ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

DETERMINANTS OF TRADE IN SERVICES IN AFRICA: A GRAVITY MODEL APPROACH

BY
MICHAEL TEDLA DIRESSIE

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ACRONYMS

2SLS	Two-Stage least squares
FDI	Foreign Direct Investment
GATS	General Agreement on Trade in Services
GDP	Gross Domestic Product
GLS	Generalized Least Squares
JB	Jarque - Bera
LDC	Least Developed Countries
LM	Lagrangean Multiplier
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
SSA	Sub-Saharan Africa
UN	United Nations
US	United States
USD	United States Dollar
WDI	World Development Indicators
WTO	World Trade Organization

ABSTRACT

Despite its stage of infancy, trade in services in Africa is expected to improve the poor portfolio and destination diversification. In order this to happen, there is a need to study the determinants and the directions of Africa's service trade. This paper intends to study the factors that affect the bilateral trade in services using a gravity model approach for a 5 year data spanning from 2003-2007. The finding of this research reveals that GDP per capita and total labor force of the African nations and their partnering nations positively affect the trade in services. An improved access to the internet also promotes the trade in services in Africa. Contrary to this, devaluation affects the service trade negatively. Land-locked African nations have lower participation than that of the costal nations. In relation to this distance has also a negative impact on service. The effects if land lockedness and distance between the capital cities of the partnering nations are reflected through the low level of GDP that land locked nations experience as a result of their poor trade performance as a whole. The other interesting finding is that the trade direction of the African nations is with their ex-colonial masters, captured through the effect of the variables called colonial history and common language.

CHAPTER ONE: INTRODUCTION

1.1 Background

In the current era of globalization where countries interact and act together for a global development, trade plays a crucial role in fostering the aimed goal. There is no nation that stays in an isolated environment. All economic aspects of a nation, including its industries, service sectors, employment, levels of income and living standard are linked with the other partner nations (Carbaugh, 2005).

Trade is the transaction of two countries in terms of exchanging goods and services. If so, what is the underlying reason for trade? There is no as such a clear-cut reason for this question. Various propositions have been forwarded by different scholars. To name few, Adam Smith's theory of absolute advantage, David Ricardo's theory of comparative advantage and the Heckscher-Ohlin model of differences in factor endowments are the milestones of trade theories (Feenstra, 2002) (Sodersten & Reed, 1994).

Despite having different reasons for trade, every nation acts as any other economic agent that aims at obtaining the optimal benefit out of its economic activities. This requires the proper identification of their respective potentials in terms of their resource endowments, economic performances and their socio-political state of affairs. Therefore, each country should be aware of what to produce in terms of the opportunity cost compared to the other product. It requires a smart move since the gains from trade are not evenly distributed (Krugman & Obstefeld, 2009).

Unlike the trade in goods, trade in services does not consist of the movement of all tangibles across international borders. The WTO/GATS has identified four possible modes of services. The first mode is known as cross-border supply of services where the buyer and the seller are separated geographically. The second mode is known as consumption abroad, where the consumers have to travel abroad. A good example for this category is international tourism and education services. Mode 3 is called commercial presence, by which firms establish a foreign affiliate, which sometimes requires FDI. The final mode, Mode 4 or presence of natural persons is where the producers are the ones to travel abroad to provide the service (see Figure A1) (Mattoo, Stern, & Zanini, 2008) (Grünfeld & Moxnes, 2003) (Christen & Francois, 2009).

Trade in services is a fast growing component of world trade, approaching 25% of the overall world trade value and representing approximately 60% of world foreign direct investment stock (SMEDA). In addition currently, it constitutes at least 50% of employment in most economies. Hence, it is possible to say that services also play a central role in economic development (SMEDA).

Speaking of Africa, its trade performance is too low. Its total exports being around 3% of the global total trade while its intra-continent trade is also low amounting to 10% of the overall exports of the continent. This poor performance is explained by the weak diversification of African trade in terms of structure and destination, the trade protection that prevails in the rest of the world against African products, the economic structure of African countries, poor institutional policies, poor infrastructure, weak

financial and capital markets, political instability, insecurity in several regions and intra-African trade barriers (AfDB/OECD, 2010).

Because of the world economic crisis, Africa's high economic growth slashed from an average of about 6% in 2006-08 to 2.5% in 2009 with per capita Gross Domestic Product (GDP) growth coming to a nearly complete halt. The economic slowdown was most pronounced in mining, manufacturing and tourism whose prices were exposed to the fall of commodity prices. On the other hand, agriculture and services were more resilient and mitigated the downturn (AfDB/OECD, 2010).

1.2 Statement of the Problem

Most of the prevailing economic theories are formulated based on the existing situation of the developed nations. This prohibits the economic study of the developing world to be carried out flawlessly (Carbaugh, 2005). It is important to analyze the theories by applying supplementary theories and ideas in order to alter and make them appropriate for the specific context.

The same argument pertains to the case of trade in services in Africa. This topic needs lots of exertions for two reasons. One, most of the time comprehensive studies are done on the exports and imports of manufactured goods only (Lejour & Smith, 2008). The other reason is that, even though there are limited studies undertaken on services, most of them are on developed nations, such as the works of (Grünfeld & Moxnes, 2003), (Kimura & Lee, 2006), (Lejour & Verheijden, 2004), (Lennon, 2006), (Walsh, 2006) and (Freund & Weinhold, 2002). The reason for this might be the failure of African nations to

report an up to date and detailed data and report on their respective trade in services performances.

Africa with its abundant population, land size, natural resources and economic potentials, it has underutilized them all. Due to the political unrests, civil wars, cross border conflicts and colonial influences that hindered its economic development it has been experiencing since the time of colonization, it was unable to strengthen its trade in services to the maximum. Taking this and the globalizing world into consideration, Africa has to identify its potentials and get involved in the world market intensively in both goods and services.

Regarding the trade in goods, it has been able to perform better, even though most of Africa's exports are primary commodities, which are prone to terms of trade deterioration. But the service trade is still underway and needs a lot of work to know the potentials they require and to understand what it takes to have a better gain. Besides, at this point in time, trade in services will not have deteriorating terms of trade effect (Morrissey & Mold, 2006) (Mold & Prizzon, 2009) (UNCTAD, 2008).

1.3 Objectives of the Study

The research questions that this paper deals with are the following. What are the determining factors and direction of trade in services of Africa? What should be done in order to enhance the exports of African services? Therefore, the general objective of this study being the identification of the major determinants of Africa's trade in services, its specific objectives are to identify the demand and supply determinants of services, the

patterns and directions of trade in services of Africa, measure the effects geographical locations and historical events such as colonization and forward suggestions based on the findings to improve the services trade of the continent.

1.4 Hypothesis of the Study

In this study it is hypothesized that economic performance and total labor force of both the trading partners is expected to have an effect of enhancing trade in services. Especially, in terms of education, transport and information technology, significant share of trade in services is going to take place with the relatively advanced economies of the continent.

Colonization is expected to have a significant effect in determining the patterns of trade in services of Africa. This is because Africa has been under the influence of its colonizers and donating nations up until now.

Among the components of the gravity model, distance between the trading partners and land lockedness are not expected to have an impact because services are intangibles that do not necessarily require to travel or cross the border physically.

1.5 Method and Data

1.5.1 Method

To achieve the intended objectives, this paper tries to employ the gravity model on a balanced panel data gathered on 162 partnering nations for the period 2003-2007. Gravity model is an equation which shows that the volume of trade between two countries is proportional to the product of their masses (GDPs) and inversely related to

the distance between them (Kimura & Lee, 2006). The concept of the gravity model is based on Newton's Law of Universal Gravitation, which its application to the social sciences was first proposed by James Stewart in the 1940s. Tinbergen (1962), the first person to apply the equation to international trade flows, used the level of bilateral trade between pairs of countries as dependent variables while the explanatory variables include population and income (Fitzsimons, Hogan, & Neary, 1999).

Since then, for the reason that the gravity model appears to fit the available data well and its ease with which models can be estimated econometrically, it has been widely applied in international trade studies these days (Walsh, 2006). It is also acknowledged for its empirical effectiveness (Anderson & Wincoop, 2003). As the empirical applications of the gravity model have grown, the theoretical foundations of the model have also been developed, which were claimed to be the defects of the model.

Its model specification has been augmented through the addition of other variables such as dummy variables for a common language, common borders or historical relationships between countries that are thought to impact trade flows. Furthermore, it is also used for policy analysis, for example the effects on trade flows between countries of membership of trade agreements or common currency areas can be assessed (Walsh, 2006).

Therefore, for the fact that it is the predominant model on bilateral trade flows, its empirical effectiveness and other attributes that it has, gravity model is chosen to be used in this paper.

1.5.2 Data Sources

This study utilized a balanced panel data gathered for the periods 2003 to 2007 from the United Nations Services Trade Database (UN Service Trade). Regarding the variables other than the value of services, they are collected from UN, World Bank, WDI and other web sites for the geographic and historic variables (see Table A1).

1.6 Significance of the Study

Africa being among the developing nations with lots of economic potential, it needs to pinpoint the sectors that it should be involved in and benefit from the world market. It has to enjoy the gains from trade through efficiency in production, accruing to the national income and winning the market for goods and services it produces. In order to make this a reality, there is a need to study the factors that would affect its trade and trade patterns. Hence, this topic is selected to point out the determinants of the current trade in services so that the continent would be able to work on the factors that should be built up so as to enhance its performance.

1.7 Limitations of the Study

This research paper faced certain slowdowns. One is the unavailability of adequate literature on the subject in the context of developing nations, specifically on Africa. The other hindrance was the lack of data on each and every sector of the services in trade. (PREM, 2010) claims that inconsistency of the series reported about trade in services between African countries has contributed to the failure of the policy makers. This made the study to be restricted at the aggregated level of services. In addition, some countries

do not report their economic and demographic indicators on time or do not report at all. All these problems impeded the flawless progress this research paper.

1.8 Organization of the Study

The rest of the study proceeds as follows. Chapter two contains the review of literature in which the theories on trade in services and gravity model as well as some empirical studies are discussed. Chapter three consists of the data analysis followed by chapter four which incorporates the conclusion and the policy implications of the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Trade in Services: Overview

Because of the presumption of regarding services as non-tradables in the traditional economic literature, their importance has gone unnoticed and they have not been figured in economic growth and development literature (Francois & Hoekman, 2008) (Nyahoho, 2010) (Grünfeld & Moxnes, 2003). But this situation started to change with the emergence of services on the international policy agenda in the 1980s, as a result of technological progress and in part as a consequence of US proposals to negotiate multilateral rules on policies affecting trade and investment in services (Francois & Hoekman, 2008) (Park, 2002).

Services are heterogeneous and have wide spectrum which led to the absence of international consensus on their definition. But the definition that is proposed in the OECD's System of National Accounts 1993 is widely accepted. This definition shows that it is difficult to disentangle the services that are incorporated in goods (Francois & Hoekman, 2008) (Nyahoho, 2010) (Walsh, 2006).

> *"Services are outputs produced to order and which cannot be traded separately from their production; ownership rights cannot be established over services and by the time their production is completed they must have been provided to the consumers; however as an exception to this rule there is a group of industries, generally classified as service industries, some of whose outputs have characteristics of goods, …"* (OECD (2000), p. 40)

The expansion of trade in services and its contribution to the GDP and employment is a result of growth and development by itself. Advancement in information and communication technology is one of the driving forces of trade in services. Its development in turn will increase the competitiveness of manufacturing firms in open economies through its permeability of low cost and high quality of services for the production process itself such as through provision of telecommunications, transport and distribution services, financial intermediation, etc (Francois & Hoekman, 2008).

There are certain differences of services as compared to goods. One is that they are not storable; their exchange requires the proximity of the consumer and the supplier. This proximity burden has progressively weakened as a result of technological advancements since the early 1980s. The other problem of services is a problem of regulation that arises from the existence of imperfect and asymmetric information, as the buyers are unable to assess the quality of services (Christen & Francois, 2009), (Francois & Hoekman, 2008) (Mattoo, Stern, & Zanini, 2008).

Recently the international trade in services represents more than 20% of the global trade, and they have an increasing contribution in the national economies accounting for about 50-70 % of internal products (Grünfeld & Moxnes, 2003).

According to Karsenty (2000) cited in (Grünfeld & Moxnes, 2003), mode 1 and mode 3 dominate the pattern of international service trade, where each category represents approximately 41% of total service trade and 37.8% respectively while trade of mode 4 is marginal. Mode 4 is where the strongest barriers of trade prevail.

2.2 African Trade in Services

Africa's shares of global services exports and imports have been roughly constant, at a low level, contrary to that of East Asia which has increased drastically over the past two decades (PREM, 2010).

