEU and the independent variables is LPI. The regression result in table 7 shows the model is fitted with the data. The result reveals that LPI has a significant and negative effect on cost to export containerized cargoes. A 1 percent increase in LPI will reduce cost by 1.1 percent ($b_1 = -1.1$, $p < 0.01$). This means improvement on countries logistics performance will enable countries to reduce their cost in exporting containerized cargoes. This finding is in line with other scholars' findings. Based on the World Bank 2012 overall LPI score for a sample of countries, LPI and trade costs have a negative association with strong significance. This means countries with better logistics performance will have lower trade cost. Such association is an evidence for developing countries opportunities to reduce their logistics costs. Thus, improving logistics performance on the six dimensions of LPI will have a pivotal role in reducing trade logistics costs (OECD and WTO 2015).

It can be concluded that countries exports are directly conditioned by costs incurred. Trade logistics costs are in turn conditioned by logistics performance (LPI) of a country such as improving logistics infrastructures (Martí and Puertas 2015). Thus, African countries shall continue to improve their trade logistics performance (LPI) in order to reduce trade logistics costs and increase their supply chain reliability. Doing so will in turn boost African countries trade.

7.2 Methodological Contribution

One of the challenges in the study of the relevance of trade logistics in countries international trade performance is the choice of proper measure for national trade logistics performance which is constructed from data that are fully comparable across countries. World Bank, LPI is an essential measure of trade logistics performance. By incorporating trade logistics performance indicators i.e., LPI components into a gravity model, this research has been able to quantify how LPI components are important indicators for African countries export flows. This study provides evidence on the reliability of the World Bank LPI towards measuring the role of trade logistics performance in facilitating countries international trade performance.

The standard gravity model introduced by Tinbergen (1962) has been applied to explain bilateral trade flows between countries as a function of economic size and trade cost. Trade cost has approximated by bilateral distance, and common history i.e., colonial relationship

and common language (Anderson 1979). In addition to core variables such as GDP and distance, (Puertas, Martí, and García 2013) has introduced an augmented gravity model with LPI dimensions in measuring the relevance of trade logistics performance on European countries export competitiveness. This model has applied in this research for African context. This study finding provides support on the robustness of the model in measuring the importance of trade logistics performance on bilateral trade flows.

The World Bank LPI is most widely used measure of trade logistics performance. However, LPI does not cover the whole concept. To detect the possible effect of cost in trade logistics, cost to export and import containerized cargoes has included in this research. Hence, this study main contribution to methods is on trade logistics cost. This research has added new variables that measures trade logistics cost to existing model. Here, trade logistics cost has measured by cost to export a TEU (export countries) and cost to import a TEU (import countries) in bilateral trade.

7.3 Theoretical Contribution

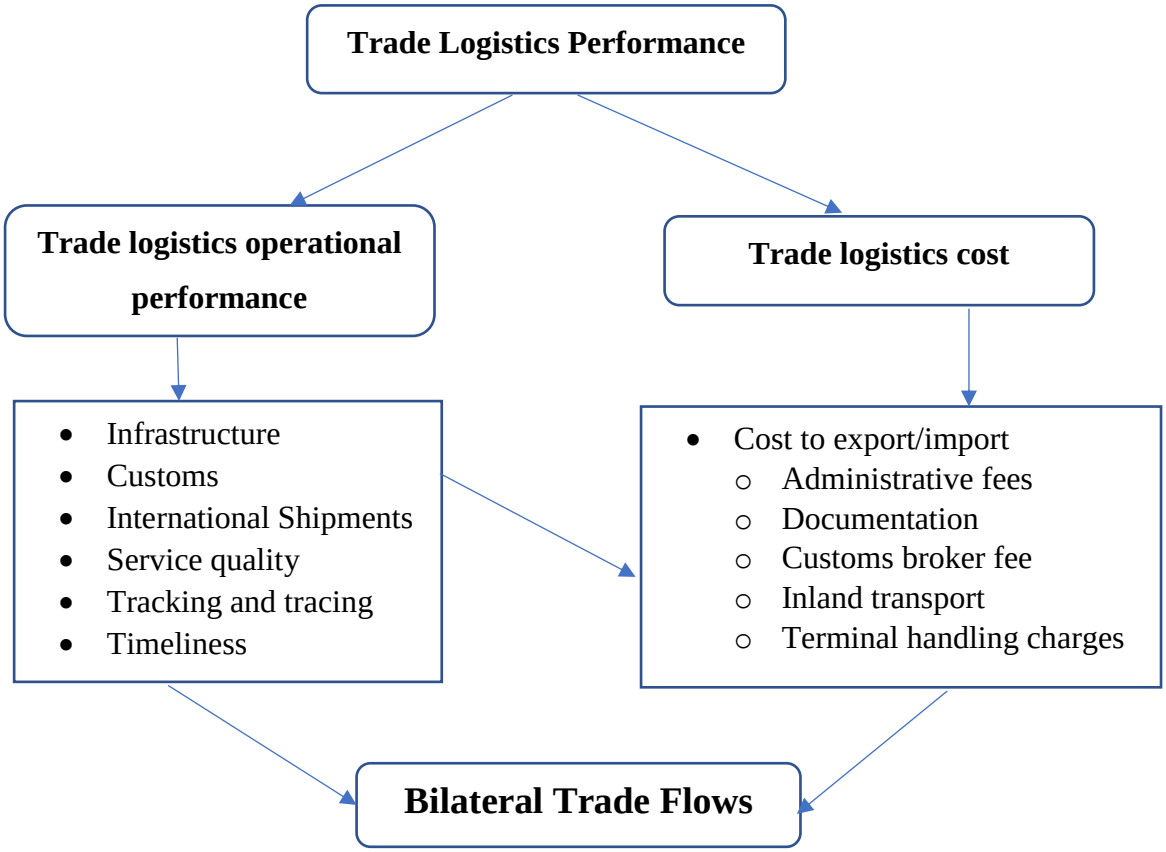
This study emphasized on the role of trade logistics performance on export, focusing on African countries bilateral export with countries in other regions. The World Bank LPI six dimensions assess countries performance in trade logistics. The index measures: trade and transport related infrastructures development, border clearance, competence and quality of logistics services. However, LPI six dimensions are not well elaborated. This study has made an additional theoretical contribution to increasing understanding of the World Bank LPI dimensions. Earlier studies on trade logistics focus on LPI however, LPI is not a comprehensive measure. One of the relevant factors on trade logistics is not included i.e., trade logistics cost. Improving trade logistics operational performance without reducing cost will impede trade logistics from having a tremendous contribution in increasing bilateral trade flows.

