The Impact of Infrastructural Development on Intra-Regional Trade: The Case of the Economic Community of West African States (ECOWAS).[1]

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1.0 INTRODUCTION

Regional Integration Arrangements (RIAs) are fast becoming a very important element in the development of countries all over the world. Most regions are using this option to form a formidable force when entering into negotiations with other regions and/or organizations. Interestingly though, the trend has been such that sub-RIAs are being formed within overall regional bodies. This has been mainly to address separate issues and has involved many countries facing the challenge of being a part of more than one arrangement. West Africa is no exception, with the inception of the Economic Community of West African States (ECOWAS) in 1975. Other sub-regional blocs within the ECOWAS include the Mano River Union (MRU), the West African Economic and Monetary Union (UEMOA), West African Monetary Zone (WAMZ) and the Community of Sahel-Saharan States (CEN-SAD) to which some of the ECOWAS members belong. The RIAs have also formed the basis for entering into trade agreements and are envisaged to promote not only international trade but also intra-regional trade among member states. Studies have shown that more than half of total trade worldwide takes place through these regional trade blocs and figures show that trade under this system grew from 43 percent to 60 percent between 2001 and 2005 (OECD Report, 2005).

The introduction and setting up of the various RECs and RIAs in West Africa have been with the aim of promoting regional cooperation and ensuring that trade and other activities are easily facilitated among countries within these regional alliances. The ECOWAS founded in 1975 is the West African regional body set up to promote economic integration within West Africa, with particular emphasis on industry, commerce, transport, telecommunications, natural resources and agriculture to name a few. This regional bloc comprises of 15 countries, with varying political, economic and social characteristics. The ECOWAS Commission through its mandate endeavors

to implement policies and embark on programmes and development projects that will facilitate the process of regional integration. Some of these projects include intra-regional road construction and telecommunication facilities. These are important facilities for promoting trade which is a vital aspect of the regional integration process. The ECOWAS has further demonstrated its acknowledgement of the importance of infrastructure development in fostering regional integration through the establishment of a Transport and Telecommunication Department within the Secretariat. The focus is on developing road, rail, maritime, river and air transport infrastructure in order to facilitate transport and transit within the region. The overall objectives of the transport division within this department as stated by the ECOWAS are to "improve regional transport system", "provide efficient and cost effective transport system", "minimize delays by removing non-tariff barriers" and "promote intra-community trade" (ECOWAS). The telecommunications division aims to "establish a single liberalised telecommunications market within the ECOWAS sub-region", "implement the adopted Telecommunications Harmonisation Model", "fast track the implementation of GSM Roaming", "promote the use of Information and Communication Technologies (ICTs) for development", evaluate and update the convergence criteria for Harmonisation of Telecommunications Policies", "develop a Regional Information Communication Technology infrastructure" and "facilitate the exchange of information and experiences between West African Telecommunications Regulators" (ECOWAS). Although, ECOWAS has all these novel plans and intentions, evidence on ground indicates otherwise. The road network is not efficient and well linked, telecommunication is better but there are lot of issues that need to be addressed and cost of doing business is unnecessarily expensive because of bribes collected by customs and immigration officers, and touts along the West African corridors (Adekunle, 2010). All these

problems constitute obstacles to intra-regional trade because they are non-tariff barriers (NTB) to trade.

Tariff and non-tariff barriers continue to be the leading factors that tend to influence the success of RIAs in promoting trade and fostering integration in specific regions. Non-tariff barriers are mainly engulfed in transaction costs. Smooth trading amongst countries can be hindered by the quality of their infrastructure, availability of efficient communication network and cultural barriers, which ultimately can be summed up into the cost of transaction. Poor road networks can affect logistics especially during bad weather conditions, thus delay delivery of goods. Weak institutional framework such as Custom and Duties and ill-equipped bureaucratic structures can lead to demurrage and other charges at the port of entry. This lack of capacity and resources coupled with poor governance, conflict and natural disasters have been identified as major causes of weak infrastructure in many developing countries. This imposes direct and indirect costs on trade, thus limiting the ability of ECOWAS member states to participate competitively in global markets.

Infrastructure has been identified in many studies (Clark et al., 2004; Rauch and Trinidada, 2003a; and Sahoo and Dash, 2009) as important for successful intra-regional trading activities and for supporting the entire process of regional integration. Improving the state of infrastructure is a crucial pre-requisite for trade, business and investment promotion, social and economic development and ensuring the regional and international competitiveness of a country. High quality and efficient infrastructural capacity can foster regional integration as it will facilitate the movement of persons, goods and services across borders, making information easily accessible

and at the same time allowing the region to develop a stronger base for trade negotiations with the international market. It also strengthens the region's comparative advantage. Nordås et al. (2004) argued that the quality of transport infrastructure may now be considered a more important determinant of trade than in previous years.

The high cost of doing business can deter efforts to encourage intra-regional trade as countries will look for better options and partners with which they can trade at preferable terms. Trade costs incurred as a direct or indirect result of poor quality infrastructure can take different forms. This study will however focus on transport costs, the costs of delays and uncertainties of delivery time as a result of lack of adequate infrastructure facilities and how these can prevent the free flow of trading activities in the ECOWAS sub-region. This is important because authors such as Grigoriou (2007) asserts that low infrastructure levels affect Central Asian trade and the lack of investment in existing infrastructure increases transport costs.

This paper investigates the impact of infrastructure development on intra-regional trade flows between countries within the ECOWAS bloc using an adaptation of the gravity model and the effect this has on regional integration. The study takes the form of a panel analysis, incorporating both a time series and a cross-sectional analysis as it focuses on the 15 member states of the ECOWAS body for the period 1993-2008. The paper develops indicators that are used as proxies for the quality of infrastructure. The study adopts the method used by Nordås et al (2004) in calculating an index for the various types of infrastructure namely, rail, roads, telecommunications, airports and institutional capacity. The number of registered air transport carrier departures worldwide is used as a proxy for institutional capacity. This methodology, by

adding more individual indicators builds on that used by Limão and Venables (2001) in their study. This allows the study to assess how each mode of transport affects trade in the West African sub- region. The cost aspect of carrying out trading activities in the sub-region is captured in the model by distance in kilometers between countries and the ease of accessibility into a country to represent transport costs and cost of delays and uncertainty of delivery time respectively. The model also takes into consideration other variables that might affect intra-regional trade and infrastructure development for the period under review. These include the type of governance in a country, the political stability of a country, the currency used, the official language spoken and the type of ownership of institutions responsible for facilitating the trade processes in the different countries. The study also carries out an ex-post analysis to highlight the different types of infrastructure development within the ECOWAS to date and how important these have been in promoting the regional integration process. This approach allows the study to take stock of the successes, weaknesses, opportunities and challenges of the various infrastructure development projects that the ECOWAS has undertaken.