In the non-oil producing parts of the sub-Saharan Africa, it is service that takes the largest part of the economy. In 2007 the service sector accounted for the 37% of the GDP of the African nations except South Africa on average. But this figure is lower than that of the LDCs and low income countries amounting to 46% for each. This is due to the low share of the oil exporting countries which is 30% while non-oil exporters alone account for 60% of GDP, which is considerably above the averages for LDCs, low income countries (PREM, 2010). In the same year, the continents total service trade reached 174 billion USD, of which more than half of it was imports. The export amount was only 76 billion USD (UNECA, 2010).

While it comes to the specific service sectors, the banking sector in Africa is an expensive sector that lacks completion. The difference between lending and borrowing rates offered by financial institutions in Africa is larger than in other regions. Electricity is another basic component that has a low outreach, only 24% of the total population of sub-Saharan Arica. But when it comes to the telephone density (landlines and cellular telephones), Africa is ahead of South Asia, with 64 versus 56 subscribers per thousand people (PREM, 2010).

The share of recorded services' exports to the total exports is about 11% in sub-Saharan Africa excluding South Africa, on average. Again this is due to the inclusion of the oil-exporting nations which is around 3%. If it was not for them it would have been around 20%. In contrast, the imports of services, in 2007 the imports of services accounted for 31% of total imports of goods and services. Out of this, Africa's oil-exporting countries registered a higher average share 37% of service imports in total imports while for non-oil exporters it remained to be only 20%. For the non-oil countries the importance of services in total imports matches the importance of service in total exports (PREM, 2010).

While looking into the shares of certain nations, there is a wide variation across countries. For instance, service is only 4% of the Guinean export revenues and 15% of Botswana's total exports while for Tanzania it is over 40%. In Rwanda and Ethiopia trade in services accounts for around half of total exports (PREM, 2010).

Sector wise, the largest component of Africa's service exports are in the travel services which consumes 50% of the total. Its share to the world total travel services exports has doubled in the past ten years. But it is still too low as compared to the East Asian nations 2% versus 10%. This figure reflects the importance of tourism in many African economies of which nearly half of them have significant tourism sectors that accounts for more than 2% of their GDP (PREM, 2010).

In contrast, other commercial services accounted for the largest share of Africa's services imports with 48% of the total in 2007, followed by transportation services with 39% and

travel services with 17%. Africa is running a substantial surplus on trade in travel services and large deficits in trade in transportation and other commercial services (PREM, 2010).

After looking at the African service as a whole it is worth mentioning few country level facts of trade in services. Different countries in Africa have dissimilarities in terms of their exports and liberalization levels.

For instance, regarding the functioning of services in the nations, Cote d'Ivoire is a nation that has fully developed its trade in services with an increasing volume of exports (Meleu & Nouhoun, 2008). On the contrary, Congo, where the recurrent wars have blown the service sector in the country and currently, it is a net importer of services (Tsatssa & Kimpolo, 2008).

In Ethiopia, the service trade is attributed to the airline service which consists of more than 50% of the total service exports. The export and import of Ethiopia are dominated by Mode 1 services that account for more than 75% in terms of both import and export. Despite this fact, this share is decreasing through time while Mode 2 is increasing but still marginal (Alemayehu & Daniel, 2008). Kenya's service is also dominated by Mode 1 followed by consumption abroad. Its tourism contributed to 8.7% of its GDP and is expected to grow by 5.6% till 2012. In 2001 it showed a decline to 0.12% from 0.17% in the previous year due to the world wide terrorism that has been threatening tourism (Ikiara, Nyandemo, & Ikiara, 2008). Unlike Ethiopia and Kenya, Nigeria earns the largest foreign exchange from Mode 3 services followed by Mode 1 (Bankole, 2008).

2.3 The Gravity Model and its Applications on Trade in Services

Various researches have been conducted in order to identify the best model that explains the trade in services. Along the way, some scholars have tried to assess the applicability of the gravity model on services' trade as it is applicable to the goods' trade.

The gravity model is originally inspired by Newton's law of universal gravity equation in physics. It states that the volume of trade between two nations is proportional to the product of their masses which is their GDP in this case and inversely related to the distance between them. Tinbergen (1962), Pöyhönen (1963) and Linneman (1966) initiated the application in the analysis of international trade (Anderson & Wincoop, 2003) (Grünfeld & Moxnes, 2003) (Linders & Groot, 2006) (Egger & Pfaffermayr, 2003).

Mathematically,

$$F_{ij} = G \frac{M_i M_j}{D_{ij^2}} \tag{2.1}$$

Where the F stands for attractive forces; M for respective masses; D for distance; and G for gravitational constant.

Dragging this to the international trade study,

$$X_{ij} = K \frac{Y_i^{\alpha} Y_j^{\beta}}{T_{ij}^{\theta}} \tag{2.2}$$

Where the X_{ij} stands for exports from i to j; or total trade (i.e. $X_{ij}+X_{ji}$); Y for economic size (GDP, POP); and T for Trade costs which might include distance, adjacency, common

language, colonial links, common currency, island, landlocked, institutions, infrastructures, migration etc (Paas, 2000) (Fitzsimons, Hogan, & Neary, 1999).

This model is acknowledged for its empirical effectiveness in having sensible parameter estimates and explaining a large part of the variation in bilateral trade. Despite this fact, it is criticized for not having a theoretical foundation (Grünfeld & Moxnes, 2003) (Linders & Groot, 2006) (Anderson & Wincoop, 2003) (Egger & Pfaffermayr, 2003).

But (Evenett & Keller, 2002) assert that since Anderson (1979), the gravity model has been increasingly recognized that it can be derived from very different models, including the Helpman and Krugman, and the Heckscher-Ohlin model, which have common characteristics.

Although (Deardorff, 1998) disagrees with the claim over the absence of theoretical foundation of the gravity models, he suspects its use for empirical tests because of its trial to characterize a large class of models mentioned earlier. But he affirms that it is not difficult to justify the gravity equation from standard trade theories. This is why (Evenett & Keller, 2002) declare this issue to be an empirical challenge that is referred to as a model identification problem because it could be easily applicable if it could be determined which theory actually accounted for the success of the gravity equation in a given sample of data.

Basing these arguments, different researches were undertaken using the gravity model on services as they are applied on the goods trade. Grünfeld and Moxnes (2003), using the OECD data tested the application of gravity model on trade in services and found

out that the standard gravity model effects on goods apply to services too. Their results showed trade between two countries is positively influenced by their size which is their GDP while the distance between them and trade barriers affect negatively (Grünfeld & Moxnes, 2003).

Using the same source of data, (Kimura & Lee, 2006) applied the standard gravity framework to services trade with the inclusion of adjacency and language dummies with the same objective as the former ones. The findings of this study emphasized that the distance between the two partnering nations is much more important than it is for goods trade, which shows that there exists a higher transport costs for services. Regarding the variable adjacency, unlike for the goods' case, it does not influence the services' trade (Kimura & Lee, 2006).

(Lejour & Verheijden, 2004) analyze the bilateral trade between the provinces of Canada and between the member states of the European Union. In their conclusion the gravity equation explains the variability in trade in services very well. It found out that distance has a lesser hindrance effect on the services trade than that of for the goods trade. Differences in languages and the regulation of product markets hinder services and goods trade in Europe.

(Lennon, 2006) found out that the effects of variables related to physical geography, namely distance, contiguity and landlocked status have insignificant effect on trade in services. On the other hand, the variable language has a significant effect as it reflects its impact trough cultural harmony and access to similar information.

Finally considering (Walsh, 2006) paper, which assured that the standard gravity framework explains the determinants of services well, has more or less similar findings to the other results. The GDP per capita of the importing and exporting countries and a common language are found to be the most important determinants of trade between two countries while distance, adjacency and membership of the European Union are not found to be significant as in the goods trade.

From the literature surveyed, it is observed that Africa has a potential for services. It is also put that it is important for the growth of the continent in two ways; through encouragement of competition and by diversifying the export portfolio of the continent. So far the continent's services had shown dissimilarities in the pattern of the service trade amongst the nations. The non-oil exporting nations and the non-landlocked nations seem to have a greater share of the continents service trade. Therefore, it is important to identify the reasons and the factors that affect the service trade in the continent, so that it would be helpful to work on the solutions to hasten the growth of the service trade of the continent and thereby facilitate its economic growth.

For this purpose and for the fact that the gravity model is acknowledged for its empirical effectiveness, it is convincing that it should be applied to study the determinants of the bilateral trade in services of the African nations with the other partners from the rest of the world. Backing up this, the literature approves that gravity is applicable for the services' trade as it is for the goods trade. For these reasons, it is

possible to implement the gravity model in this research work to identify the determinants of trade in services in Africa, and as well as the direction of services trade.

CHAPTER THREE: DATA ANALYSIS

3.1 Data Source

The data used in this study is gathered from two major sources. The imports and exports of services of the African nations and the trading partners for the years 2003-2007 is obtained from the UN Service Trade database. Since the African nations do not have a well organized reporting system, it is gathered using the mirror image of their trading partners from the rest of the world. That means, instead of using their direct reports of imports and exports, it is the report of their partnering nations. In this manner, the export of the partnering nation will be the import of the African nation while the import will be the export of the African nation.

The partnering nations are selected on their role in the global services trade. Nations that have more than 2% trade share in the global trade in services are used as partnering nations. These countries are 11 in number namely; Belgium, Canada, Hong Kong China, France, Germany, Italy, Japan, Netherlands, Spain, United States, United Kingdom. On the other hand, regarding the African nations, all the African countries that have taken place in the global service trade are considered in the study. All the selection of these nations is based on the UN Service Trade database.

The other source of data is the World Development Indicators database (WDI) 2008 and 2009 editions. GDP, GDP per capita, population, total labor force and other socio-economic indicators are taken from this source. The exchange rates for the respective years for all the nations are obtained from the World Bank online data base. Other data

sources such as the United Nations Statistics Division are used to supplement the data set. The rest variables such as the distance, colony, language and the likes are collected from the internet. The distance between the capitals of the two partnering nations is taken from the website http://www.distance fromto.net/ (see Table A1).

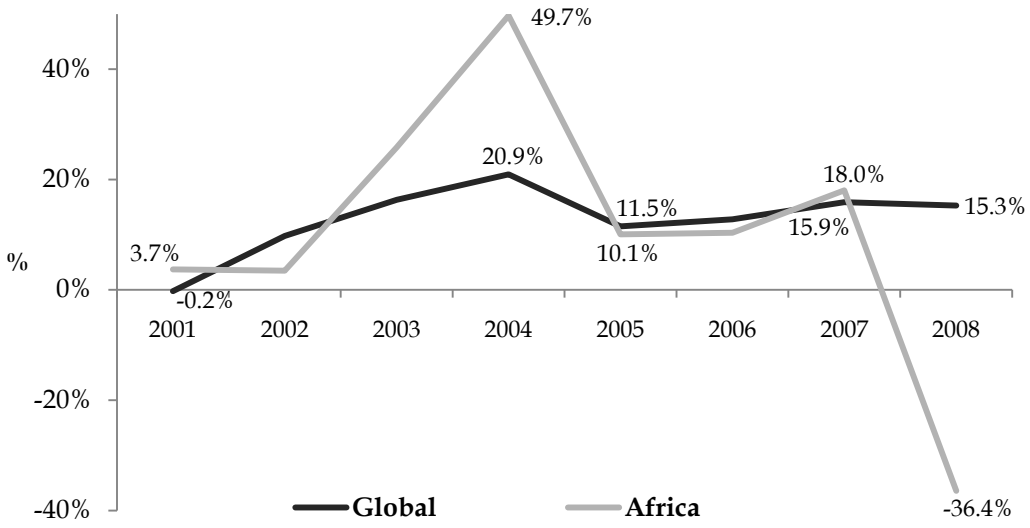
3.2 Performance of the African Service Sector in the Global Trade in Services

Trade in services has shown distinct noticeable patterns over the past decade. According to Karsenty (2000) cited in (Grünfeld & Moxnes, 2003), mode 1 and mode 3 trade dominate the pattern of international service trade, where each category represents approximately 41% of total service trade and 37.8% respectively while trade of mode 4 is marginal. Mode 4 is where the strongest barriers of trade prevail.

In 2008, the total exports of services around the globe accounted for more than 3 trillion which has scored a 15% increment than the previous year (see Figure 3.1)[1]. In this year, the principal exporters of services were the United States, the United Kingdom, Germany and France. Their export share to the global total exports was 14.14%, 7.48%, 6.41% and 4.18% respectively. Following the same pattern, Africa's service trade could sustain its encouraging growth until 2007 which was 15.9%. But in 2008, Africa experienced a sudden downfall of nearly 36.4% from the previous year.