This study has extended the research on trade logistics performance through adding a measure for trade logistics cos in Africa context. The variables used for this purpose are costs incurred to export a TEU from each country most populous city to port of loading and cost to import a TEU by importing countries in bilateral trade. The cost includes administrative fees for customs clearance and technical control, documentation, customs broker fee, inland transport and terminal handling charges. In line with this, the result has confirmed, a significant role of cost to export and import in bilateral trade flows.

Earlier studies on the impact of LPI on export, such as (Puertas, Martí, and García 2013), (Marti, Puertas, and García 2012), (Hoekman and Nicita 2011) has overlooked the potential impact of moderator in the association between LPI and export. Thus, the other theoretical contribution of this study is with regards to the interaction effect of lack of direct access to the sea on strength of the relationship between trade logistics performance (LPI) and export. The study found out that, improved trade logistics performance increases export for both coastal and landlocked countries, but the positive effect is higher for coastal than it does for landlocked countries.

In addition, this study found out that the strategic role of higher LPI towards reducing cost to export a TEU. This implies that improving LPI will enable to pursue twofold purposes. One is reducing trade logistics cost and the other is increase trade flows. Hence, this study finding provides a contribution to improving the existing concept of trade logistics by adding a variable for the concept development of trade logistics performance. Figure 13 depict clear conceptualization of trade logistics performance and how its measures affect bilateral export.

Figure 13: Conceptualization of Trade Logistics Performance



The above figure has visualized to have a clear conceptualization of trade logistics. Trade logistics refers to set of processes that are involved in delivering goods from one country

into another. The processes and services involved in delivering cargoes from domestic producer to foreign customers include customs and border clearance, transportation, port operations, tracking and tracing, and management of international shipments. Trade logistics performance has classified into two parts; trade logistics operational performance and trade logistics cost. Operational performance can be measured by logistics infrastructures developments, customs and border clearance, ease of arranging competitively priced international shipments, competence, and quality of logistics services i.e., tracking, tracing, and on-time delivery.

Here, trade logistics cost has delimited to costs incurred in delivering cargoes from country's most populous city to port of loading or vice versa. But, trade logistics cost must go beyond these to include all costs incurred in delivering goods from producer's premises to foreign customers. These costs could include shipping cost, information cost and contract enforcement in addition to the above costs. Higher operational performance in trade logistics reduces cost. Lower costs in turn increase earning from trade. Generally, trade logistics will increase countries abilities to connect firms, suppliers, and consumers to global supply chains in an efficient manner. Hence, trade logistics is essential to improve countries international trade competitiveness.

7.4 Practical Implications of the Research

This research has met two main aims. First, trade logistics performance of Africa has analyzed based on LPI, and cost to export and import a TEU. Then trade logistics area where African countries are severely challenged had figure out. Second, the effect of trade logistics performance on bilateral export has explored. This study findings are worth of practical implications and policy guidance for encouraging further improvements on African countries trade logistics performance to maximize bilateral export flows and improve the region's export share in global market. A practical challenge is of course, how African countries can improve their trade logistics performance.

The promise of this research is by showing trade logistics main inefficiencies for African countries regulators. The main challenges of African countries trade logistics performance are logistics infrastructures development, customs clearance and border management, and competence and quality of logistics services, consecutively. These three areas are identified as input for supply chain service delivery (Arvis et al. 2016). First, it would be worthwhile for African countries to invest more in infrastructures developments for trade and transport

such as port, railways, road and intermodal facilities. Mbekeani pinpoint that, African countries transport infrastructure services could be improved through, better and safe roads, efficient and safe ports and improving maintenance of transport assets (Mbekeani 2010).

The second area of improvement shall be customs clearance and border management. Further improvement in terms of customs efficiency can be obtained through computerization of customs offices and atomization of customs procedures. All automated customs offices shall be connected with each other (Ojala and Çelebi 2015). To reduce cumbersome procedures, duplication, and unpredictable delays; African countries shall implement *One Stop Border Post* (OSBP), where customs operations are carried out at only one side of the border but in complying with the laws of both countries. To implementation OSBP an agreement shall be reached on the establishment of joint facilities and harmonization of cross-border procedures. This can be implemented by regional groups in Africa such as South African Development Community, Common Market for Eastern and South Africa, East Africa Community, and Economic Commission for West African States (Barka 2012).

In accordance with prioritized trade logistics challenges of Africa, the third inefficient area is competence and quality of logistics service. Trade logistics competencies can be improved with public and private sectors active participation at national level. Public sector plays a critical role in preparing conducive regulations and allocation of investments in a way that will promote efficient competencies. Additionally, private firms involvement such as freight forwards, and logistics service providers would have significant contributions in adding values for country's logistics service quality in international trade competitiveness (Burmaoglu and Sesen 2011). Thus, in addition to strengthening public sectors role, African countries shall give emphasis in creating conducive legal environments to attract investment and active participation of private firms in trade logistics.

The research emphasized on the benefit of improving performance on LPI to reduce trade logistics cost and maximize trade flows. The study reveals, Africa remains as a region with one of the highest trading cost to export and import containerized cargoes. High trade logistics cost will have a negative effect on African economies, particularly on local consumption, production, and exportation. High trade logistics cost will reduce consumer welfare because of increasing price of imported goods. It also makes local producers less competitive as inputs are relatively expensive and in turn will result in more expensive

finished products. Using gravity model for some African countries, it is estimated that, improvement in trade logistics is more important than substantial cut in tariff barriers (Portugal-Perez and Wilson 2008). High trade logistics cost will reduce export earnings. The implication is worse for landlocked Africa countries. Thus, another regulation area for African countries is reducing trade logistics cost.