1.1 Statement of the Problem

Evidence abounds on how lack of adequate infrastructure in the ECOWAS region affects productivity, trade and development. These include but are not limited to insufficient electricity supply, poor road networks, lack of adequate alternative means of transportation and inadequate communication infrastructure. Sequel to this, the volume of trade among neighboring countries in the region is relatively low. In fact, trend in exports over an eight year period, shows that Sierra Leone exports most of its products to western countries, with only about less than 10 % directed towards countries in the ECOWAS sub- region.

Apart from minimal intra-regional trade, uncertainty about delivery time and the state in which products are delivered as a result of poor quality of infrastructure is also a contributing factor to the cost of trade in Africa. Furthermore, delays have been shown to have a greater impact on developing countries where most of their exports are perishable agricultural products (Soloaga et al, 2006). In addition to this predicament, alternative means of transporting goods are also expensive with freight costs in developing countries about 70 percent higher on average than in developed nations, with Africa recording the highest, about twice the world average (UNCTAD, 2003b).

Furthermore, studies by the West African Trade Hub (WATH) have revealed that delivery trucks are often damaged as a result of bad roads, thereby increasing the time spent on maintenance and reducing the productive capital rate of return. This proves to be a hindrance to the linking of isolated producers in most cases smallholder farmers to local and regional markets (Grigoriou 2007). There is the high possibility that delivery vans can deviate from their normal routes to avoid extremely bad roads which may result in certain communities being deprived the goods and services they need at a relatively less expensive price. More often, they will have to obtain these same products from a secondary or black market at much more inflated prices. Such scenarios not only hinder trade, but also contribute to poverty.

1.3 Objectives

The main objective of this research is to investigate the impact of infrastructure development on regional trade integration and how this affects the promotion of regional integration in West Africa. The study will assess the impact of both physical and institutional infrastructure on trade performance among members of the ECOWAS, focusing mainly on transport and

telecommunication infrastructure, as well as institutional capacity. The specific objectives of the study are:

- To assess the trend of growth and development in ECOWAS countries between 1990 – 2010.

- To analyse the present state of infrastructure in the region.

- To determine the impact of the current state of infrastructure on trade patterns in the ECOWAS region.

- To develop evidence-based policy recommendations on how specific indicators of infrastructure development could be utilized to facilitate trade and promote regional integration in West Africa.

1.4 Structure of Report

Following this introductory section, the rest of the paper is organized as follows. Section 2 focuses on a review of the relevant literature surrounding the topic, whilst section 3 develops and describes the methods used in carrying out this study. Section 4 gives an overview of regional integration, carrying out some ex ante and ex post analysis on the various projects by ECOWAS towards fostering integration. Section 5 presents the results of the empirical analysis and section 6 provides summary and concluding remarks on the study as well as some policy recommendations.

2.0 LITERATURE REVIEW

This section reviews both theoretical and empirical literature on the importance of infrastructure on trade and the effect on regional trade integration. We did the review in such a way that the gap in literature is identified and our contribution to knowledge is glaring.

Africa is a continent that is challenged in terms of adequate provision of infrastructure. This unfortunate situation affects growth in this continent because different studies have continued to emphasize the role of infrastructure on economic development (Perkins et.al, 2005; Ndulu, et.al 2005). Jimenez (1995) and Barro (1990) assert that expenditure on infrastructure raises the marginal product of other capital expenditure within the economy. Investing in infrastructure, though vital, can be very costly and this is supported by the findings of a study carried out by Rosenstien-Rodan (1943).

Morrison and Schwartz (1996) confirm that a decrease in infrastructure investment reduces the productivity growth impacts of public infrastructure. In constructing a model for the technology and behavior of firms and applying it to state-level data for the manufacturing sector in the U.S.A., they find that investment in infrastructure results in a significant return to manufacturing firms, increasing their productivity growth. According to Bonaglia and La Ferrara (2000), infrastructure investment contributes positively to total factor productivity growth, output and cost reduction, with investment in transportation being the most productive. An empirical study by Pereira and Sagales (1999) further supports the need for infrastructure investment, suggesting that public investment has a positive effect on private investment, employment, and output at both aggregate and regional level.

Lack of adequate infrastructure in a country is identified as a major bottleneck for achieving sustainable growth and poverty reduction (Sahoo and Dash, 2009). It is believed that properly designed infrastructural development programs can result in a more inclusive growth process that benefits poorer groups and communities in remote areas (Bhattacharyay, 2010). Provision of

appropriate and adequate infrastructure can boost investment and enhance trade within and across borders (Sahoo and Dash, 2009). Furthermore, infrastructural development can contribute to overall economic development through creating and stimulating production facilities and economic activities. It can reduce trade and transaction costs, create an enabling environment for competitiveness, employment and public goods creation (Egert, Kozluk and Sutherland, 2009; Sahoo and Dash, 2009).

The cost of trading between any two countries can be greatly augmented by the time it takes to search for information, to enter into and enforce agreements, transporting the goods or products once they have been acquired and the time it may take for the other party to receive them. These are all major costs that can influence bilateral or regional trade patterns (Nordås and Piermartini 2004). Understanding and having insight into the business environment in a country of interest might reduce these costs. Having institutions in place that are fully operational and easily accessible as well as having standard communication facilities is expected to enhance trade through the reduction of trade costs. Nordås and Piermartini (2004) state that countries that share a common language and have similar cultural characteristics will tend to understand and know more about each other and this is likely to cause such countries to trade with each other. Thus, common language and culture also make the flow of information relatively easy.