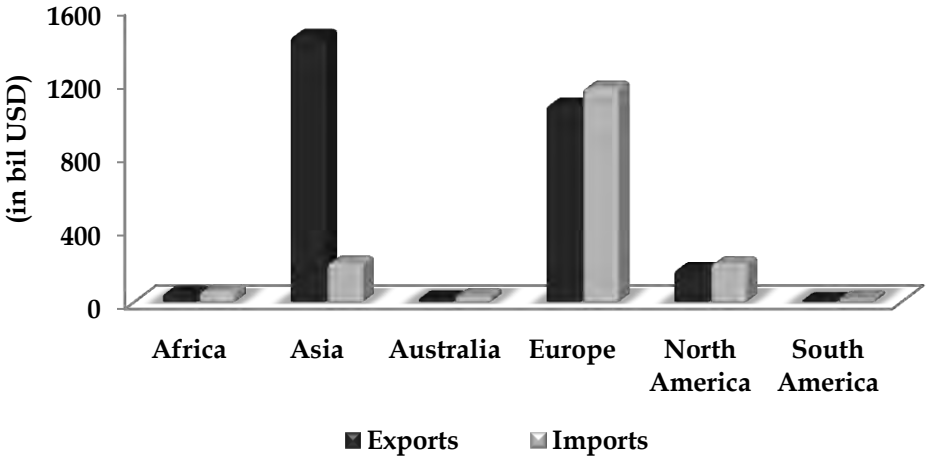
[1] Source: UN Service Trade, own computation

Figure 3.1: Growth Rates of Exports of Services (2001-2008)



On the aggregate level in 2008, the global export share of services was dominated by Asia and Europe while that of imports was by Europe followed by North America and Asia with a wider margin. Considering the share of Africa in terms of both the exports and imports, it shows that it was at its infancy stage (see Figure 3.2)[2].

Figure 3.2: Global Trade in Services Shares of the Continents in 2008

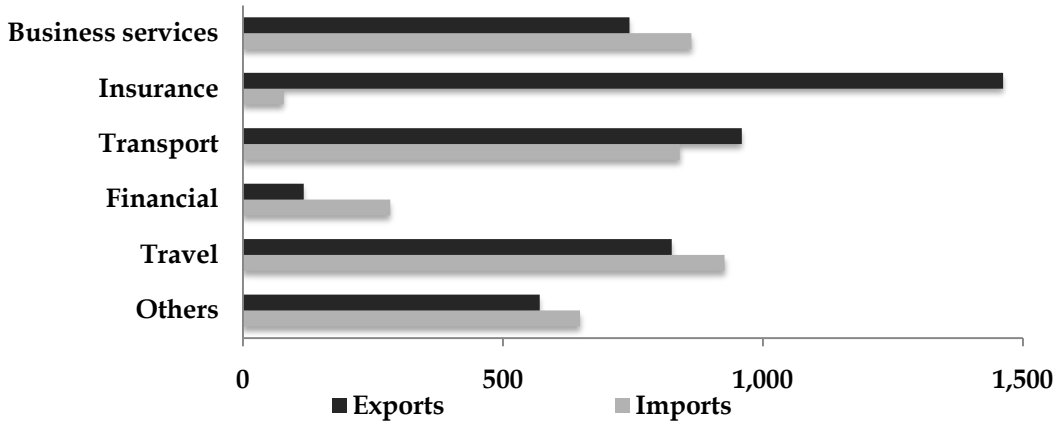


[2] Source: UN Service Trade, own computation

Sector wise, the trade shares indicate that Africa is involved in dissimilar sectors than that of the whole world together (see Figures 3.3 a and b) [3] In 2008, it was the transport sector that takes the lion's share of Africa's service exports while the travel service sector takes the majority of the service imports of the continent. Globally, it is the insurance sector that dominates the exports of services. On the other hand, the transport sector, the business sector and the travel sector have nearly equal shares of the global service imports.

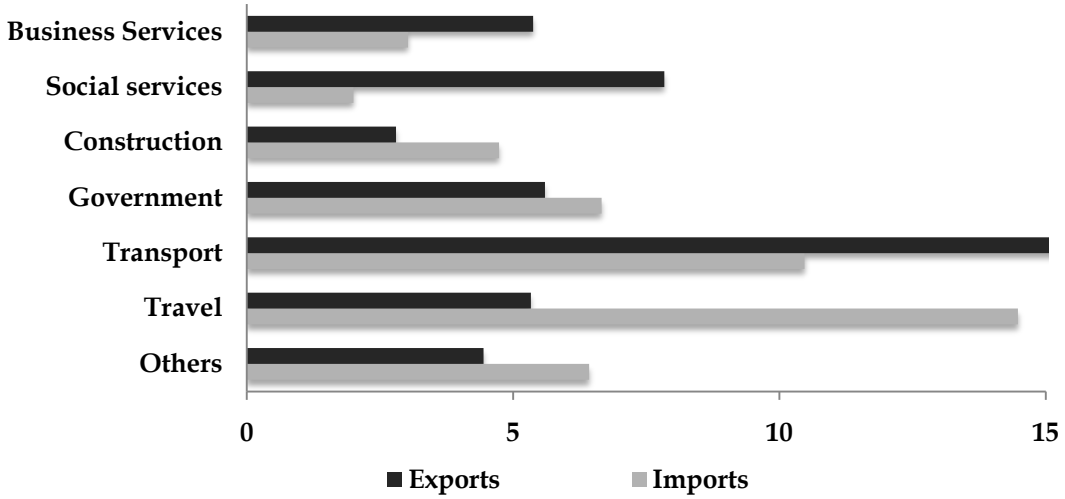
From the two graphs below, it is clearly observable that the financial and the insurance sector's share are minimal in Africa. This low share might be due to the level of technological advancement and lack of infrastructure that can accommodate these sectors. In addition to that, as discussed in (PREM, 2010) the banking sector is an expensive sector in Africa. It is possible to claim that most of the service types that Africa provides and receives are more of labor intensive such as social services, government services, transport and travel etc.

Figure 3.3 (a): Global Shares of the Major Service Sectors in 2008 (in billion USD)



[3] Source: UN Service Trade, own computation

Figure 3.3 (b): African Shares of the Major Service Sectors in 2008 (in billion USD)



3.3 Model Specification

This paper tries to study the major determinants of Africa's trade in services with the rest of the world that comprises the 11 nations listed in the data source section. Using this data, gravity model shown below is applied to see the major factors that determine the international trade in services of Africa.

$$X_{ij} = \beta_i \frac{Y_i^{\beta_1} Y_j^{\beta_2}}{T_{ij}^{\beta_3}} \tag{3.1}$$

Where the Xij stands for exports from i to j; or total trade (i.eXij+Xji); Y for economic size (GDP, POP); and T for Trade costs which might include distance, adjacency, common language, colonial links, common currency, island, landlocked, institutions, infrastructures, migration etc. (Paas, 2000) (Fitzsimons, Hogan, & Neary, 1999).

Transforming the above equation,

$$lnX_{ij} = ln\beta_i + \beta_1 lnY_i + \beta_2 lnY_j - \beta_3 lnT_{ij} \tag{3.2}$$

Based on equation (3.2), we can derive the following benchmark model to be estimated by expanding T_{ij}.

$$Y_{it} = \beta_i + X'_{it}\beta + \mu_{it} \quad (3.3)$$

Where: Y_{it} stands for the total imports and exports of services between two nations for year i. X'_{it} refers to the vector that consists of the following variables, GDP per capita, total labor force, exchange rate, total internet users and land-lockedness of the two partnering countries, as well as the distance, common language and colonial history between the two partnering nations

As the gravity model tries to explain the major reasons for a bilateral trade between two countries, this model tries to explain the major determinants of trade in services of Africa with the major trade partners of the world.

In this benchmark model, total labor force is used instead of the total population. This is because, it is important to see the effect of labor indicates productivity of the nation. Since we cannot employ both variables in one equation, we are forced to go for one variable and hence total labor force is chosen. Another variable, total number of internet users, is employed to serve as a measure for technological advancement level. This variable is chosen among other variables for two reasons. One, it has a significant contribution on the global trade in services, and two, for being among the major indicators of technological advancements. It is included for the African nations only because, for the partnering nations it is no more an issue. They have developed their technology that can be fully employed in the service sector. They have reached the stage

where they can supply and receive services from abroad (See (Friedman, 2006)). For this reason, it is believed that the effect of that variable can be seen only on the trade performance of the African nations where their technology is at infancy.

It is expected to obtain significant effects after the estimation of the parameters in equation (3.3) after all the necessary tests being undertaken. It is hypothesized that the mass of both partnering nations, which is the GDP per capita of the African nation and the rest of the world in this case, to have a positive and significant effect on the total service trade value between two nations, all other factors being constant. The same is true for the respective total labor force, total number of internet users, usage of common language between the two nations and if one nation, particularly the African nation, was a colony of the other partnering nation.

On the contrary, the other variables, such as exchange rate, being land-locked and distance between the capitals of the two nations are expected to have a negative effect on the total service trade value between the two nations. But being land locked and distance are not expected to have a significant effect, because unlike the trade in goods, service does not require transportation cost and other costs that will be exacerbated because of the lack of proximity of the two partnering nations.

3.4 Data Exploration

Before going into the estimation of an econometric model it is crucial to explore the statistical characteristics of the data set. (Mukherjee, White, & Wuyts, 1998) state data exploration as a pre-requisite for good model formulation and econometric estimation.

It is important to know the pattern of the data in order to model it in a mathematical form. They indicated the three major techniques that are comprised in data exploration and inference, namely, graphical inspection, data transformation, and diagnostic Analysis. Subsequently, the data exploration and estimation are done based on the techniques aforementioned.

The graphical inspection is made on the major variables that are included in the gravity model mentioned in equation (3.3). Accordingly, the two way scatter plots for the variables reflect that almost all variables are concentrated near zero, their peaks being highly dispersed. For instance, the total trade in services between two countries has most values concentrated near zero. The peaks are also highly dispersed. This might be due to the difference in trade diversification and as well as the difference in the level of development that is attributed to the African nations. This is also reflected in the scatter plot diagram for the GDP per capita of the African nations. It exhibits a similar pattern where most values are concentrated near zero with highly dispersed peak values.

As discussed above, since the data includes all African nations, the difference in the level of development, growth rate and national income has a weighty effect. Here it is noteworthy to mention that this variation prevails among the nations of Sub-Saharan Africa, South Africa and the countries from North Africa. Consequently, the variable that contains number of internet users in Africa shows the same pattern which can be affixed to the same reason. One thing that is worth mentioning here is that the peak values start to get dispersed after the midpoint of the time frame which is after year

2004. This might be due to recent developments in technological innovations and developments (See Figures A2-A7).

The variables representing total population of Africa and total labor force of Africa have plots which are scattered uniformly. The same is true for the total population of the partnering nations and their total labor forces. Unlike the GDP per capita of the African nations, the per capita GDP of the partnering nations show a uniformly scattered plot. This might be because of the fact that the nations included in this variable are well developed and more or less in a similar development stage registering similar growth patterns. Subsequently, the variable representing the total number of the internet users of these nations has also a uniformly scattered two way plot.

Following this, it is important to closely study the summary statistics of the variables. According to the reported summary statistics in Table A3, most of the variables, except the GDP per capita of the partnering nations, happen to have positively skewed and leptokurtic distribution which lacks kurtosis. For instance, total trade value has skewness and kurtosis of 4.28 and 25.69, respectively. Similarly, GDP per capita of the Africa has 3.64 and 22.62 skewness and kurtosis, respectively. This means both variables have positively skewed and leptokurtic distributions.

Regarding the variability of the variables, they show variability that ranges from 2.22 being the maximum for total trade value to 0.2 being the minimum for per capita GDP of the partnering nations.

After all these inspections, it is necessary to test if the samples of the variables are drawn from a normally distributed population. To assess this, box plot and the Jarque-Bera test for normality can be employed.

The box plots except that of the GDP per capita of the partnering nations and their total number of internet users, reveal that the variables have some degree of skewness. In addition to their non-normal distribution, they also contain outliers. But those two variables seem to be drawn from a normally distributed population even though they appear to have outliers (See Figures A14-A20).

The other method to test normality is the JB test, which is a popular LM test (Verbeek, 2004). The test statistic can be computed as,

$$LM = T(\frac{b_1}{6} + \frac{(b_2-3)^2}{24}) \quad (3.4)$$

Where; $\sqrt{b_1} = \frac{\mu_3}{\mu_2^{3/2}}$ and $b_2 = \frac{\mu_4}{\mu_2^2}$ which represent the skewness and kurtosis coefficients respectively. T stands for the sample size of the respective variable (Jarque & Bera, 1980).