Above all, LPI has lower positive effect in increasing bilateral export for landlocked countries in Africa than their coastal neighbors, particularly for seaborne trade. There are 16 landlocked countries in Sub-Sharan Africa. The geographical disadvantage can be reduced through integrated development strategies that would be implemented by both coastal and landlocked countries (Collier 2007). Landlocked countries are likely to expand their trade in goods that are transported by Air (Korinek and Sourdin 2011). These products include vegetables, fruits, cut flowers, freshwater fish, and meat as well as time-sensitive high-value goods such as electronic components for the computer industry (World Bank Group 2014). Air transportation can be expanded through low-cost air transport service provider companies (Collier 2007). However, since 80 percent of trade in value is seaborne, regional trade facilitation through sea is important to enhance landlocked countries international trade (Korinek and Sourdin 2011). This includes encouraging coastal neighbor's to have better policies (Collier 2007), assure efficient hinterland connections through regional integration, improve availability and quality of logistics infrastructures i.e., ports, roads, railways, intermodal facilities and border checkpoints (World Bank Group 2014).

Successful improvements in African countries trade logistics such as; logistics infrastructures, customs and border clearance, and logistics service quality will enhance African countries supply chain deliveries i.e., on-time delivery of shipments, ease of arranging competitively priced international shipments and high-level of tracking and tracing consignments. Thus, African countries could continue to improve their trade logistics performance to meet twofold aims; increase supply chain reliability in international trade and reduce trade logistics cost. This will boost Africa's export and maximize Africa export share in global market.

7.5 Limitations of the Study

Though LPI is an interesting indicator in making comparative analysis across countries logistics performance, its relevance for the research analysis is limited by the fact that the data will offer a general picture of trade and transport related infrastructures development,

customs clearance, and competence and quality of logistics service. The LPI does not include cost aspect of logistics in international trade. This research has tried to included cost but it is not complete. Trade logistics cost included under this study does not include some of the important costs incurred in delivering cargoes from producer's factories to foreign customer's place such as maritime transport cost and contract enforcement cost.

Another limitation of the study is related to the time of the data used in this study. The study has carried based on 2014 performance statistics. Even though 2016 LPI and other variables data are available, but Africa countries export value for 2016 is not yet published at UN Comtrade database until April 30, 2017.

7.6 Future Research Direction

There are some limitations and findings, which suggest directions for future research. Africa remain as a low performer in trade logistics measure i.e., LPI. Among LPI dimensions, the region has scored worst performance in terms of logistics infrastructure and customs clearance. Further research shall be carried on the root causes of African countries lowest LPI score, particularly in terms: (1) trade and transport related infrastructure development and (2) customs and border clearance. With regards to Africa's higher cost to export/import a TEU, further studies shall be carried on the driver of these costs such as costs for documentation, administrative fees for customs clearance and technical control, customs broker fees, inland transport, and terminal handling charges. Emphasizing on cost drivers will enable to figure out most inefficient area.

Second, this study has used cost incurred to export a containerized cargo by African countries and cost to import a containerized cargo by importing countries in abroad. However, this is not a comprehensive measure of trade logistics cost. The future research can extend to develop key trade logistics cost indicators considering different type of commodities. The indicators shall consist of all costs incurred in delivering cargoes from domestic producers to foreign customers. These costs may include charges incurred for information, documentation, inland transport, customs and border clearance, terminal handling charges, shipping and contract enforcement.

Based on this study finding, improvement in LPI will have significant effect at reducing cost to export. However, further study shall be conducted on the relevance of LPI on trade logistics cost, taking full cost components. Further research shall also be conducted through

longitudinal data and estimation strategy other than OLS that will consider zero bilateral trades.

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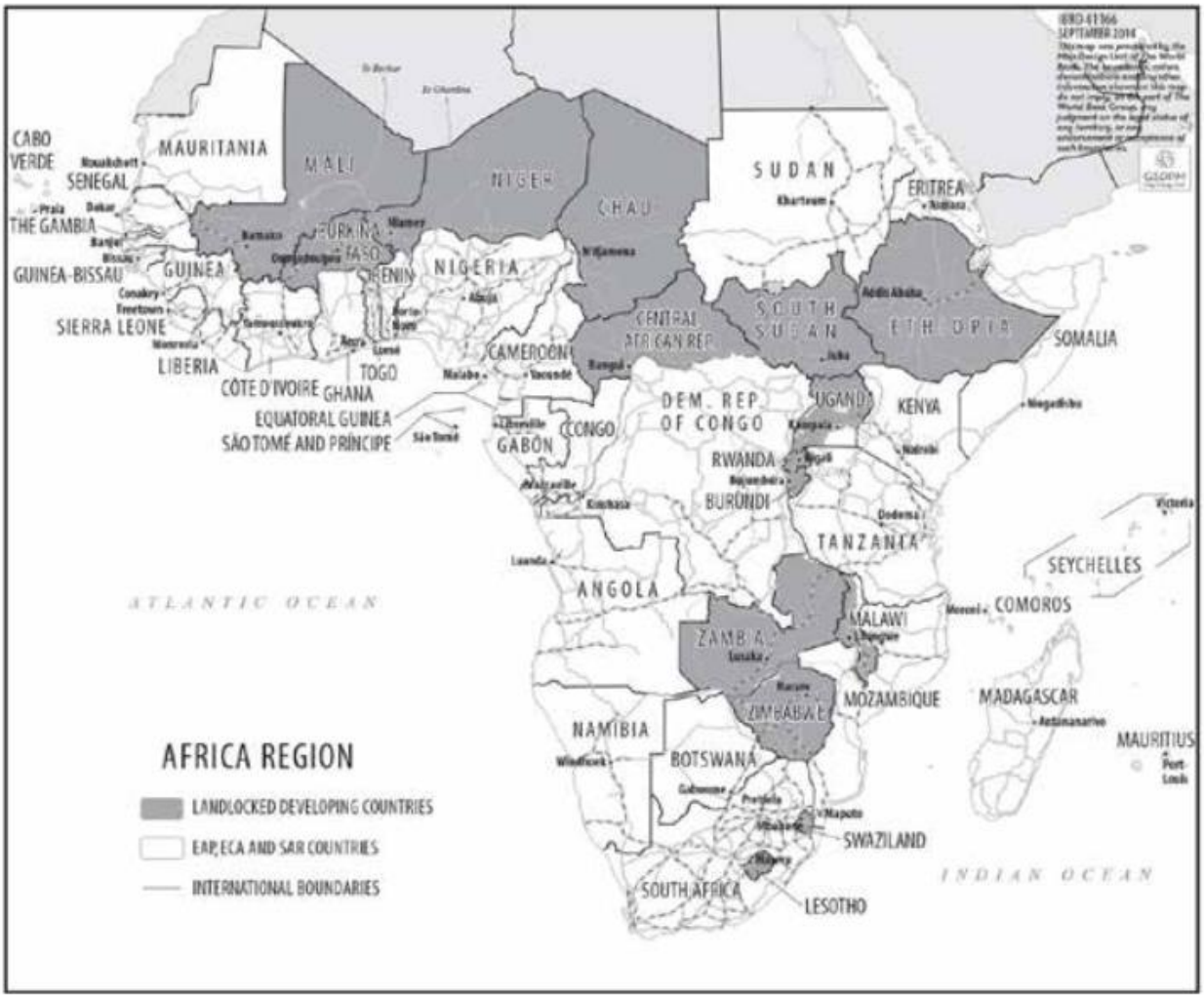
Appendix