The flow of information across countries is a major determinant of the cost of searching for information on a potential trading partner. The telecommunication infrastructure is expected to play an important role in the ease of accessibility to relevant information. In the case where the state of the telephone system is undeveloped, firms are limited in their communication and this

increases the transaction costs of ordering, gathering information and searching for services. Improvement in the telephone system is said to reduce the cost of doing business and increase the level of output for individual firms in various sectors of the economy (Röller & Waverman, 2001). In a study by Rauch and Trinidada (2003a), they argue that the emergence of the information economy has contributed to the reduction of search costs to a large extent. The ease of flow of electronic communication is however contingent on the trading partners having good access to telecommunication infrastructure. Nordås and Piermartini (2004) argue that "the cost of not being able to place a telephone call or access the internet may be just as important as the cost of making the call", with the former cost pertaining to the rate of penetration of telephone lines. Although information technology makes transaction and communication easy, there is still a need to physically move commodities from one point to the other and this makes distance an important variable in trade flow analysis. Distance from the primary market and high cost of transport as a result of lack of infrastructure affects the competitiveness of most African countries (Ndulu, et. al, 2005; Amjadi and Yeats, 1995). This high cost is witnessed in Africa because this continent is the most fragmented in the world with little or no connectivity among the countries. The impact of fragmentation can be reduced if quality of infrastructure available in the region is improved (Limão and Venables, 2001). Improvement in the quality of infrastructure will lead to increase in trade volume and a reduction in transportation and transaction costs (Limão and Venables, 2001).

Transport costs and the cost of delivery of goods are very important factors in the pattern of trade flows among countries. The mode of transport that trading partners settle on can influence the time goods take to arrive at their final destination. The 2003 UNCTAD report focuses on the importance of multimodal transport services such as packaging, warehousing and transport from

exporter's premises to that of the importer's. The choice made by trading partners on mode of transporting goods often depends on their geographical locations (Nordås et al., 2004). Canning and Fay (1993), focusing only on transportation infrastructure for 96 countries, find high rates of return on the investment in developed and industrialized countries and moderate rates of return in underdeveloped countries. In an article on trade in ECOWAS, it is cited that it is possible for goods to be transported from Nigeria to Liberia within two days via sea. According to the President of the Nigeria-Ghana Chamber of Commerce, this has not been the case as ships often go through Europe or Asia before heading for the destination as a result of bureaucracy. This results in shipment from Nigeria taking about a month to get to Liberia (The Punch, 2011). In other words, West Africa has one of the most expensive transportation costs in the world and some of these costs are attributed to lack of infrastructure.

Furthermore, some studies show empirically that there exists a relationship between the quality of infrastructure in a particular country and the cost it imposes on trade and how adequate infrastructure can boost economic growth. Clark et al (2004), Wilson et al (2003) and Limão and Venables (2001) discover that the quality of infrastructure has a positive and significant impact on trade. Clark et al (2004) further indicate that the efficiency of the operation in a country's port can reduce the cost of freighting significantly. According to Nordås et al (2004), these studies used an overall measure of infrastructure quality or just maritime infrastructure, and expressed the need for more individual variables.

The relevance of infrastructure is also emphasized by Easterly and Rebelo (1993). Their study proves that investment in transport and communication has a positive impact on economic

growth. Hardy (1980) using data for over 15 developed and 45 developing nations, finds that the number of telephones per capita has a significant impact on GDP. However, the study finds no significant impact when the developed and developing economies where analyzed separately. This was attributed to the possible presence of important fixed effects. Norton (1992) also carried out an analysis of the relationship between telecommunication and economic growth using data from 47 countries over a 20-year period. The study shows the telecommunication variable to be positive and significant and concludes that the presence of telecommunications infrastructure causes transaction costs to fall whilst output rises. Röller & Waverman (2001) investigates the impact of telecommunications investments on economic developments using evidence from 21 OECD countries over a 20-year period and find evidence of a significant positive causal link. Canning et al. (1994) states that telephones have a positive effect on economic growth. Fink et al. (2002a) also assert that communication cost has a significant and negative impact on bilateral trade when the bilateral cost of making telephone calls is included in a gravity model. They also discover that a 10 percent reduction in price of phone calls between two trading partners can increase bilateral trade by about 8 percent (Fink et al, 2002b).

Sanchez-Robles (1998) further show that road length and power generating capacity can explain future growth; the study indicates that physical units of infrastructure are positively and significantly correlated with growth. Public capital strongly affects growth, though the effect differs across sectors and is more relevant in the industry sector than in the agriculture, construction and services sectors (Fernandez and Montuenga- Gomez, 2003). Using a panel of bilateral trade flows between 167 countries over 13 years, Grigoriou (2007) show empirically that an improvement in domestic country's infrastructure quality would raise exports and imports

by 14.5% and 19.6% respectively. However, the impact is found to be higher in the case of an improvement in the transit-country's infrastructure quality. In this case, export would increase by 52%.

Hummels (2001) focuses on time as a barrier to trade and shows in his study that there is a close relationship between the time goods take in transit and the quality of infrastructure including the quality of the ports, the services offered and the customs procedures. He observes that over the past decades, air freighting has increased relative to sea freighting and this he attributes partly to the fall in the relative price of air freight and partly to the importance that business people have given to time. In another related study, Djankov et al. (2006) discover that trade reduces by about 1% each day because of time delays in moving standard cargo from the factory gate to the ship. The importance of infrastructure was also affirmed by Yeaple and Golub (2002). They suggest that the differences in the quality of public infrastructure explain the differences in total factor productivity. They further argue that the intensity, with which the various sectors depend on high quality infrastructure, can influence the extent of the impact of quality infrastructure on total factor productivity.

To a large extent, quality of infrastructure and high transaction cost can be referred to as a non-tariff barrier (NTB). In a study by the World Bank (2001), the results show that 168 of the 216 trading partners of the USA had their transport costs much higher than the tariff barriers. This is more pronounced in most countries in Sub-Saharan Africa (SSA), where the findings reveal that the transport cost incidence for exports was 5 times more than the tariff cost incidence. Limão and Venables (2001) carried out a study on a cross section of countries, controlling for the

quality of transit-country infrastructure and they show that poor infrastructure accounts for about 40% and 60% of predicted transport costs for coastal and landlocked countries respectively. They further indicate that distance only accounted for a 10% change in transport costs. Brun et al. (2005) also provide evidence of a high impact of remoteness and infrastructure on trade costs.