The null hypothesis is that the calculated LM value to be zero. This means, in order to satisfy normality, the skewness has to be 0 and the kurtosis must be 3 so that there will be no excess kurtosis.

H_o: $b_1 = 0$ *and* $b_2 = 3$, *against*

H_1: *Not* H_o

(Jarque & Bera, 1980) showed that the LM is asymptotically distributed as χ_2^2 and a test based on equation (3.3) is locally powerful. Based on this, the null hypothesis will be rejected if the calculated statistic is greater than the tabulated values of χ_2^2.

Looking at the results in Table A5, it is observed that all variables exhibit a p-value of 0.000 which forces us to reject the null hypothesis of skewness being zero and kurtosis being 3, to make the excess kurtosis zero, which is a typical property of normal distribution. Thus we can say that all the variables show that they are not normally distributed.

In order to overcome the problems regarding the distributional properties of the variables, it is better to use transformation. As recommended by (Mukherjee, White, & Wuyts, 1998), transformation of variables is among the three major techniques of data exploration and inference. According to these authors, transformation of a variable, particularly into logarithmic form, helps to show influential points in a very sharp manner and also corrects skewed variables into the right distribution towards normality which is relevant in the context of regression analysis.

In this paper, after all the data exploration is done, it is identified that there is a need to transform the variables into logarithmic forms. Logarithmic form is chosen over differenced form of variables, not only due to the need to correct their non-normal distributions, but also due to nature of the model. Gravity model's parameters are initially non-linear in parameters, while the classical econometric approach requires

linearity in parameters. Therefore, to suit that requirement it is important to use logarithmic forms of the variables included in the model, equation (3.3).

By doing so, the variables show an improvement in their distributions. The scatter plots for all variables reveal that the variables are uniformly scattered (see Figures A8-A13). The box plots indicate that most of the variables are now close to normal distribution (see Figures A21-A27). In addition, the JB test for the log values also show that they have improved than their distribution in levels (see Table A4 and A6). Therefore, in this paper we proceed with the log values of the variables for our further estimations.

3.5 Diagnosis and Estimation Procedure

In order to proceed with our estimation, we need to diagnose our estimation procedures so that it would be possible to identify which estimation technique fits our model and data well. Therefore, the important panel data tests are discussed accordingly.

i. Test for Poolability:

It is important to test the poolability of a data set before proceeding with the estimation process. It tests whether the coefficients are the same for all entities of the panel variable, which is the set of partnering nations in this paper. The test statistic goes as,

$$F_{obs} = \frac{{}^{(e'e-\sum e_i'e_i)}/_{(N-1)K'}}{{}^{\sum e_i'e_i}/_{N(T-K')}} \tag{3.5}$$

Using this test statistic we test the hypothesis H_o: $\beta_i=\beta$ for all i against not H_o. This is the standard Chow (1960) test extended from two regressions to the case of N regressions (Baltagi, 2008) (Baltagi, 2009).

Since the calculated value of the test statistics at 1% significance level is 0.45 which is less than the tabulated value, 1.37, we fail to reject the null hypothesis. Thus we can show that this test result proves the poolability of the data (see Table A7).

ii. Test for Fixed Effects:

We perform fixed-effects test in order to answer the question of whether to use fixed effect or pooled OLS. The test statistic according to (Baltagi, 2009) is;

$$F_{obs} = \frac{(RRSS-URSS)/(N-1)}{URSS/(NT-N-K)} \; H_o \sim F_{N-1,N(T-1)-K} \tag{3.6}$$

The null and alternative hypotheses are:

H_o: $\beta_{2003} = \beta_{2004} = \beta_{2005} = \beta_{2006} = \beta_{2007} = 0$

Against

H_1: There are time specific effects.

Using this test statistics, the calculated value does not allow us to reject the null hypothesis since it is less than the tabulated value at 1% significance level. Therefore we can conclude that there are no time specific effects (see Table A7).

iii. Hausman-Taylor Test for Fixed Versus Random Effect Estimation:

It is important to have a method for choosing between random effects and fixed effects by testing whether μ_i and x_{it} are correlated. Since FE is consistent and RE is inconsistent when μ_i and x_{it} are correlated, a statistically significant difference is interpreted as evidence against the random effects (Wooldridge, 2004).

(Hausman & Taylor, 1981) pinpointed that if the crucial assumption of cross sectional specification, which is the expectation of the disturbances given knowledge of the explanatory variables is zero, is violated the within, between, and GLS estimators are affected differently. For this reason it is important to test it using the following test statistic.

The Hausman test is a way of comparing two estimators; one which is consistent under both the null and alternative hypothesis and one which is consistent (and typically efficient) under the null hypothesis only. A significant difference between the two estimators indicates that the null hypothesis is unlikely to hold. The test statistics goes as (Verbeek, 2004):

$$Chi^2(k) = \left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right)' [\hat{V}\{\hat{\beta}_{FE}\} - \hat{V}\{\hat{\beta}_{RE}\}]^{-1} \left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right) \quad (3.7)$$

Where; *FE* is for fixed effects and *RE* is for random effects.

Under this test the hypotheses are:

H_o: Difference in coefficients is not systematic, against

H_1: There is a systematic difference in coefficients

Using this statistics, the calculated value is 11.36 with a p-value of 0.0778, which makes us fail to reject the null hypothesis that claims the difference in coefficients is not systematic at 5% (see Table A7).

iv. Test for Heteroskedasticity:

When the usual assumptions of homoskedastic disturbances and fixed coefficients are not met, the loss in efficiency in using OLS may be substantial and, more importantly, the biases in estimated standard errors may lead to invalid inferences (Breusch & Pagan, 1979).

Even though heteroskedasticity does not affect the consistency of the estimators, it creates a minor trouble on inference. (Wooldridge, 2004) claims heteroskedasticity test as a means to justify the use of the usual OLS or 2SLS statistics.

A simple test for heteroskedastic disturbances in a linear regression model is developed using the framework of the LM test (Breusch & Pagan, 1979).

The null hypothesis in this test is H_o: homoskedasticity against not H_o. Based on this test, the calculated value which is very high and the p-value that is less than 0.01, show the existence of heteroskedasticity (see Table A7).

v. Test for Serial Autocorrelation:

When one or more explanatory variables are not exogenous and are correlated to the error term, it is said to possess serial autocorrelation. Ignoring this autocorrelation will result in consistent but inefficient estimates of the regression

coefficients and biased standard errors (Baltagi, 2008). For this reason it is important to undertake the test for autocorrelation.

The null hypothesis is

H_o: no first order autocorrelation, against

H_1: Not H_o.

The test statistics indicate the prevalence of serial autocorrelation because the calculated F-statistics result at 1% significance level is greater than the tabulated value (see Table A7).

vi. Test for Endogeneity:

As recommended by (Verbeek, 2004), since the Hausman test is a way of comparing two estimators, we can apply this test to identify if there is endogeneity or not.

$$Chi^2(k) = (b - B)'[\hat{V}\{b\} - \hat{V}\{B\}]^{-1}(b - B) \quad (3.8)$$

Where:

b = consistent under H_o and H_1; obtained from IV regression

B = inconsistent under H_1 and efficient under H_o; obtained from OLS regression

Under Hausman test for endogeneity the null and alternative hypotheses are:

H_o: Difference in coefficients is not systematic, against

H_1: There is a systematic difference in coefficients

The suspected variables that would exhibit endogeneity, which are the per capita GDPs of the two countries are estimated using instrumental variables. The instrumental variable is chosen to be the differenced lag variable of the respective variables mentioned. (Hsiao, 2003) says that the lagged or lagged difference of variables are correlated with the variables but are uncorrelated with the error tems. Therefore, they can be used as instrumental variables. This way of finding instruments is also backed by (Roodman, 2006), stating that for random walk like variables, differences of lagged variables may be more predictive of current levels than past levels are of current changes, so that the new instruments are more relevant.

Based on the test statistics the computed value is less than that of the tabulated value at 1% significance level. This makes us fail to reject the null hypothesis indicating that there is no endogeneity (see Table A7).

Based on all these tests, it is observed that serial autocorrelation and heteroskedasticity prevail. In view of the fact that looking into the effects of time invariant variables, such as colonization and common language is imperative, the random effects are preferred to fixed effects. Given that and since GLS accounts for first order autocorrelation and heteroskedasticity it is chosen over all other estimators.

3.6 Estimation Results and Interpretation

As discussed in the previous sub-section, GLS is used to estimate the gravity model specified under equation (3.3). The dependent variable is log of total trade value of

services between two countries, one country being from Africa and the other partner being from the top 11 service exporters in the global service trade. The data set that is used in this study is gathered for the years 2003-2007, five years period. It is a strongly balanced panel data set, where each set of partnering nations has information of the 5 years mentioned.

From the estimation result, we note that overall, the variables in the model are jointly significant. It is tested using the Wald test statistic which is computed to be 381699.63 with a p-value of zero at 1% significance level. It is worth noting that the number of observation has declined from 810 to 793 due to existence of missing values in some of the variables.

Most of the estimates are as per the expectations which were based on the literature on gravity model. All variables, but log of exchange rate of Africa, show significance at 1% significance level. The log of exchange rate of Africa is significant at 5% significance level.

From the estimation result, it is observed that a 1% increase in the GDP per capita of the two partnering nations, the African nation and the partnering nation, will increase the total service traded value by 0.59% and 0.49% ceteris paribus, respectively. Hence, here it is observed that the respective GDP per capita have positive and significant effects on value of trade in services of Africa. This indicates that service is highly affected by GDP. (Mann, 2007) classify service as price and income elastic, claiming it as superior or special product. This is what we can drag from the finding of the gravity model

estimated in this paper. As nations develop, as their income increases they tend to demand for services and therefore be involved in service trade.

Table 3.1: Estimation Results of the Log Transformed Variables

Independent Variable	*Coefficient*	*z-ratio*	*p-value*
LOG of GDP per capita of the African nation	*0.594154*	*13.79*	*0.000*
LOG of GDP per capita of the partnering nation	*0.4888409*	*5.38*	*0.000*
LOG of total labor force of the African nation	*0.5524925*	*13.94*	*0.000*
LOG of total labor force of the partnering nation	*0.3385375*	*8.83*	*0.000*
LOG of exchange rate of the African nation	*-0.030594*	*-2.06*	*0.039*
Land lockedness of the African nation	*-0.6056608*	*-7.45*	*0.000*
Usage of the same language	*0.8817897*	*7.86*	*0.000*
Presence of colonial history	*0.7899815*	*7.19*	*0.000*
LOG of distance between the capital cities	*-0.7647396*	*-13.34*	*0.000*
LOG of total internet users of the African nation	*0.0849973*	*3.04*	*0.002*
Number of observations = 793			
Number of groups = 160			
Wald $chi^2(10)$ = 381699.63			
Prob > chi^2 = 0.000			

Considering the labor force, total labor force has a positive and significant impact on services trade. A 1% increase in the labor force of Africa tends to increase the total services value by 0.55% while that of the partnering nations have a 0.34% effect, all other factors being equal.

The other two variables that have a positive impact are the dummies of common language and colonial history. If the partnering nation was a colonizer of the African nation, the total service trade between the two nations is will increase by 0.79%, ceteris paribus. In relation to that, if the two nations have the same official language, the total service trade is likely to increase by 0.88%, other factors being constant. It is evident that the former colonizers are still intact with their ex-colonies in terms of economic and political affairs.

From the results' table, as a nation's total number of internet users' increase by 1%, which is used as an indicator of technological advancement, other factors remaining unchanged, the total services trade will increase by 0.09%. An increase in a country's Internet access will facilitate an increase in its service trade with other countries (Choi, 2010). Internet facilitates trade in services by reducing transaction costs. According to (Mann, 2007), cheaper Internet and information technology, digitization, and codification of information allow tasks to be separated so that they would create both domestic market and international outsourcing. (Freund & Weinhold, 2002) concluded that the internet will affect growth directly through its impact on productivity.

The effect of devaluation on the service trade is as per the expectation. A 1% increase in the exchange rate of the African nation will reduce the total value of services traded between two nations by 0.03%, ceteris paribus.

The distance between the capitals of the two partnering nations is showing unexpected result. Theoretically, distance is expected to have a negative impact on trade in goods

and services in general. But specifically for trade in services, that is not expected to happen. Under this estimation, it has a negative and significant effect on the dependent variable. As the distance between the two partnering nations increases by 1%, total value of services traded will decline by 0.77%.

Another variable that is showing unexpected significance is land-lockedness. If an African nation is land locked, its trade in services will decline by 0.61% than those African nations that are not landlocked, other factors being equal. These two variables indicate that most of the services traded in Africa are more of labor intensive that require physical movement. As it can be seen in Figure 3.3 (b), most of the services involved in Africa are the likes of travel, transport and construction, which require labor power.