Appendix 1: Africa Map



(World Bank Group 2014)

Appendix 2: Methodology for selecting country groups for survey respondents

	Respondents from low-income countries	Respondents from middle-income countries	Respondents from high-income countries
Respondents from coastal countries	Five most important export partner countries + Three most important partner countries	Three most important export partner countries + The most important import partner country + Four countries randomly, one from each country group: a. Africa b. East, South, and Central Asia c. Latin America d. Europe less Central Asia and OECD	Two countries randomly from a list of five most important export partner countries and five most important import partner countries + Four countries randomly, one from each country group: a. Africa b. East, South, and Central Asia c. Latin America d. Europe less Central

Respondents from landlocked countries	Four most important export partner countries + Two most important import partner countries + Two land-bridge countries	Three most important export partner countries + The most important import partner country + Two land-bridge countries + Two countries randomly, one from each country group: a. Africa, East, South, and Central Asia, and Latin America b. Europe less Central Asia and OECD	Asia and OECD + Two countries randomly from the combined country groups a, b, c, and d

Source: (Arvis et al. 2014)

Appendix 3: Regression Assumption Test

Equation (2): Customs

Variable	VIF	1/VIF
ln_gdp_o	1.40	0.715773
ln_gdp_d	1.38	0.723899
ln_customs_d	1.37	0.731301
ln_customs_o	1.30	0.767651
landlocked	1.18	0.847773
colony	1.09	0.920455
comlang_off	1.07	0.932413
ln_distance	1.06	0.942364
Mean VIF	1.23	

Equation (3): Infrastructure

Variable	VIF	1/VIF
ln_gdp_d	1.78	0.561046
ln_infrast~d	1.77	0.564550
ln_gdp_o	1.45	0.688682
ln_infrast~o	1.33	0.754671
landlocked	1.09	0.917866
colony	1.09	0.920525
ln_distance	1.08	0.928562
comlang_off	1.07	0.931956
Mean VIF	1.33	

Equation (4): Shipment

Variable	VIF	1/VIF
ln_gdp_d	1.47	0.681539
ln_shipmen~d	1.44	0.696463
ln_gdp_o	1.37	0.732516
ln_shipmen~o	1.27	0.785784
colony	1.09	0.920053
landlocked	1.07	0.935994
comlang_off	1.06	0.942538
ln_distance	1.06	0.947602
Mean VIF	1.23	

Equation (5): Quality

Variable	VIF	1/VIF
ln_gdp_o	1.85	0.539693
ln_gdp_d	1.78	0.561623
ln_quality_d	1.77	0.566001
ln_quality_o	1.71	0.585939
landlocked	1.18	0.846297
ln_distance	1.10	0.909425
colony	1.09	0.921110
comlang_off	1.07	0.935546
Mean VIF	1.44	

Equation (6): Tracking

Variable	VIF	1/VIF
ln_gdp_o	1.96	0.510276
ln_trackin~o	1.79	0.558724
ln_trackin~d	1.77	0.566007
ln_gdp_d	1.76	0.567558
landlocked	1.10	0.906193
colony	1.09	0.920743
comlang_off	1.07	0.931780
ln_distance	1.07	0.934798

Equation (7): Timeliness

Variable	VIF	1/VIF
ln_gdp_o	1.80	0.556194
ln_gdp_d	1.73	0.578250
ln_timelin~d	1.69	0.590176
ln_timelin~o	1.63	0.612172
ln_distance	1.11	0.897715
landlocked	1.11	0.902982
colony	1.09	0.921633
comlang_off	1.06	0.945232
Mean VIF	1.40	

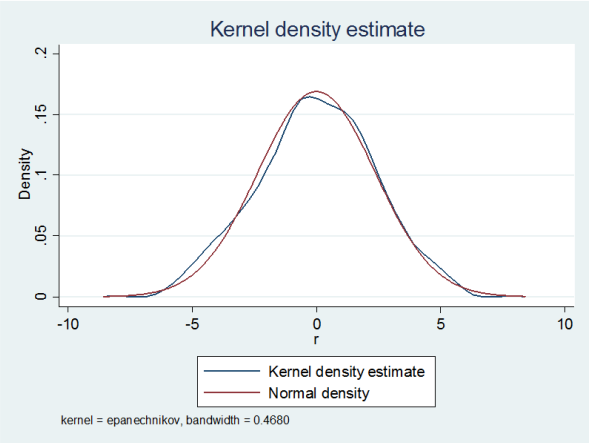
Equation (8): Cost to export/import

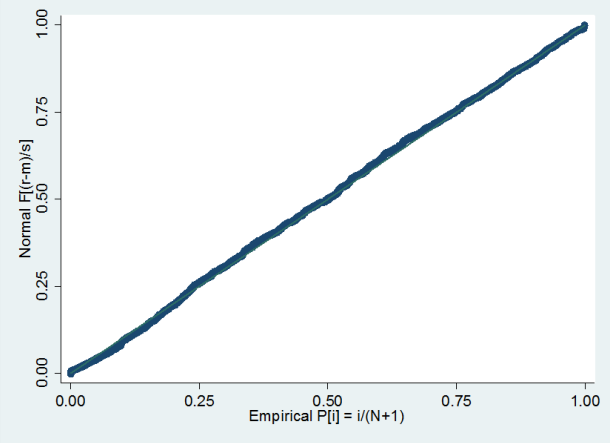
Variable	VIF	1/VIF
landlocked	1.72	0.582494
ln_cost_exp	1.69	0.590886
ln_gdp_o	1.13	0.882323
ln_cost_imp	1.10	0.909799
ln_gdp_d	1.09	0.914620
ln_distance	1.09	0.916822
colony	1.09	0.921285
comlang_off	1.06	0.946108
Mean VIF	1.25	