Other variables that may affect intra-regional trade include common border, languages and colonial histories, which have positive effect on bilateral trade (Nordås et al., 2004). Carrère (2006) also suggests that SSA and ECOWAS landlocked countries will trade 28 percent less than their coastal counterparts and Raballand (2003) reveals that being landlocked reduced trade by more than 80 percent. This was mainly as a result of the way in which the land lock variable was represented in the study, focusing on bilateral trade between two landlocked countries. Radelet and Sachs (1999) in their study on 97 developing nations, discover that transport and insurance costs were twice as high for landlocked than for coastal countries.

In summary, Africa has various challenges in terms of regional trade integration such as the lack of capacity of staff at border posts, delays at borders, lack of adequate infrastructure, poor condition of roads, underdeveloped telecommunication and energy sectors that cause final prices of products to be inflated (East African Business Survey, 2005). The role and the involvement by governments in infrastructure development cannot be overlooked. The decision on which infrastructure projects to invest in often comes from those in power and as Canning (1998) suggests, the trend in infrastructure stock growth in countries can be better explained by the political economy rather than by economic efficiency as governments are highly involved in infrastructure development.

Many studies in Africa cite poor infrastructure as a contributing factor to slow economic growth. However, some of the empirical studies reviewed show that infrastructure development has no significant impact on economic growth. Among these is the study by Easterly and Levine (1994), which in an attempt to explain Africa's growth tragedy using a cross-sectional regression on a list of variables, discover that infrastructure investment is not significant in explaining the trend in growth. Easterly and Rebelo (1993), using a consolidated public-sector investment in transport and communications also did not find any significant impact of these variables on growth. Another study by Canning and Fay (1993), using physical measures of infrastructures such as kilometers of roads, railways per worker, electricity generating capacity per worker and telephones per worker for a cross-country sample, reveal that the variables had no significant impact on growth. Ghafoor and Yorucu (2002), finds in their study on Northern Cyprus using aggregated and disaggregated time series data from 1977–98, that both the long-run and short-run elasticities of gross national product (GNP) with respect to infrastructure and human capitals are very low and in most cases statistically insignificant. The study therefore concludes that further investment in infrastructural and educational sectors will not contribute towards improving economic performance.

Summary

Polenske (1994) summarises the state of both the theoretical and the empirical literature on public infrastructure and productivity and finds that several studies show opposite conclusions in their investigation of the relationship between regional economic performance and infrastructure expenditure and views this as convincing evidence that more work needs be done on the topic.

Hakfoort (1996) in reviewing the empirical literature on infrastructure and growth concludes that in general, infrastructure has a positive and significant impact on output.

The African Development Bank (1999) Annual report based on background papers, examined the importance of physical infrastructure. The report suggests that the major causes of the poor state of infrastructure are mainly structural, in particular, low economic density and geography. The challenge according to the report is to expand the quantity and quality of infrastructure in a cost - effective way. World Bank (2000) also produced a review report on infrastructure in Africa and concludes that lagging infrastructure may be due to low demand rather than inadequate supply. The report identifies that in order to ensure sustainable institutional arrangements, it is necessary to have cross-border and regional cooperation. The report further suggests that the region has to employ sustainable incentive packages necessary to extend infrastructure access to rural areas. Rehabilitation and maintenance of existing infrastructure are seen as very important in the infrastructure development process. The report also emphasizes the need for private participation, towards improving investment effectiveness and service provision.

The theoretical and empirical review of relevant and existing literature indicates that though there are varying views and findings, in general the availability and quality of infrastructure promotes trade and economic growth. This impact has not been analyzed for the ECOWAS countries, especially with respects to intra-regional trade among the 15 member countries. Thus, this paper will fill this gap and contribute immensely to literature.

3. Methods

The analysis in this paper covered the 15 countries in ECOWAS and we explored the use of both qualitative and quantitative approaches in order to enrich our results and policy recommendation. We did an ex-post analysis of infrastructural development and its impact on trade within the region. Ex-post analysis is usually based on the knowledge of the past, in other words, we

examined how the problems of infrastructural development and intra-regional trade integration has been solved, the actors involved and whether the prevailing institutions have really affected intra- regional trade in West Africa. Second, we assessed whether the objectives of ECOWAS was reached using different performance indicators. Third, we explored the possibility of alternative delivery mechanism rather than the use of complicated bid process. Fourth, we assessed whether the infrastructure development in the region has added value to the GDP and volume of trade (export, import and total trade) in the region. Fifth, we developed a case study of lessons learned and suggested a strategic plan for the future that will lead to a better integration in West Africa with borderless states where transaction cost of doing business is reasonable. We did the ex-post analysis using materials from the ECOWAS commission, African Development Bank, Africa Infrastructure Country Diagnostic (AICD), Sub-Saharan Africa Transport Project and Borderless.

Furthermore, to enrich our analysis we developed ECOWAS maps showing the intensity of rail, link roads and airports in the sub-region. The maps in this paper were developed through Global GIS data from Data Resource Center at the University of Guelph. Dr. Gift Dumedah (McMaster University) using other datasets and land vector information with the GIS information developed the maps as required for our analysis.

To provide an empirical evidence for our study we developed a model that considers political, economic and institutional variables. The dependent variable was total trade (import + export) within the region. An additive infrastructure index was developed to measure infrastructure. The model was analyzed as a panel data using pooled effect, fixed effect and random effect after

which the best fit was selected through Haussmann test. Our data-set, a panel data, covered the

period between 1993 and 2008. The specific variables included in our model were:

Dependent Variables:

Total trade (INTTR) – total intra-regional trade for each country in ECOWAS

Exports to ECOWAS (INTEX) – total export from a country to other ECOWAS members

Imports from ECOWAS (INTIM) – total import by a country from other ECOWAS members

Explanatory Variables:

Gross Domestic Product (GDP) for all the countries in the region

GDP per capita for each country (GDPC)

Distance (D) – used as a proxy for transport cost

Ease of Accessibility (ACC) – the ease with which a country can be accessed. Whether a country

is Landlocked or not has been used as a proxy for this variable. 1 = Landlocked; 0 = Otherwise.

Infrastructure Index (INFRIND) – This was an additive index of infrastructure variables such as

road density (kilometer of road per 100 sq. km of land area), air transport – freight (million ton-

km), telephone mainlines (per 1000 persons) and mobile phone subscribers (per 100 people).