CHAPTER FOUR: CONCLUSION AND POLICY IMPLICATIONS

4.1 Conclusion

Trade in services in Africa, being at its infancy stage is positively influenced by the nations' per capita GDP and the number of total labor force that they possess. In addition to these variables, an expected indicator, which is advancement of technology that is reflected through the total number of internet users positively affect the trade in services in Africa.

Colonial history and common language between the two partnering nations has also a positive contribution to the trade in services. This is an interesting finding in a way that it reflects the pattern of Africa's trade in services. We can see that most of the African nations trade with their ex-colonials for different reasons. One reason might be the fact that the cultural similarity that was inherited during the colonial period that makes the African nations to do things in a way that their former rulers used to do. The other factor might be the similarity of language, which has originally been introduced by the ex-colonial masters. The language dummy has depicted this by itself. Having the same language facilitates trade in services by reducing the cost of verbal communication as services unlike goods require a higher degree of communication.

Another reason might be the prevailing economic and political affiliation between the African nations and their ex-colonial rulers. It is evident that the colonizers are still concerned about their ex-colonies in Africa in every aspect. For instance, the ex-French colonies are still in connection with France. They have formed a union named Union

Monétaire Ouest Africaine (Monetary Union of West Africa) UMOA, whose members are West African French ex-colonies; they use a common currency that is pegged to the French franc. They have maintained a fixed bilateral exchange rate against the French franc since October 1948 (Macedo, 1986). These kinds of affiliations influence the trade patterns of the nations, as they tend to trade more with their ex-colonial nations.

Distance and land-lockedness has a deteriorating impact on trade in services. This is backed by (PREM, 2010) that the land-locked countries have a lower share of services as compared to those of the coastal nations. This might be due to their low level of income spectrum which results from their low level of overall trade that also includes trade in goods. Since the estimation result in Table 3.1 shows that an increase in GDP per capita will increase the trade in services; countries with low level of GDP will have a lesser trade in services.

In conclusion, African trade in services is positively influenced by its GDP per capita, labor force, internet facility, colonial history and common language while exchange rate, distance and land-lockedness weaken the services trade of the continent. Looking into the patterns of the trading partners, the countries are more affiliated with their former colonizers. This indicates that, there is a low level of diversification in terms of service destination.

4.2 Policy Implications

As suggested by (PREM, 2010), trade in services would be a very good potential for export diversification especially true for the landlocked nations whose opportunities to

diversify among manufactured goods are limited due to the high cost of transportation of goods.

So far, the excuse for the poor performance in international trade has been weak diversification of export in terms of export portfolio and destination (AfDB/OECD, 2010). According to (UNECA, 2010), it is the service sector that has a promising progress in diversifying its export portfolio, particularly the mode 4 that involves natural presence. This is justified by looking at the remittance earnings of the SSA which grew by 37.2% between 2000 and 2008 (UNECA, 2010).

As has been seen from the Figure 3.3 (b), there is a low level of service portfolio diversification, where most services are travel and transport. This being accompanied by the low level of diversification in terms of service destination, it verifies the relatively poor performance of the continents trade in services. To improve this situation, it is imperative to forward some policy implications.

Since the service trade requires skilled labor force for the production and delivery of the service, it is essential to train the abundant labor in the countries of Africa. This has been observed in the Asian nations such as India, where the unemployed are trained to take over the tasks of the western world. They are trained, not only the skill of operation but also the language, the native accent, so that they would imitate as native workers from the west (Friedman, 2006). Therefore, the African nations have to work on such trainings to take over the tasks of the rest of the world as the Indians did.

Along with this, access to the internet should be improved. In view of the fact that most of the service sectors, such as consultancy, financial service that includes banking and the works of audit, information transmission and telecommunication, can be done through the internet, it is mandatory to improve the access. That is why it is said that these services are at their stage of infancy. According to (PREM, 2010) developing countries are lagging behind the developed countries in the adoption and use of the most efficient technologies such as the internet. Africa, despite its low level of development, has to strive to improve its technological advancement.

The other possible way for Africa to improve the service sector is to alter its policy in terms of its service destination. It has to try to start trading with other nations, other than their ex-colonial affiliates. Above all it has to expand its intra-continental trade. More has to be done with regard to this aspect.

Looking into its benefits, the nations need to have a focused policy on trade in services. They need to regulate the market as they do for the goods trade. This includes recording and reporting the transactions in a timely manner and adjusting the trade policies in a way that they can be applicable for the service sector in the specific nation's context. Due to lack of proper measurement and recording systems, the intra-African trade in services may be significantly understated (PREM, 2010). The reason for this might be the economic structure of the continent, poor institutional policies, weak infrastructure, weak financial and capital markets, and failure to put trade protocols in place (AfDB/OECD, 2010). Therefore, it is important to work on its policy instruments.

A lot can be done to enhance the trade in services in Africa. Since this study cannot capture all the factors causes of the service trade in Africa, due to methodological differences and data inaccessibility reasons, further research has to be done in order to forward comprehensive policy recommendations.

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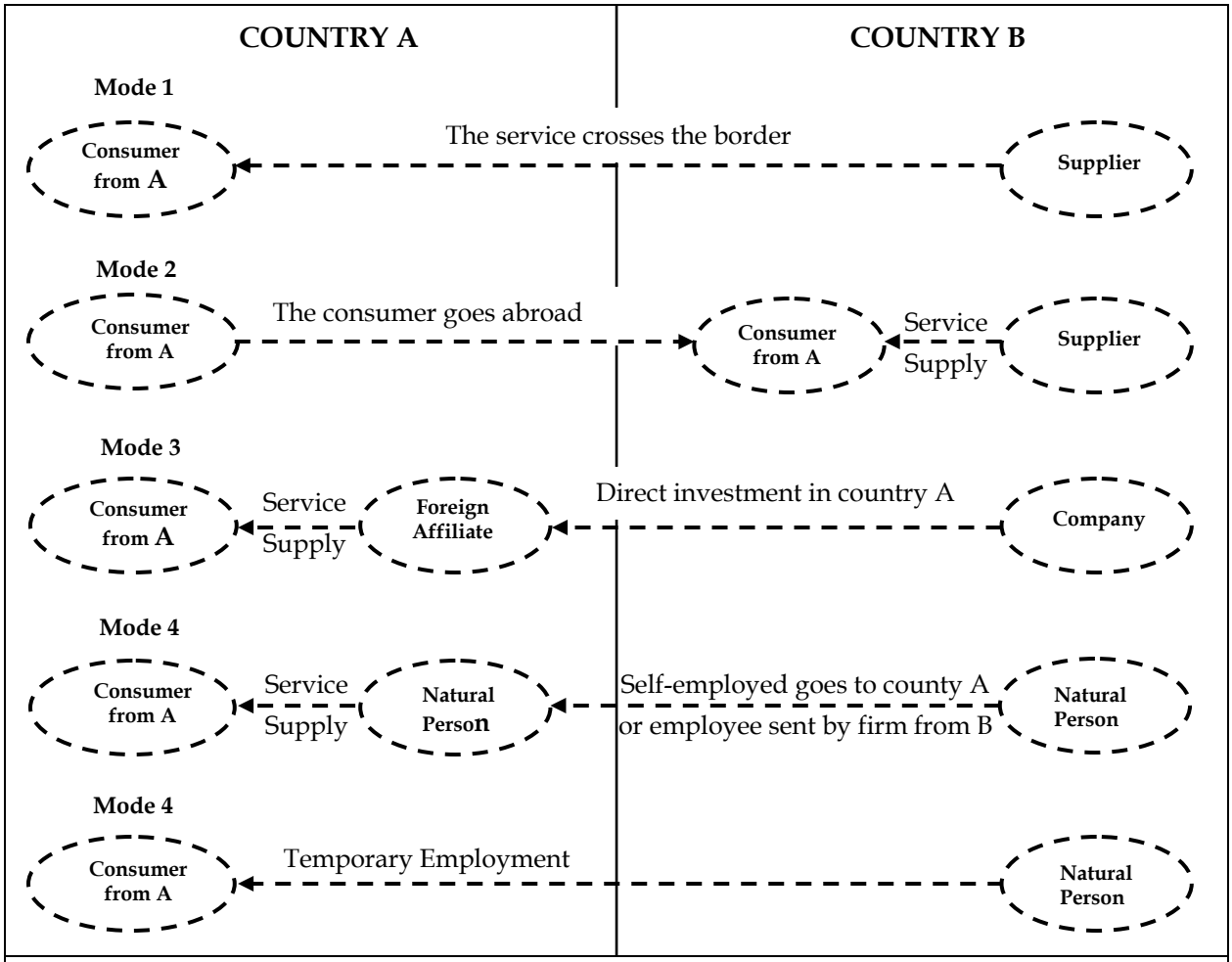
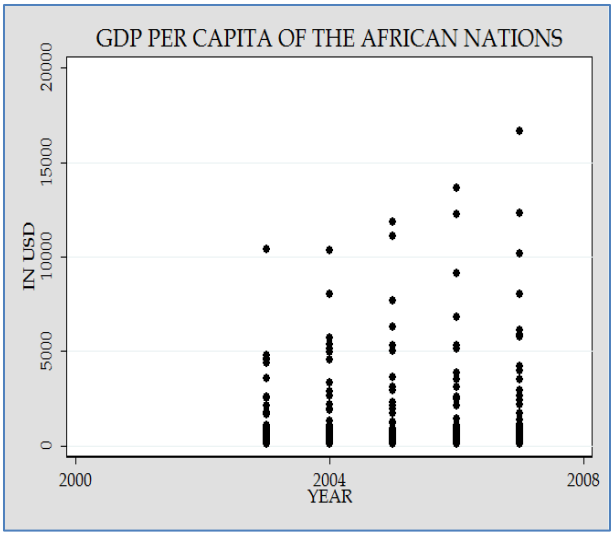
ANNEXES

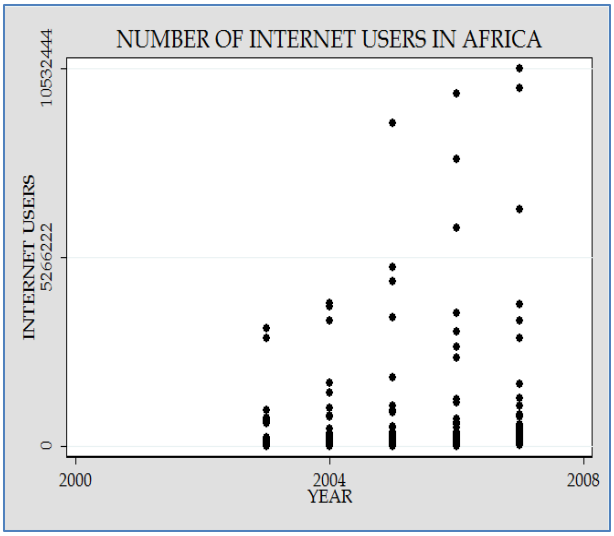
Figure A1: Modes of Supply of Services as GATS' Classification

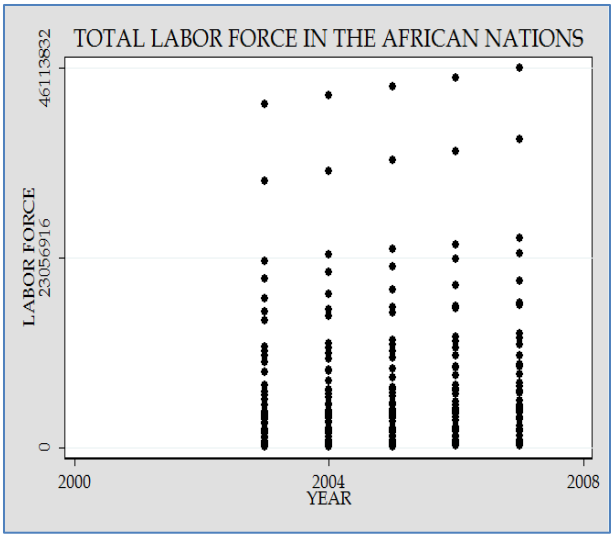


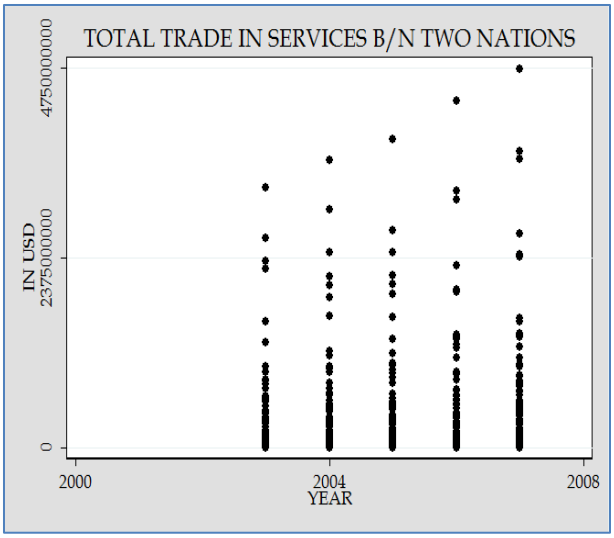
The four supply modes of international trade in services (Lindner et.al , 2001,p.6)