Equation (8): Regression with interaction

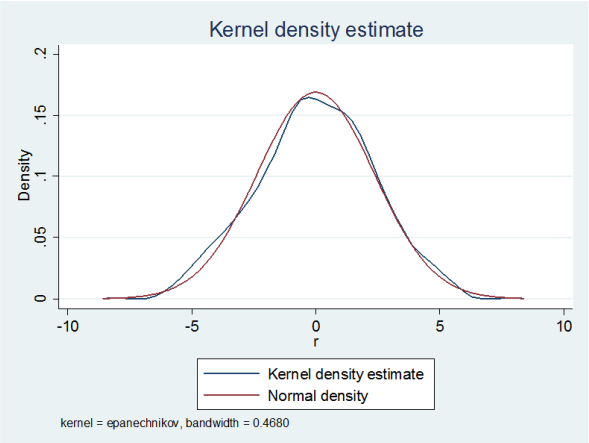
Variable	VIF	1/VIF
ln_lpi_o	2.09	0.477380
ln_gdp_o	1.88	0.532889
ln_gdp_d	1.72	0.580373
ln_lpo_d	1.72	0.582325
lpi_oxland~d	1.36	0.732917
landlocked	1.14	0.878619
colony	1.09	0.920144
ln_distance	1.08	0.926824
comlang_off	1.07	0.933073
Mean VIF	1.46	