Type of Governance (GOVER) – 1 = Military; 0 = Otherwise

Political Stability (POLSTB) – 1 = Civil War; 0 = Otherwise

Use of Common Currency (CURRN) – 1 = CFA; 0 = Otherwise

Use of Common Language (LANG) – 1 = English; 0 = Otherwise

The impact of the explanatory variables mentioned above on the intra-regional trade was examined

using an adapted version of the gravity model. We did the analysis using 12 out of the 15 countries

in the region. We had a lot of missing data in the case of Sierra Leone, Liberia and Guinea Bissau that we had to remove these countries from the panel data analysis. The non availability of data from Liberia, Sierra Leone and Guinea-Bissau might be as result of factors such as 1. Sierra Leone and Liberia had civil war for a significant part of the study period 2. None of the major corridors pass through these three countries and 3. Guinea Bissau's official language is Portuguese (although most of them speak the Creole version). These might be part of the reasons why data is missing or may be their trade activities with other countries within the region is weak.

Model Specification

The gravity model which stipulates that the trade flow between two regions is directly related to the GDP and inversely related to the distance between them (Tinbergen, 1962; Poyhonen, 1963) was used in this study. Further studies have also extended the gravity model to include variables such as common language, tariffs, transaction/transport cost, history, politics, foreign direct investment, exchange rates and other macroeconomic variables (Hacker and Einarsson, 2003; Eichengreen and Tong, 2006; Cardamone, 2006; Boughanmi et. al, 2009 and Adekunle and Gitau, 2011). In our own case, we are interested in the total trade among countries in ECOWAS and we also consider infrastructural development and socio-political factors as variables that might affect the intra-regional trade. We thus specify a model that will examine the impact of infrastructure and other aforementioned variables stated below:

$$F_{ij} = f\,(GDP_i^{\beta}GDPC_i^{\alpha}D_{ij}^{\delta}\,B^{\gamma})\,\varepsilon_{ij} \qquad\qquad\qquad 1$$

Where: F_{ij} = Volume of trade between each ECOWAS country and other countries in the region. We considered the total trade, exports and imports as separate models in this paper.

GDP_i = GDP for all the ECOWAS countries included in the model

$GDPC_i$ = GDP per capita of the ECOWAS countries included in the model

D_{ij} = Distance between the ECOWAS countries in the model

B = This is a vector of all other variables (political, economic, social, etc including the infrastructural index) included in the model.

β , α , δ, and γ are parameter estimates which will turn to elasticities once the natural log of both sides are taken. And ε_{ij} is the error factor.

We linearized the model by taking the natural logarithm of all variables, thus the relationship will be of the form:

Total trade: $\ln INTTR_{ij} = \beta_0 + \beta_1 \ln GDP_i + \alpha \ln GDPC_i + \delta \ln D_{ij} + \gamma_1 GOVER + \gamma_2 POLSTB + \gamma_3 CURRN + \gamma_4 LANG + \gamma_5 INFRIND + \gamma_6 ACC + \varepsilon_{ij}.$ 2

Exports: $\ln INTEX_{ij} = \beta_0 + \beta_1 \ln GDP_i + \alpha \ln GDPC_i + \delta \ln D_{ij} + \gamma_1 GOVER + \gamma_2 POLSTB + \gamma_3 CURRN + \gamma_4 LANG + \gamma_5 INFRIND + \gamma_6 ACC + \varepsilon_{ij}.$ 3

Imports: $\ln INTIM_{ij} = \beta_0 + \beta_1 \ln GDP_i + \alpha \ln GDPC_i + \delta \ln D_{ij} + \gamma_1 GOVER + \gamma_2 POLSTB + \gamma_3 CURRN + \gamma_4 LANG + \gamma_5 INFRIND + \gamma_6 ACC + \varepsilon_{ij}.$ 4

Data

This paper considered 12 out of the 15 countries in ECOWAS because of serious cases of missing data for Sierra Leone, Liberia and Guinea Bissau. We examined the factors that predict regional trade using data sets for the period 1993 to 2008. The data used was compiled from various sources.

Annual figures for GDP, GDP per capita, were obtained from world development indicators (WDI) database of the World Bank. Data on exports and imports within the ECOWAS was obtained from COMTRADE database using World Integrated Trade Solutions (WITS), and data on distance was from time and dates website, www.timeanddate.com, which measures distance between cities in kilometers. All data was measured in current prices of US dollars where necessary. Data for the dummy variables; type of governance, political stability, use of common currency and common language were computed based on our personal experience and research. In our estimation, we use unbalanced panel data and with individual effects included in the regressions. We used Haussman test to determine which of the models, fixed or random model, was the most appropriate as done by Adekunle and Gitau (2011).

4.0 REGIONAL INTEGRATION

Regional integration is vital for the building of markets, the creation of robust and diverse economies as well as increasing opportunities for growth and attracting investment finance. Regional integration has been defined as referring to the outcome of cooperative arrangement

and processes, the implementation of intergovernmental treaties and market-led processes, which produces the platform for economies in a region to become more closely interconnected (AfDB, 2010).

Kwaku (1995) suggests that the main force influencing the increasing number of RIAs on the African sub-continent is the need to increase regional cooperation through the establishment of unified economic blocs. The African countries also envisage that RIAs will form the building blocks for stronger integration between countries (UNECA, 2004; WTO, 2005). Some express the view that regional integration will increase intra-regional trade, which will in turn spur economic growth and development through economies of scale (Kasekende & Ng'eno, 2000; Mistry, 2000). A study by World Bank 2004 suggests that regionalism within the African continent will go a long way in aiding the pooling of the under-utilized resources and fragmented markets, promoting industrialization and acting as a suitable alternative to unilateral trade liberalization.

With overlapping memberships in various regional bodies, there is the tendency for the capacity of these institutions to be overstretched. This can limit their technical capacity as well as the ability to exercise their enforcement powers. Adequate infrastructure might aid regional trade integration in developing countries, most especially West Africa countries with serious problems in terms of availability of infrastructure. Africa's infrastructure need is estimated to be $ 93 billion annually but only $45 billion is currently spent on it annually (World Bank, 2010). This shows that there is a gap of $48 billion that needs to be spent on Africa if the continent will catch up with the rate of development in other continents in the global village. The private sector has

become more fully involved in this regard, though most of their investment is claimed to be more geared towards the information and telecommunication sector. According to the OECD (2010) report, this sector received 87 percent of all investment commitments in 2008. Since infrastructural development is a catalyst and a positive externality for economic development, adequate analysis of the state of infrastructure in ECOWAS, its impacts on regional trade integration and the way forward will be the focus of this section. Specifically, we will look at infrastructure such as power, rail, road, sea/airports and telecommunications.