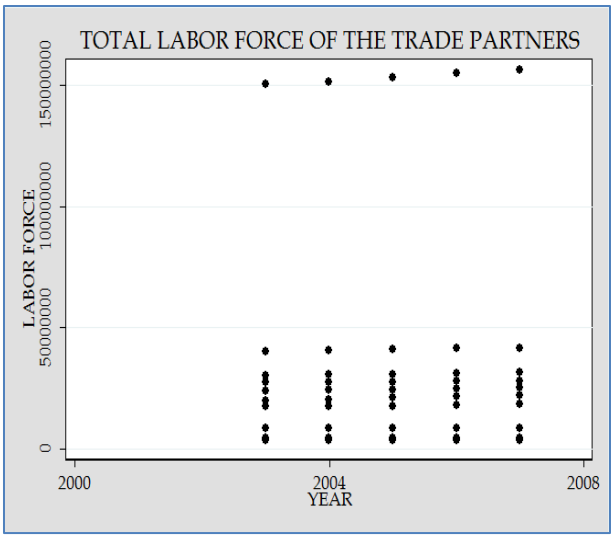
Figures A2-A7: Scatter Plots of the Variables in Levels

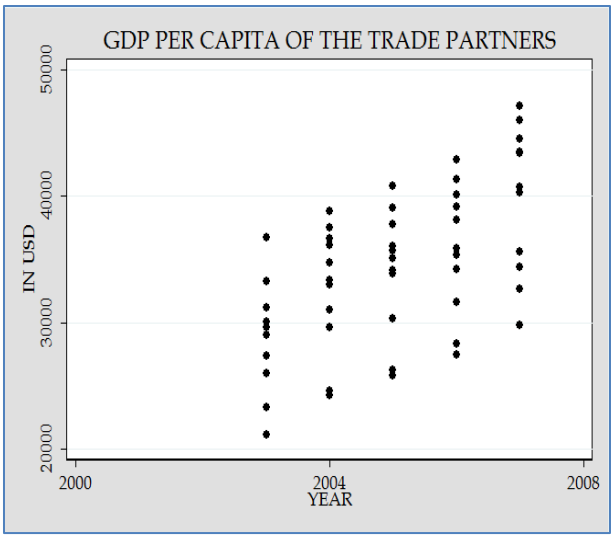




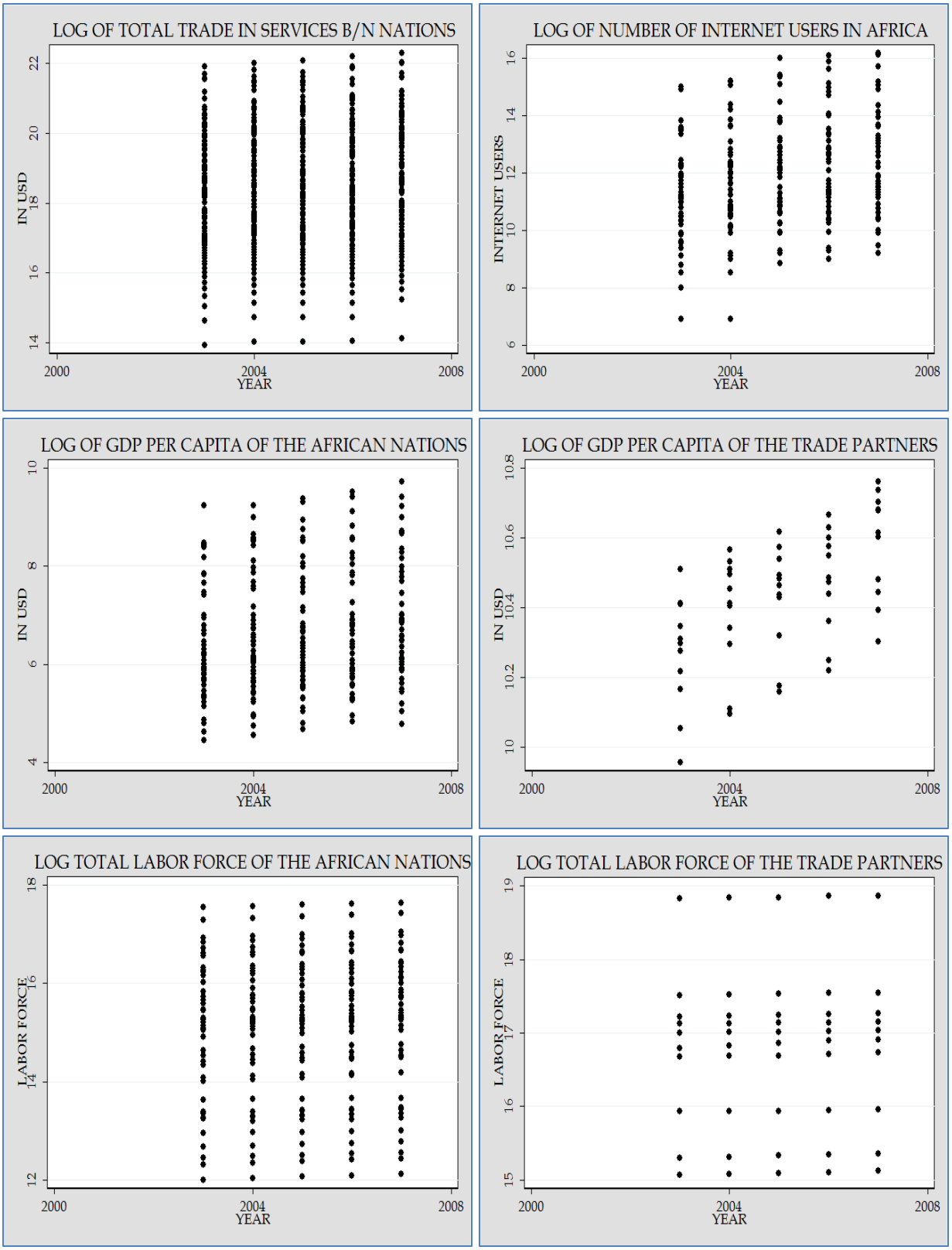




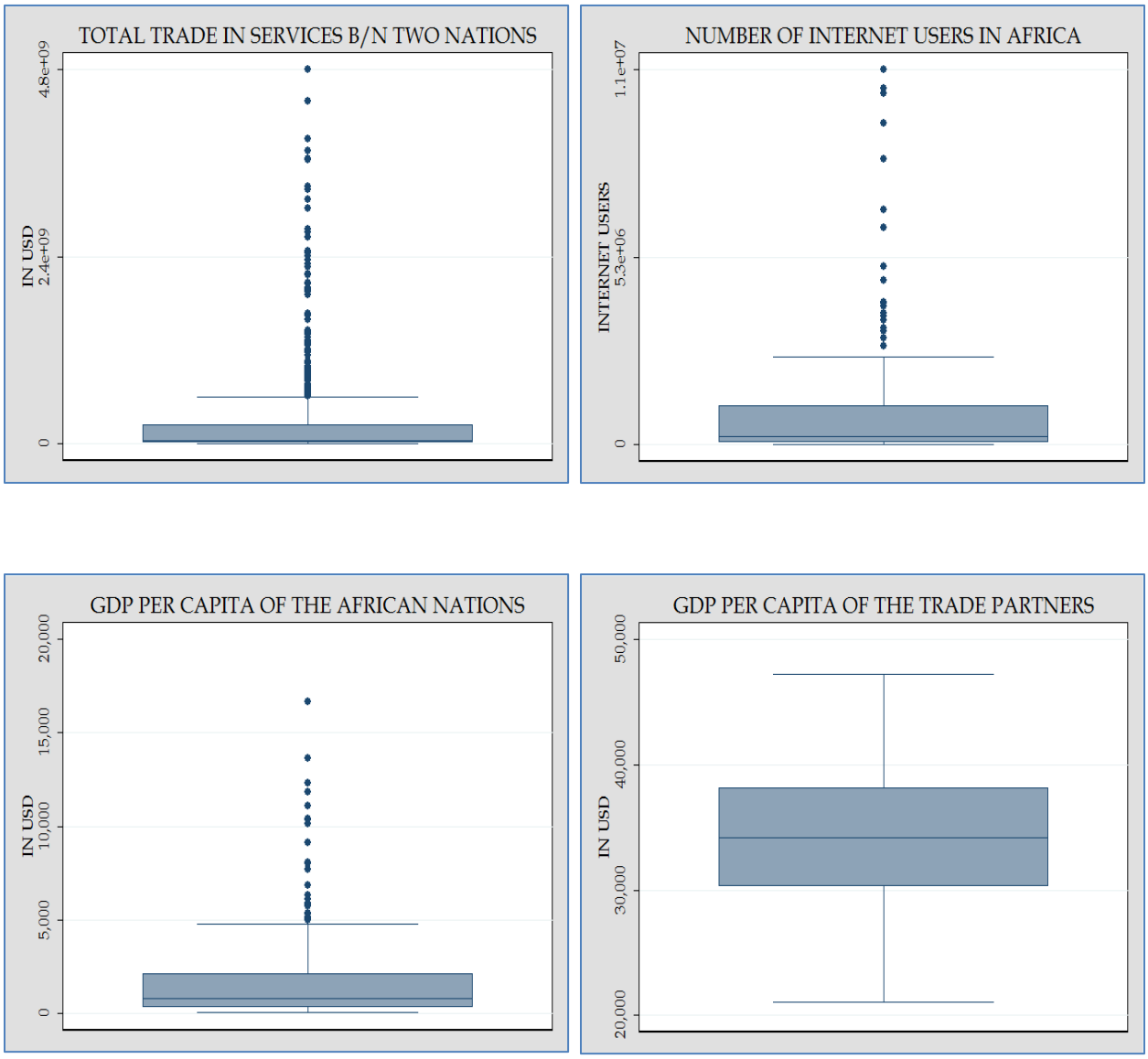


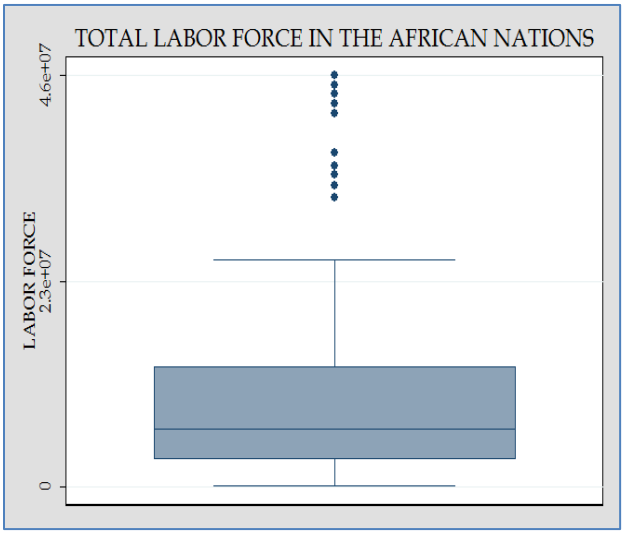


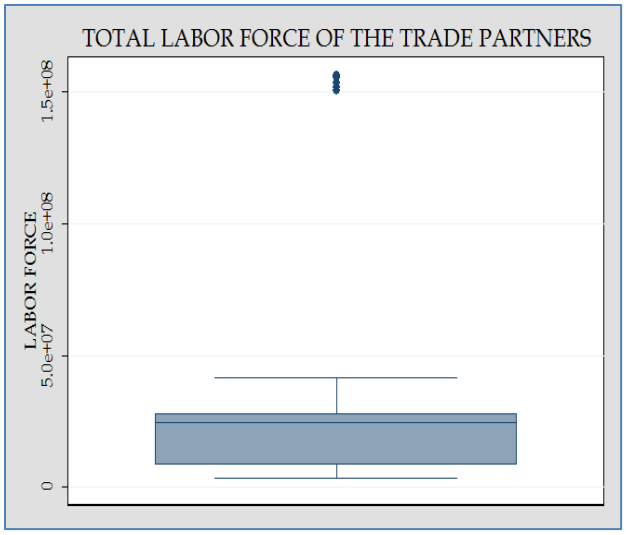
Figures A8-A13: Scatter Plots of the Variables in Logarithmic Form