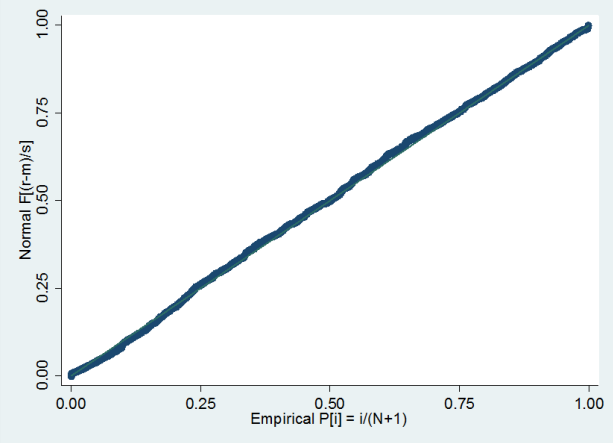
Equation (2): Customs



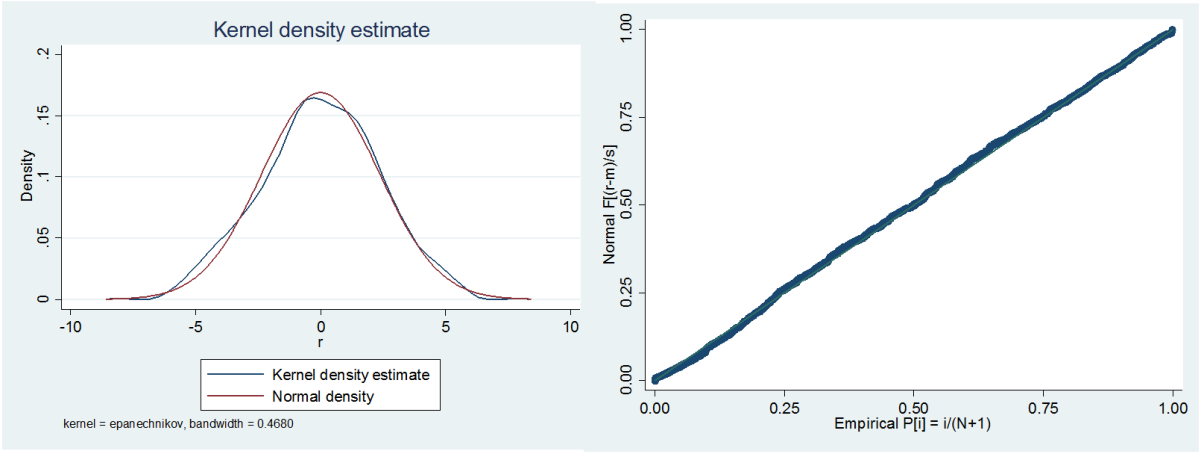


Equation (3): Infrastructure

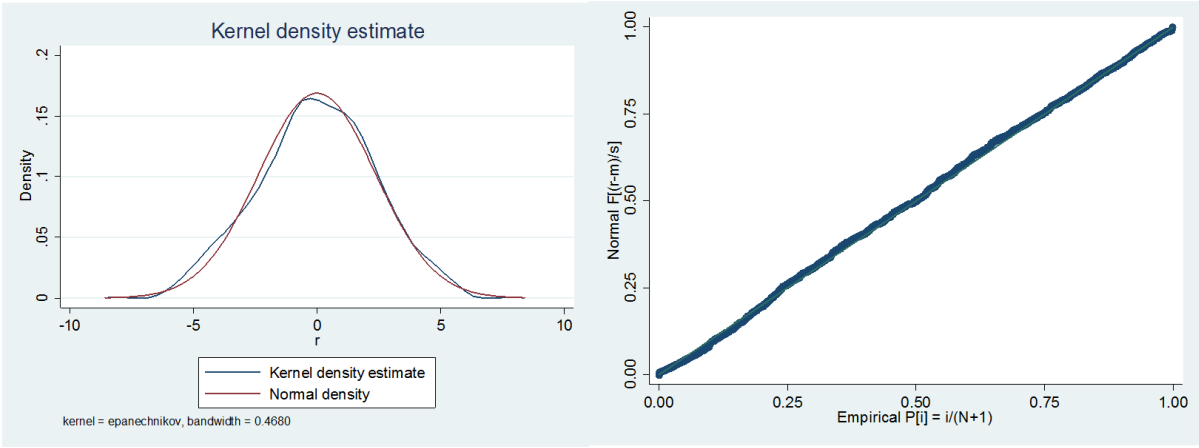




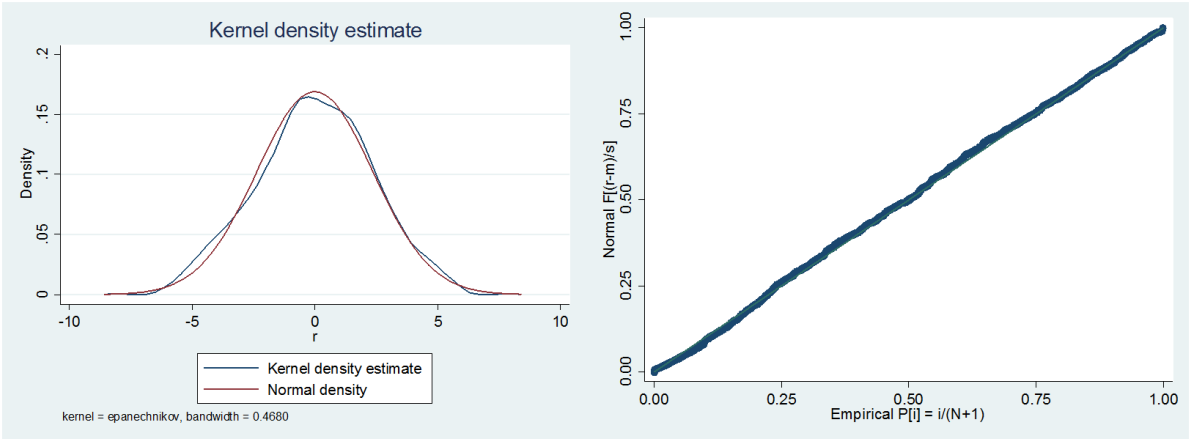
Equation (4): Shipments



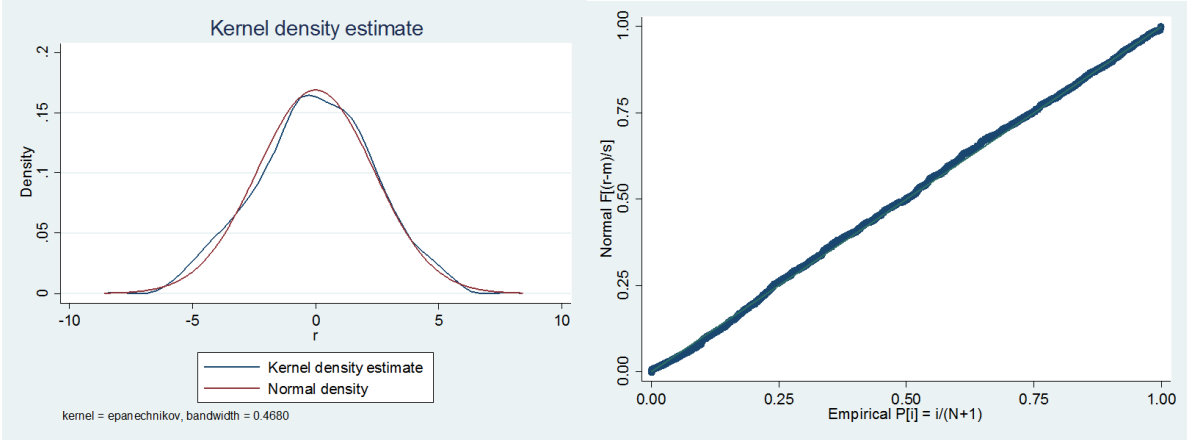
Equation (5): Quality



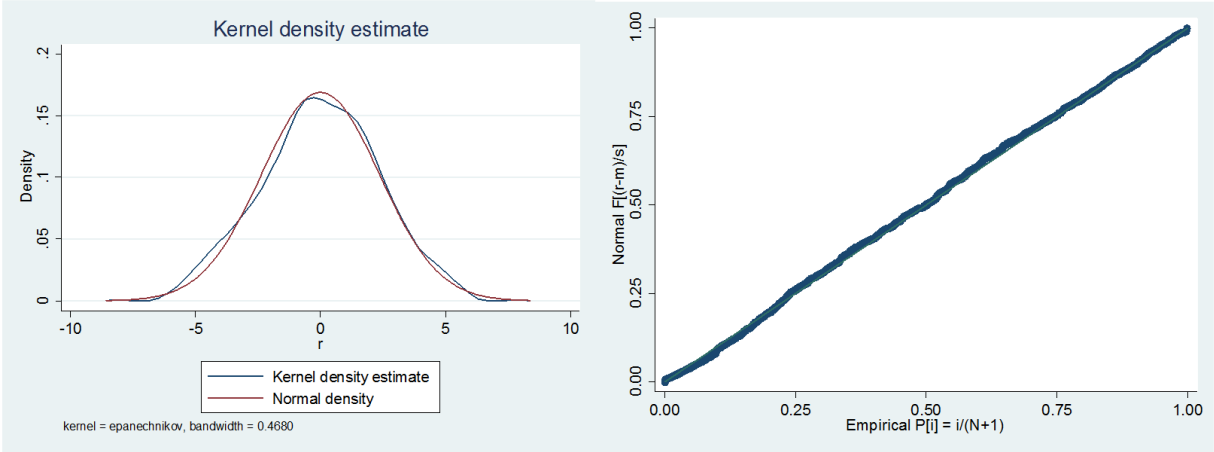
Equation (6): Tracking



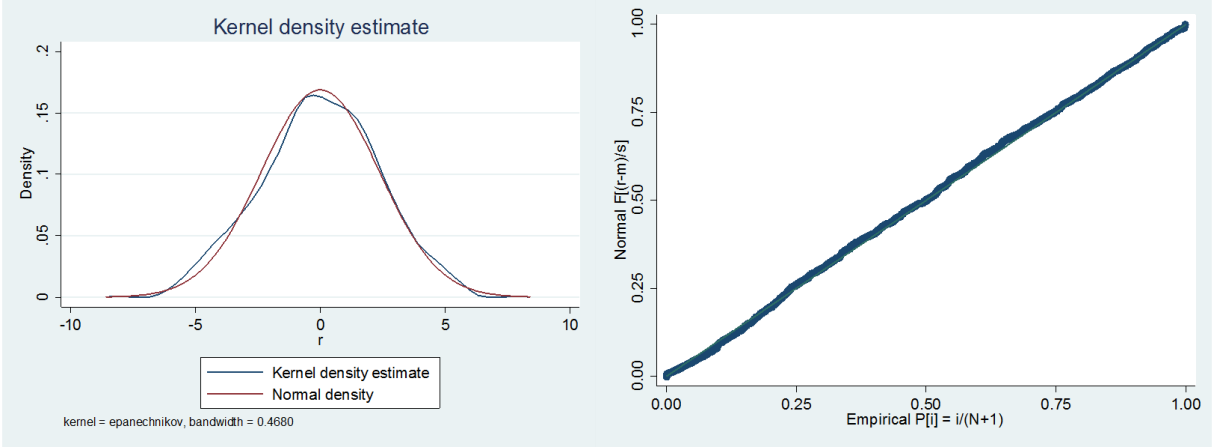
Equation (7): Timeliness



Equation (8): Cost to export/import



Regression with Interaction



Appendix 4: World Regions by WTO Statistics

North America
Bermuda
Canada
Mexico
United States of

South and Central America and the Caribbean			
Antigua and	Colombia	Guatemala*	Saint Kitts and Nevis*
Argentina	Costa Rica*	Guyana*	Saint Lucia*
Aruba (the	Cuba*	Haiti*	Saint Vincent and Grenadines*
Bahamas	Curaçao	Honduras*	Sint Maarten
Barbados	Dominica*	Jamaica*	Suriname*
Belize*	Dominican Republic*	Nicaragua*	Trinidad and Tobago*
Bolivia,	Ecuador*	Panama*	Uruguay*
Brazil*	El Salvador*	Paraguay*	Venezuela,
Chile*	Grenada*	Peru*	Bolivaria Rep. of*

Europe			
Albania*	Montenegro*	Bosnia and Herzegovina	Lithuania*
Andorra	Slovak Republic*	Bulgaria*	Luxembourg*
Austria*	Slovenia*	Finland*	Portugal*
Czech Republic*	Netherlands*	France*	Romania*
Denmark	Norway*	Italy*	Serbia**
Estonia*	Poland*	Latvia*	Turkey*
Hungary*	Spain*	FYR Macedonia*	United Kingdom*
Iceland*	Sweden*	Germany*	Croatia*
Ireland*	Switzerland*	Greece*	Cyprus*
Malta*	Belgium*	Liechtenstein*	

Commonwealth of Independent States (CIS)			
Armenia	Moldova*	Kyrgyz Republic*	Belarus**
Azerbaijan**	Turkmenistan	Russian Federation*	Tajikistan*
Georgia*	Kazakhstan**	Ukraine*	Uzbekistan*

Middle east		
Bahrain*	Iran**	Iraq**
Israel*	Jordan*	Kuwait,
Lebanese	Oman*	The State of Qatar*
Saudi Arabia,	Syrian Arab	United Arab Emirates*
Kingdom of Yemen		

Africa			
Algeria	Botswana	Cameroon	Chad
Congo	Djibouti	Eritrea	The Gambia
Guinea	Lesotho	Madagascar	Mauritania