4.1 Infrastructure and Trade in Regional Integration

Infrastructure as identified in the literature plays a vital role in the development process (Perkins et.al, 2005; Ndulu, et.al 2005). It has the potential to improve the region's competitiveness, boost both domestic and regional trade and overall, enhance the integration of the region into the world economy. Cross-border infrastructure projects promote regional integration and contribute to regional trade and growth. These projects can however be very costly as transaction costs are high and so are the risks involved. To fund regional infrastructure projects successfully, the countries involved need to work together and coordinate well.

The disparities among African nations are obstacles that hinder the regional integration process. There is a lot of missing regional and trans-African links that pose serious threat to the success of integration (AfDB, 2010). The challenge is not only the low level of physical infrastructure but also the lack of existing road and rail links and the poor connectivity to ports within the region.

With countries in the ECOWAS sub-region mainly engaged in the export of primary commodities, having a functional and efficient rail system can provide a more efficient means of

transporting these goods within the region and can be comparatively cost effective. Investment in infrastructure, mainly in the transport sector, is highly likely to have a positive impact on trade that will in turn accelerate growth and development within the sub-region.

Africa's infrastructure facilities continue to lag behind that of other regions and this has been a major obstacle in achieving sustainable development (Brixiova et al, 2011). The absence of well developed infrastructure has been attributed to the lack of adequate financing for such projects which are known to be very costly. According to the discoveries by Africa Infrastructure Country Diagnostic (AICD), Africa lacks the technical expertise to develop this infrastructure. There is thus a need for capacity building through proper education and the creation of enabling environment for the development of entrepreneurs who are innovative, imaginative and are willing to take risk in the tough African business environment full of opportunities though at times very fragile.

Efforts towards exploring possible ways of financing infrastructure development have been ongoing at country level. In Ghana, an external sovereign bond was used to finance such projects. The government of Nigeria is using the Private-Public Partnership to help close the infrastructure gap. One such project is the Lagos State Bus Rapid Transit, said to be the first of its kind in sub-Saharan Africa. This project is a joint venture between the Lagos Metropolitan Authority and the private sector and has succeeded in reducing traffic, cutting transport cost by about 30% and creating a safer alternative for commuters (World Bank, 2009). Another such venture is the construction of the US$385 million Lekki-Epe Toll Road in Lagos, which was the first PPP and privately funded toll project in Nigeria (AfDB, 2010). It was carried out in an

endeavour to upgrade the country's infrastructure in order to reduce traffic and successfully completed in 2006.

At the continent level, the African Development Bank (AfDB) renders support to its regional member countries (RMCs) through the accessing of long-term financing which is more appropriate for infrastructure. Over US$6 billion was invested by the bank in 2009, a 177.3% increase from that invested in 2008 and accounting for 52% of the bank's portfolio (AfDB, 2010). The AfDB, through the African Legal Support Facility, further supports private sector financed infrastructure projects in the region. This facility set up to provide technical advice to RMCs, seeks to ensure that the right environment with the appropriate legal and regulatory framework is in place to allow African nations enter into lucrative contracts with partners in the private sector. African countries are endowed with natural resources which are often left to be managed by the private sector, which in turn is required to make specified social contributions. It is most often the case that African economies enter such agreements without proper negotiations that would ensure they reap the utmost benefits. Private sector investments in infrastructure have increased over the years, moving from US$40 billion in 2006 to US$42 billion in 2007 (AfDB, 2010).

4.2 Overview of the ECOWAS

The ECOWAS was established by the Treaty of Lagos in May 1975 to promote economic trade, cooperation and self-reliance. It is said to be the largest regional economic multi-cooperation organization in Africa, accounting for one sixth of the size and one third of the population of Africa (Journal of International Relations, 2009). The organization among other things, aim at

ensuring regional free trade, introducing common tariff, facilitating the free movement of capital and human resources as well as promoting infrastructure development. Figure 1 shows the countries and the ecological zones in the ECOWAS region[2].

The figure depicts that there are vast opportunities in the region because of different economic activities and agricultural production that abound. The region is also known for its mineral resources such as crude oil in Nigeria and Ghana and mineral resources in Niger.

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[2] All maps in this paper were developed with data from the Data Resource Centre, University of Guelph and developed by Dr. Gift Dumedah (McMaster University)