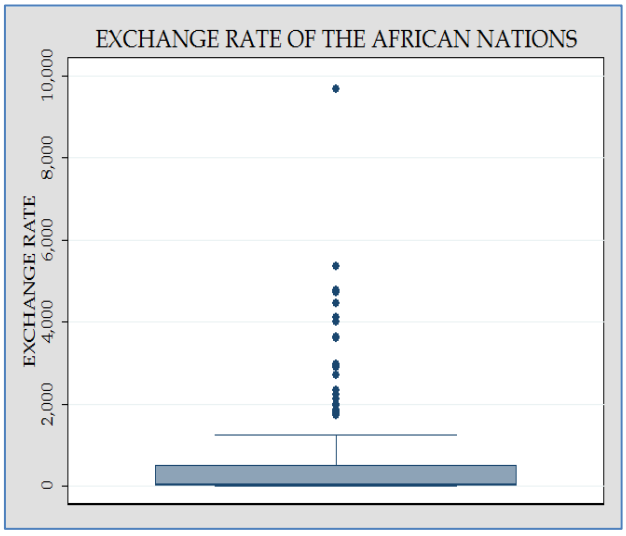


Figures A14-A20: Box Plots of the Level Variables

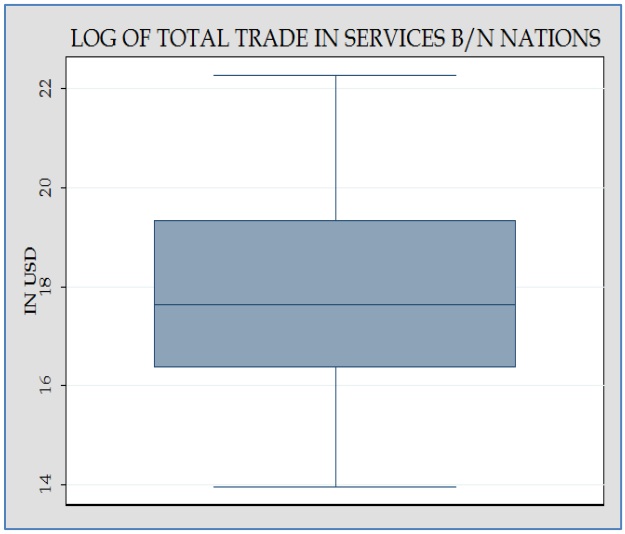


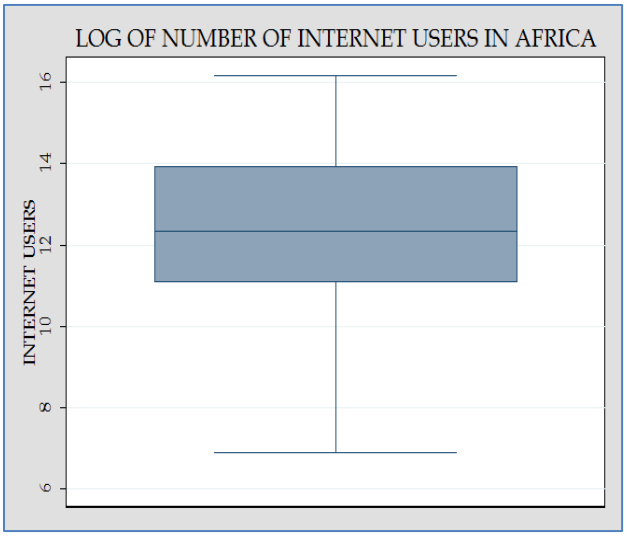

TOTAL LABOR FORCE IN THE AFRICAN NATIONS
LABOR FORCE
0
2.3e+07
4.6e+07

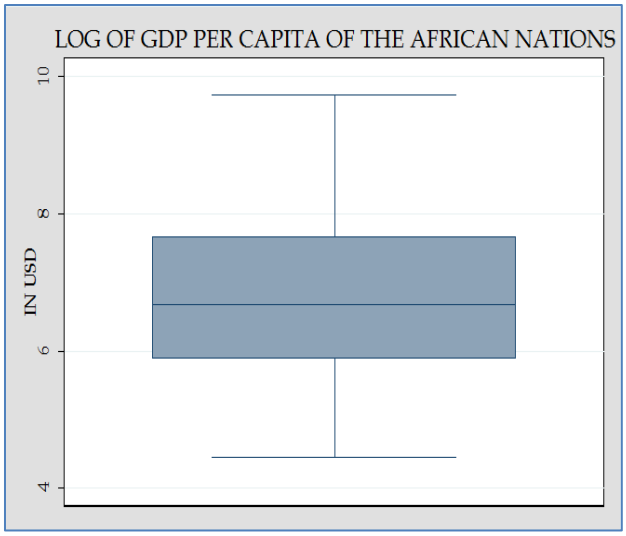

TOTAL LABOR FORCE OF THE TRADE PARTNERS
LABOR FORCE
0
5.0e+07
1.0e+08
1.5e+08

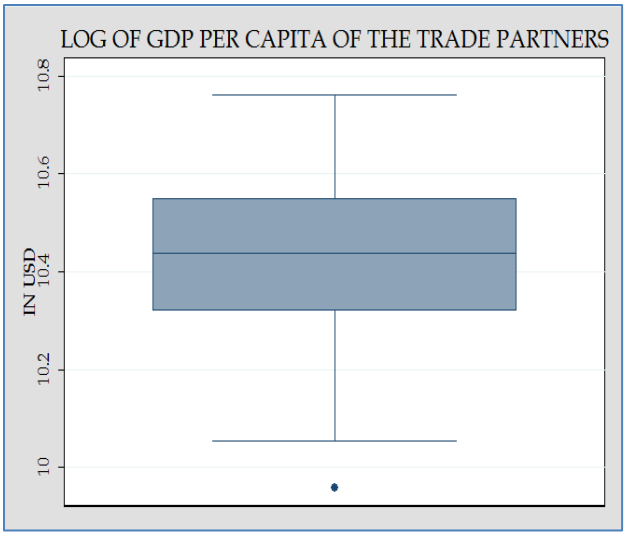

EXCHANGE RATE OF THE AFRICAN NATIONS
EXCHANGE RATE
0
2,000
4,000
6,000
8,000
10,000

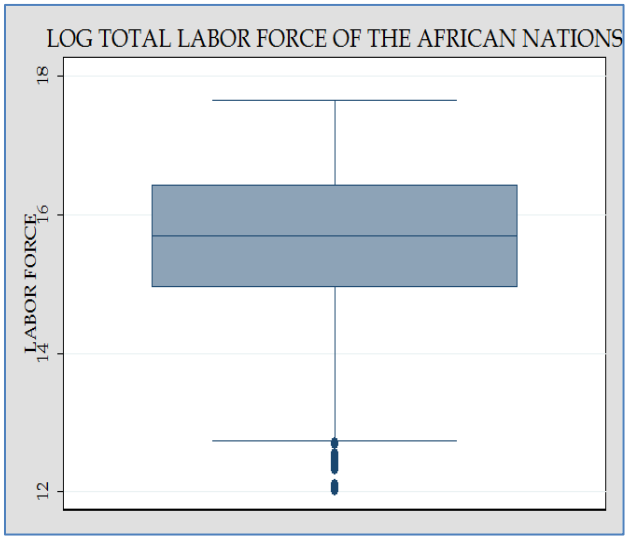
Figures A21-A27: Box Plots of the Variables in Logarithmic Form