Morocco	Niger	Sao Tome and Principe	Sierra Leone
South Africa	Swaziland	Tunisia	Zimbabwe
Angola	Burkina Faso	Cabo Verde	Comoros
Congo, Dem. Rep.	Egypt	Ethiopia	Ghana
Guinea-Bissau	Liberia	Malawi	Mauritius
Mozambique	Nigeria	Senegal	Somalia
Sudan	Republic of Tanzania	Uganda	
Benin	Burundi	Central African Republic	
Côte d'Ivoire	Equatorial Guinea	Gabon	
Kenya	Libya	Mali	
Namibia	Rwanda	Seychelles	
South Sudan	Togo	Zambia	

Asia			
Afghanistan	Tuvalu	Singapore*	China*
Hong Kong, China	Bangladesh*	Viet Nam*	Lao People's Dem. Rep.*
Malaysia	Indonesia*	Brunei Darussalam	Pakistan
Papua New Guinea	Mongolia	Kiribati Nepal*	Chinese Taipei*
Tonga	Samoa*	Solomon Islands*	Fiji
Australia	Vanuatu	Cambodia*	Macao, China*
India	Bhutan	Korea,	Palau Thailand*
Maldives	Japan	Republic of New Zealand*	
Philippines	Myanmar	Sri Lanka*	

Source: (WTO 2015)

Appendix 5: Regression

Gravity model estimation on effect of customs on bilateral trade flow (Equation 2)

```
Linear regression                               Number of obs =    1791
                                                F(  8,  1660) =  366.20
                                                Prob > F      =  0.0000
                                                R-squared     =  0.5608
                                                Root MSE      =  2.3942

                                  (Std. Err. adjusted for 1661 clusters in distance)
```

ln_trade	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_distance	-1.137425	.1057675	-10.75	0.000	-1.344877	-.9299734
ln_gdp_o	.8668798	.0496345	17.47	0.000	.769527	.9642326
ln_gdp_d	.9240228	.0363893	25.39	0.000	.8526491	.9953965
ln_customs_o	3.318031	.4224932	7.85	0.000	2.489355	4.146707
ln_customs_d	3.124415	.3607424	8.66	0.000	2.416857	3.831973
comlang_off	.7590607	.1525633	4.98	0.000	.4598239	1.058297
colony	1.197054	.2565597	4.67	0.000	.6938397	1.700269
landlocked	-1.653806	.1308588	-12.64	0.000	-1.910472	-1.39714
_cons	-26.50916	1.719788	-15.41	0.000	-29.88234	-23.13598