Main Ecological Areas

Mauritania

Niger

Mali

Senegal

Gembia

Guinea-Bissau

Burkina Faso

Guinea

Benin

Nigeria

Sierra Leone

Ivory Coast

Ghana

Togo

Liberia

Legend

Water

Rain Forest

Mixed Forest

Grassland/Desert

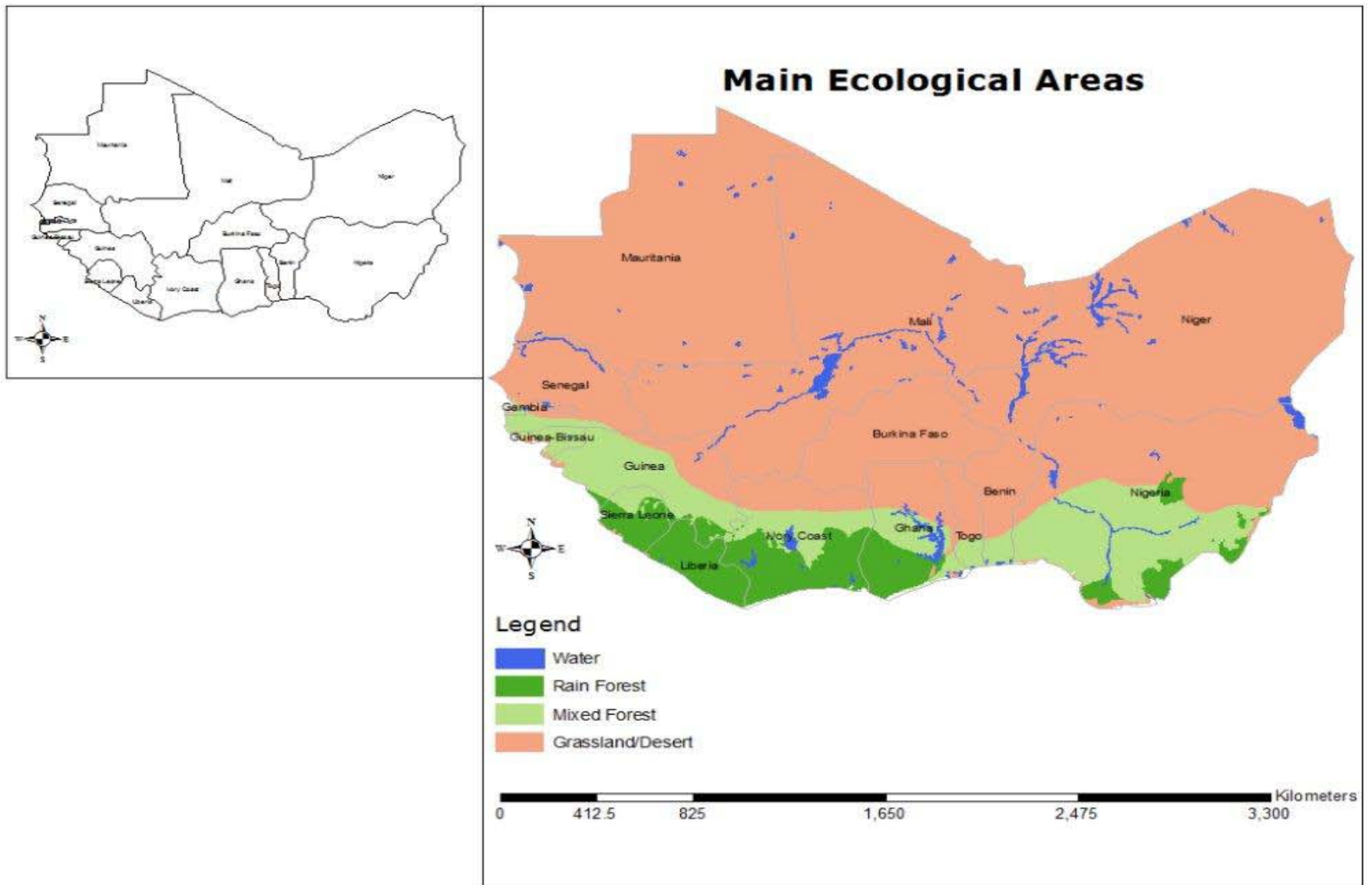Kilometers

0   412.5   825   1,650   2,475   3,300

Figure 1: ECOWAS – showing the countries and the ecological zones

The organization has put in place product standards and has realized free trade for industry products, removing tariff barriers. A common external tariff has been established with the rates ranging from 0% to 20%. As far as infrastructure goes, ECOWAS has embarked on the construction of the highway and roads that connect the region as well as focusing on aviation and railway construction. One stop border post initiatives are currently applied at borders in Ghana, Mali, Togo and Burkina Faso to assist landlocked countries in facilitating transit. Within the region, air service liberalization through the 1999 Yamoussoukro Decision have only been fully implemented by the West African Economic and Monetary Union, made up of mostly the French speaking states and Guinea-Bissau and also the Banjul Accord Group. ECOWAS, the overall regional body is yet to take significant steps in this regard (Bofinger, 2009).

The characteristics of the various countries within ECOWAS make it more challenging for the successful implementation of certain infrastructure projects. Characterized by mainly small economies, with 11 economies having a GDP less than $5 billion (AICD, 2008), fairly low population density on average and low rates of urbanization make intra-regional connectivity difficult and therefore relatively low in the sub-region. Most of the intra-regional road networks are characterized by major discontinuities. The region is also characterized by relatively high prices for the services provided by the limited existing infrastructure facilities.

The relatively small sizes of most of the ECOWAS member countries, makes it challenging to embark on cost-effective infrastructure development projects. At present, most of the countries in the region rely on satellite communications which can be costly (Katiti, 2010). Collaborating at the regional level to implement the fiber-optic submarine cable will go a long way in reducing

the costs associated with ICT activities. Collaboration in the various country hubs as well as the road and rail corridors is necessary to enhance the integration process. Regional integration is therefore a necessity as it can bring about low costs across all types of infrastructure.

Though there have been some improvements in the road network in the region, there are still a lot of gaps and some roads are still not in the best condition. Table 4.1 below shows the state of some regional roads in the ECOWAS countries. It can be seen that on average, only about 45% of such roads within ECOWAS are in good condition.

Table 4.1: ECOWAS Countries Roads and their Condition:

Country	Condition		Type
	Good (%)	Fair (%)	Paved (%)
Benin	35.8	1.8	96.8
Burkina Faso	58.2	33.6	100
Cape Verde	0	0	0
Cote d'Ivoire	16.1	47.1	90.3
Gambia	0	89.4	47.4
Ghana	70.3	23.6	100
Guinea	22.2	20.7	89.1
Liberia	39.4	55.9	47.5
Mali	66.6	21.7	99.6
Niger	31.2	31	88
Nigeria	55.6	29.7	100
Senegal	39.8	15.1	99.8
Sierra Leone	19.5	58.4	33.6
Togo	49.7	0	100
ECOWAS	45.1	28.4	92.5

Source: AICD, 2010

4.2.1 Trade Patterns in the Sub-Region

ECOWAS has developed a trade relation with China which has become intense with an increase in the amounts traded over the years. With ECOWAS' lack of high technology products and machinery, they have turned to China to provide these products. ECOWAS on the other hand is

well endowed in mineral and other natural resources, which China has very little of. As such they have engaged in a trade relationship that they envisage will be mutually beneficial. This paper is interested in the intra-regional trade, though we acknowledge the fact that lack of infrastructure might create incentive for countries to trade with countries (outside the region) that provide infrastructure through bilateral trade arrangements. In fact, the trade with China is surging and the capacity to benefit from the relationship through proper macroeconomic management is lacking though the relationship is a reality and ECOWAS governments are suppose to use compensation principle for people that are worse off (Adekunle and Gitau, 2011). It is possible beneficiaries will increase and transaction cost will reduce if countries within the region trade with each other. Below are graphs that depict the trade pattern within ECOWAS for the period of the study.