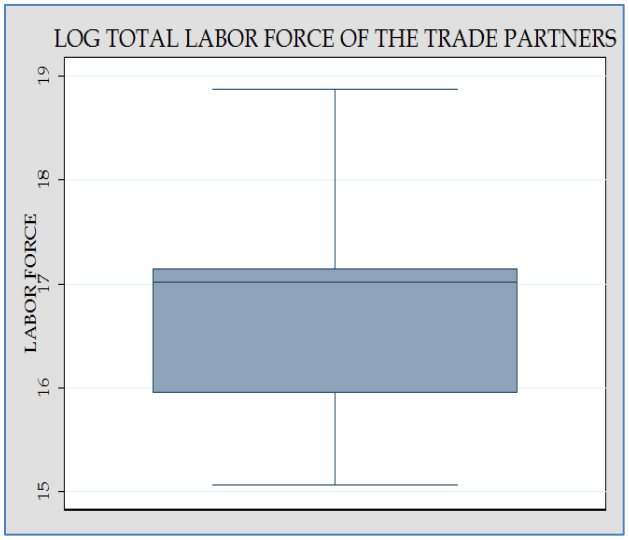


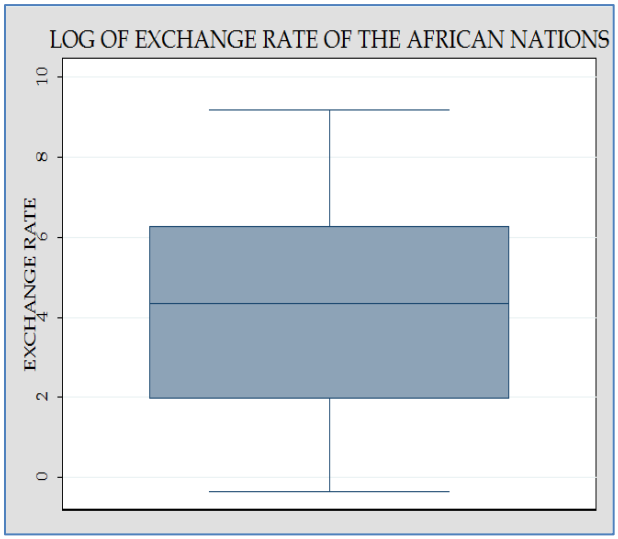




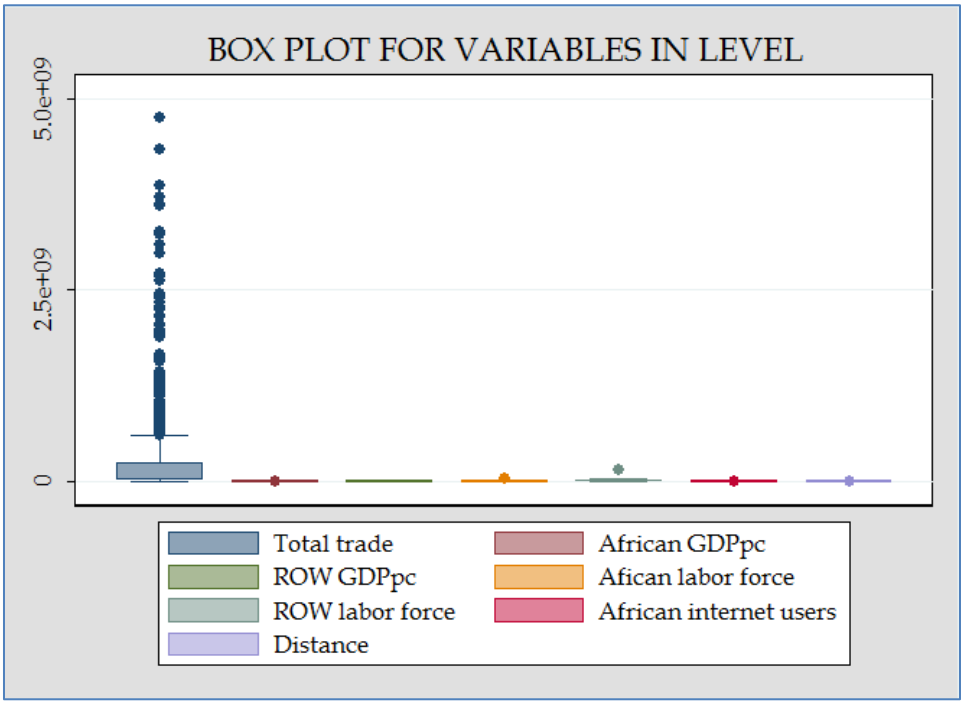



LOG TOTAL LABOR FORCE OF THE AFRICAN NATIONS
LABOR FORCE
12
14
16
18


LOG TOTAL LABOR FORCE OF THE TRADE PARTNERS
LABOR FORCE
15
16
17
18
19


LOG OF EXCHANGE RATE OF THE AFRICAN NATIONS
EXCHANGE RATE
0
2
4
6
8
10

Figures A28: Box Plot of the Level Variables



Figures A29: Box Plot of the Variables in Logarithmic Form

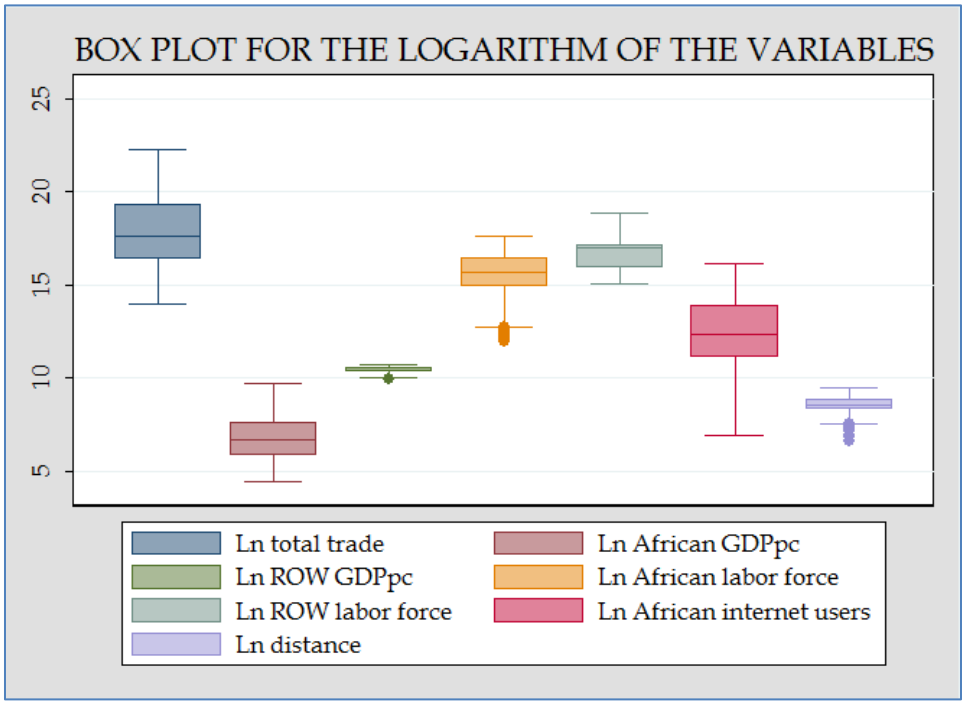


Table A1: Sources of Data

Variables	Source	Date of access
Imports and exports of services	http://unstats.un.org/unsd/ServiceTrade/default.aspx	2/20/2011
GDP per capita	http://data.un.org/Data.aspx?q=gdp&d=SNAAMA&f=grID%3a101%3bcurrID%3aUSD%3bpcFlag%3a1	12/6/2010
Exchange rate	http://data.worldbank.org/indicator/PA.NUS.FCRF?	12/10/2010
Distance	http://www.distancefromto.net/	12/27/2010
Labor force	World Development Indicators (WDI,2009)	-
Number of internet users	World Development Indicators (WDI,2009)	-

Table A2: Nations Used in the Estimation of the Gravity Model

LIST OF AFRICAN NATIONS				
Algeria	Congo Rep.	Ghana	Mauritius	South Africa
Angola	Cote d'Ivoire	Guinea	Morocco	Sudan
Benin	D. R. Congo	Guinea-Bissau	Mozambique	Swaziland
Botswana	Djibouti	Kenya	Namibia	Tanzania
Burkina Faso	Egypt	Lesotho	Niger	Togo
Burundi	Equatorial Guinea	Liberia	Nigeria	Tunisia
Cameroon	Eritrea	Libya	Rwanda	Uganda
Cape Verde	Ethiopia	Madagascar	Senegal	Zambia
Chad	Gabon	Malawi	Seychelles	Zimbabwe
Comoros	Gambia	Mali	Sierra Leone	

LIST OF PARTNERING NATIONS	
Algeria with Belgium	Madagascar with Italy
Algeria with France	Malawi with France
Algeria with Germany	Malawi with Germany
Algeria with Italy	Malawi with Italy
Algeria with Netherlands	Malawi with Netherlands
Angola with Belgium	Mali with France
Angola with France	Mali with Italy
Angola with Germany	Mali with Netherlands
Angola with Italy	Mauritius with Belgium
Angola with Netherlands	Mauritius with France
Benin with Germany	Mauritius with Italy
Benin with Netherlands	Morocco with Belgium
Botswana with France	Morocco with France
Botswana with Italy	Morocco with Germany
Botswana with Netherlands	Morocco with Italy
Burkina Faso with France	Morocco with Netherlands
Burkina Faso with Netherlands	Morocco with Spain
Burundi with Italy	Morocco with United Kingdom
Burundi with Netherlands	Mozambique with France
Cameroon with Belgium	Mozambique with Germany

Cameroon with France
Cameroon with Italy
Cameroon with Netherlands
Cape Verde with France
Cape Verde with Germany
Cape Verde with Italy
Cape Verde with Netherlands
Chad with France
Chad with Germany
Chad with Italy
Comoros with France
Congo Rep. with France
Congo Rep. with Italy
Cote d'Ivoire with Canada
Cote d'Ivoire with France
Cote d'Ivoire with Italy
D. R. Congo with Belgium
D. R. Congo with Italy
D. R. Congo with Netherlands
Djibouti with Italy
Egypt with Belgium
Egypt with Canada
Egypt with France
Egypt with Germany
Egypt with Italy
Egypt with Netherlands
Egypt with Spain
Egypt with United Kingdom
Equatorial Guinea with Germany
Eritrea with Germany
Eritrea with Italy
Mozambique with Italy
Mozambique with Netherlands
Namibia with Germany
Namibia with Italy
Namibia with Netherlands
Niger with Belgium
Niger with France
Niger with Netherlands
Nigeria with Belgium
Nigeria with Canada
Nigeria with France
Nigeria with Germany
Nigeria with Italy
Nigeria with Netherlands
Rwanda with Belgium
Rwanda with Germany
Rwanda with Italy
Rwanda with Netherlands
Senegal with Belgium
Senegal with Canada
Senegal with France
Senegal with Germany
Senegal with Italy
Senegal with Netherlands
Seychelles with Belgium
Sierra Leone with Germany
Sierra Leone with Italy
South Africa with Belgium
South Africa with Canada
South Africa with China, Hong Kong SAR
South Africa with France

Ethiopia with Belgium
Ethiopia with Germany
Ethiopia with Italy
Ethiopia with Netherlands
Gabon with France
Gabon with Italy
Gabon with Netherlands
Gambia with France
Gambia with Italy
Gambia with Netherlands
Ghana with Belgium
Ghana with Germany
Ghana with Italy
Ghana with Netherlands
Guinea with France
Guinea with Netherlands
Guinea-Bissau with Italy
Kenya with Belgium
Kenya with Germany
Kenya with Italy
Kenya with Netherlands
Lesotho with Italy
Liberia with Germany
Liberia with Italy
Liberia with Netherlands
Libya with France
Libya with Germany
Libya with Italy
Libya with Netherlands
Madagascar with Germany
South Africa with Germany
South Africa with Italy
South Africa with Japan
South Africa with Netherlands
South Africa with United Kingdom
South Africa with USA
Sudan with Belgium
Sudan with France
Sudan with Germany
Sudan with Italy
Sudan with Netherlands
Swaziland with Italy
Tanzania with Belgium
Tanzania with Germany
Tanzania with Italy
Tanzania with Netherlands
Togo with Netherlands
Tunisia with France
Tunisia with Germany
Tunisia with Italy
Tunisia with Netherlands
Uganda with Germany
Uganda with Italy
Uganda with Netherlands
Zambia with Germany
Zambia with Italy
Zambia with Netherlands
Zimbabwe with Germany
Zimbabwe with Italy
Zimbabwe with Netherlands

Table A3: Summary Statistics of the Level Variables

	Mean	*Standard Deviation*	*Skewness*	*Kurtosis*	*CV (Variability)*
Total trade value	276000000.0	581000000.0	3.80	20.28	2.11
GDP per capita of the Africa	1737.1	2196.3	2.32	9.87	1.26
GDP per capita of the partners	34860.1	5192.9	0.38	2.82	0.15
Total labor force of the Africa	9995080.0	10300000.0	1.68	5.68	1.03
Total labor force of the partners	22800000.0	16100000.0	3.28	27.86	0.70
Exchange rate of the Africa	449.2	991.2	4.89	35.32	2.20
Total internet users of the Africa	1295813.0	2291873.0	2.43	8.64	1.77
Distance b/n the capital cities	5567.3	2384.7	0.45	3.58	0.43

Table A4: Summary Statistics of the Log Transformed Variables

	Mean	*Standard Deviation*	*Skewness*	*Kurtosis*	*CV (Variability)*
Total trade value	17.9	1.9	0.22	2.26	0.10
GDP per capita of the Africa	6.8	1.2	0.27	2.13	0.17
GDP per capita of the partners	10.4	0.1	0.00	2.76	0.01
Total labor force of the Africa	15.5	1.3	-0.70	2.89	0.09
Total labor force of the partners	16.7	0.8	-0.51	2.30	0.05
Exchange rate of the Africa	4.2	2.4	-0.09	1.86	0.57
Total internet users of the Africa	12.6	1.9	0.08	2.47	0.15
Distance b/n the capital cities	8.5	0.5	-1.14	4.60	0.06

Table A5: Skewness/Kurtosis Tests for Normality (J-B Test) – for Level Variables

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	------- joint ------	
				Adj. chi2(2)	Prob>chi2
Total trade value	810	0.0000	0.0000	.	0.0000
GDP per capita of the Africa	810	0.0000	0.0000	.	0.0000
GDP per capita of the partners	810	0.0000	0.3084	17.46	0.0002
Total labor force of the Africa	805	0.0000	0.0000	.	0.0000
Total labor force of the partners	805	0.0000	0.0000	.	0.0000
Exchange rate of the Africa	810	0.0000	0.0000	.	0.0000
Total internet users of the Africa	803	0.0000	0.0000	.	0.0000
Distance b/n the capital cities	810	0.0000	0.0047	28.24	0.0000

Table A6: Skewness/Kurtosis Tests for Normality (J-B Test) – for Log Variables

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	------- joint ------	
				Adj. chi2(2)	Prob>chi2
Total trade value	810	0.0103	0.0000	44.67	0.0000
GDP per capita of the Africa	810	0.0020	0.0000	.	0.0000
GDP per capita of the partners	810	0.9698	0.1422	2.16	0.3403
Total labor force of the Africa	805	0.0000	0.5709	45.39	0.0000
Total labor force of the partners	805	0.0000	0.0000	58.15	0.0000
Exchange rate of the Africa	810	0.2698	0.0000	.	0.0000
Total internet users of the Africa	803	0.3719	0.0000	16.10	0.0003
Distance b/n the capital cities	810	0.0000	0.0000	.	0.0000

Table A7: Estimation Test Results

	Calculated Value	P-value
Poolability Test	0.45	0.9988
Hausman Taylor Test Fixed Vs Random	11.36	0.0778
Test for Time Fixed Effects	0.54	0.7040
Heteroskedasticity	210000.00	0.0000
Serial Autocorrelation	11.97	0.0007
Hausman Endogeneity Test	4.64	0.5702

Table A8: Regression Results

	(1) FE	(2) RE	(3) IVREG	(4) GLS
LOG of GDP per capita of the African nation	0.335	0.518***	0.583	0.594***
	(1.69)	(5.34)	(0.78)	(13.79)
LOG of GDP per capita of the partnering nation	0.811	0.568**	0.559	0.489***
	(1.75)	(2.60)	(0.67)	(5.38)
LOG of total labor force of the African nation	-0.0640	0.471***	0.723	0.552***
	(-0.05)	(5.26)	(1.07)	(13.94)
LOG of total labor force of the partnering nation	2.134	0.394***	0.0790	0.339***
	(0.83)	(3.34)	(0.07)	(8.83)
LOG of exchange rate of the African nation	0.0705	0.0181	0.0453	-0.0306*
	(1.84)	(0.64)	(0.77)	(-2.06)
Land lockedness of the African nation	.	-0.730***	-0.979	-0.606***
	.	(-3.40)	(-0.47)	(-7.45)
Usage of the same language	.	0.958***	0.737	0.882***
	.	(3.49)	(0.28)	(7.86)
Presence of colonial history	.	0.689*	0.806	0.790***
	.	(2.22)	(0.26)	(7.19)
LOG of distance between the capital cities	.	-0.727***	-0.740	-0.765***
	.	(-4.13)	(-0.43)	(-13.34)
LOG of total internet users of the African nation	0.127*	0.130**	-0.0190	0.0850**
	(2.13)	(2.63)	(-0.15)	(3.04)
N	793	793	473	793
R^2	0.256			
F	35.90			

t statistics in parentheses
** p < 0.05, ** p < 0.01, *** p < 0.001*

DECLARATION

I, the undersigned, declare that this project paper is my original work and has not been presented for a degree in any other university, and that all source of materials used for the thesis have been duly acknowledged.

Declared by:

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Date: June 17,2011

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