Gravity model estimation on effect of infrastructure on bilateral trade flow (Equation 3)

```
Linear regression                               Number of obs =    1791
                                                F(  8,  1660) =  387.26
                                                Prob > F      =  0.0000
                                                R-squared     =  0.5702
                                                Root MSE      =  2.3683

                                  (Std. Err. adjusted for 1661 clusters in distance)
```

ln_trade	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_distance	-1.091171	.1043552	-10.46	0.000	-1.295853	-.8864893
ln_gdp_o	.8316954	.0500794	16.61	0.000	.7334699	.9299209
ln_gdp_d	.8358146	.0420008	19.90	0.000	.7534345	.9181948
ln_infrastructure_o	4.423606	.4752619	9.31	0.000	3.49143	5.355782
ln_infrastructure_d	3.650823	.3726734	9.80	0.000	2.919864	4.381783
comlang_off	.7086709	.1494894	4.74	0.000	.4154634	1.001878
colony	1.173753	.266437	4.41	0.000	.6511651	1.696341
landlocked	-1.513009	.1249955	-12.10	0.000	-1.758175	-1.267844
_cons	-25.48526	1.681401	-15.16	0.000	-28.78315	-22.18738

Gravity model estimation on effect of shipments on bilateral trade flow (Equation 4)

Linear regression

Number of obs	= 1791
F(8, 1660)	= 360.44
Prob > F	= 0.0000
R-squared	= 0.5622
Root MSE	= 2.3902

(Std. Err. adjusted for 1661 clusters in distance)

ln_trade	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_distance	-1.076802	.1015656	-10.60	0.000	-1.276012	-.8775919
ln_gdp_o	.8908575	.0476569	18.69	0.000	.7973835	.9843315
ln_gdp_d	.9029791	.0369767	24.42	0.000	.8304532	.975505
ln_shipments_o	3.627316	.4894478	7.41	0.000	2.667316	4.587316
ln_shipments_d	5.053724	.5159071	9.80	0.000	4.041827	6.065621
comlang_off	.7906175	.1525647	5.18	0.000	.4913781	1.089857
colony	1.169017	.2472611	4.73	0.000	.6840399	1.653993
landlocked	-1.324619	.1256126	-10.55	0.000	-1.570995	-1.078243
_cons	-30.09536	1.648295	-18.26	0.000	-33.32832	-26.86241

Gravity model estimation on effect of quality on bilateral trade flow (Equation 5)

Linear regression

Number of obs	= 1791
F(8, 1660)	= 381.78
Prob > F	= 0.0000
R-squared	= 0.5610
Root MSE	= 2.3936

(Std. Err. adjusted for 1661 clusters in distance)

ln_trade	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_distance	-1.108758	.106355	-10.43	0.000	-1.317362	-.900154
ln_gdp_o	.7865549	.0585933	13.42	0.000	.6716304	.9014795
ln_gdp_d	.8507131	.0428065	19.87	0.000	.7667527	.9346736
ln_quality_o	4.386948	.5487971	7.99	0.000	3.31054	5.463355
ln_quality_d	4.106461	.4529262	9.07	0.000	3.218094	4.994828
comlang_off	.7065531	.1507915	4.69	0.000	.4107915	1.002315
colony	1.24248	.2543101	4.89	0.000	.7436778	1.741282
landlocked	-1.61602	.1295393	-12.48	0.000	-1.870098	-1.361943
_cons	-25.46059	1.788229	-14.24	0.000	-28.96801	-21.95316

Gravity model estimation on effect of tracking on bilateral trade flow (Equation 6)

Linear regression

Number of obs	= 1791
F(8, 1660)	= 346.50
Prob > F	= 0.0000
R-squared	= 0.5529
Root MSE	= 2.4155

(Std. Err. adjusted for 1661 clusters in distance)

ln_trade	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_distance	-1.015126	.1039154	-9.77	0.000	-1.218945	-.8113073
ln_gdp_o	.8123522	.060377	13.45	0.000	.693929	.9307753
ln_gdp_d	.8567799	.0423971	20.21	0.000	.7736225	.9399374
ln_tracking_o	3.619959	.5832078	6.21	0.000	2.476059	4.76386
ln_tracking_d	3.8721	.4636136	8.35	0.000	2.962771	4.781429
comlang_off	.7135811	.1533174	4.65	0.000	.4128653	1.014297
colony	1.243237	.2575353	4.83	0.000	.7381093	1.748366
landlocked	-1.46472	.1292471	-11.33	0.000	-1.718224	-1.211215
_cons	-26.20606	1.774786	-14.77	0.000	-29.68711	-22.725

Gravity model estimation on effect of timeliness on bilateral trade flow (Equation 7)

Linear regression

Number of obs	= 1791
F(8, 1660)	= 338.10
Prob > F	= 0.0000
R-squared	= 0.5532
Root MSE	= 2.4147

(Std. Err. adjusted for 1661 clusters in distance)

ln_trade	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_distance	-1.104026	.1068648	-10.33	0.000	-1.31363	-.8944218
ln_gdp_o	.8072689	.0533872	15.12	0.000	.7025556	.9119821
ln_gdp_d	.8926986	.040925	21.81	0.000	.8124286	.9729686
ln_timeliness_o	5.11275	.6642631	7.70	0.000	3.809868	6.415632
ln_timeliness_d	3.85248	.493679	7.80	0.000	2.884181	4.82078
comlang_off	.8246294	.1515383	5.44	0.000	.527403	1.121856
colony	1.300455	.2474535	5.26	0.000	.815101	1.785809
landlocked	-1.527043	.1282727	-11.90	0.000	-1.778636	-1.27545
_cons	-28.85193	1.685864	-17.11	0.000	-32.15857	-25.54529

Gravity model estimation on effect of logistics cost on bilateral trade flow (Equation 8)

Linear regression

Number of obs	= 1780
F(8, 1650)	= 307.77
Prob > F	= 0.0000
R-squared	= 0.5473
Root MSE	= 2.4307

(Std. Err. adjusted for 1651 clusters in distance)

ln_trade	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_distance	-1.060252	.1047323	-10.12	0.000	-1.265674	-.8548293
ln_gdp_o	1.04472	.0424583	24.61	0.000	.9614418	1.127997
ln_gdp_d	1.07056	.0311978	34.32	0.000	1.009368	1.131751
ln_cost_exp	-.5368805	.1238798	-4.33	0.000	-.7798587	-.2939022
ln_cost_imp	-1.130697	.13299	-8.50	0.000	-1.391544	-.8698498
comlang_off	.8810887	.1543549	5.71	0.000	.5783365	1.183841
colony	1.636439	.260524	6.28	0.000	1.125446	2.147431
landlocked	-.7562868	.1587453	-4.76	0.000	-1.06765	-.4449233
_cons	-17.4046	2.076864	-8.38	0.000	-21.47817	-13.33103