The trade volume within the region has continued to increase within the study period (1993-2008). This might be due to better policy implementation on the part of the ECOWAS Commission, the African Development Bank and governmental and non-governmental organizations. As seen in Figure 2 below, the total trade within the region has increased from less than US$ 4 billion in 1993 to close to US$ 20 billion in 2008. In order to maintain this development there is a need for adequate infrastructure within the region.
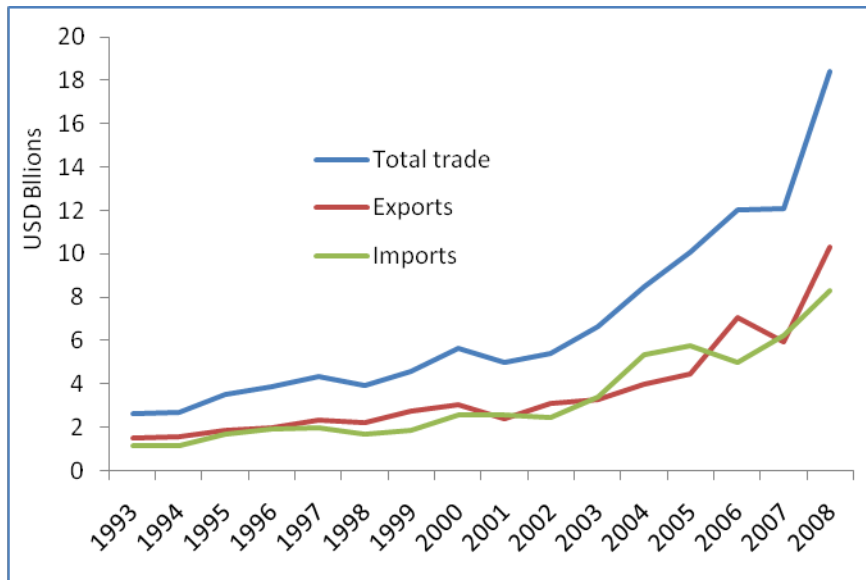
Figure 2: Volume of trade within the ECOWAS region.

We also examined the share of total trade in SSA accounted for by intra-ECOWAS trade for each country (except countries with no data). It was discovered that 55- 90 % of the trade in SSA by West African countries were done within the region. In fact, countries such as Mali, Gambia, Burkina Faso and Niger did most of their trade activities with countries from within the region (Figure 3).
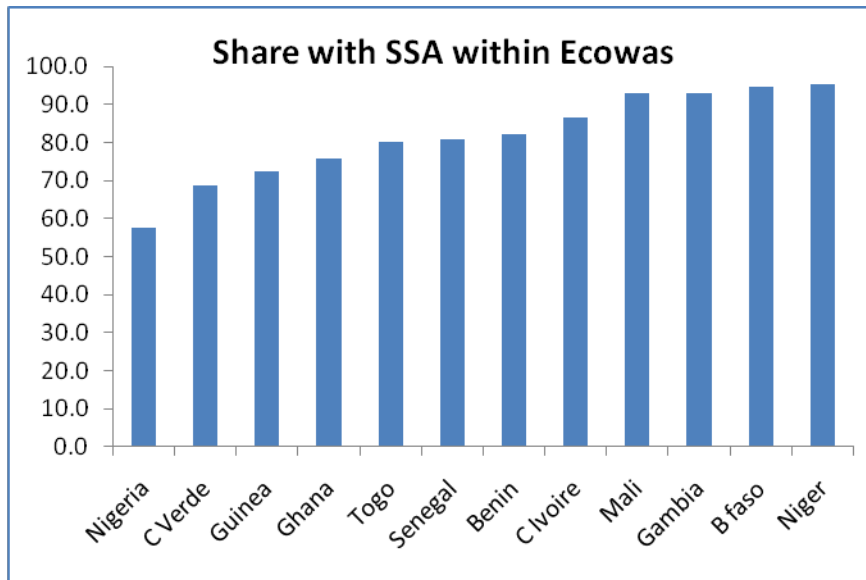
Figure 3: Contribution of countries to ECOWAS out of total trade within SSA

Since a lot of the ECOWAS countries trade more within the region as compared with SSA, we examined the share each country contributed to the regional trade (Figure 4). The graph showed that Nigeria and Cote D'Ivoire accounted for 23.2% and 28.8% respectively. Due to the importance of these two countries, a better connectivity with other countries within the region might contribute significantly to intra-regional trade. Cape Verde had the least value of 0.1%.
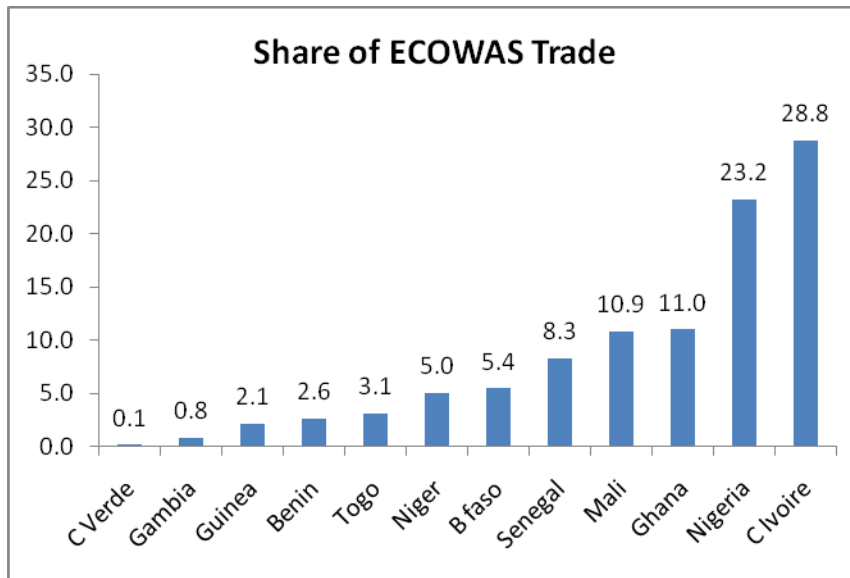
Figure 4: Country's share of total trade within ECOWAS

A breakdown of the total trade to imports and exports (Figure 5) indicated that the two largest countries (Nigeria and Cote D'Ivoire) export a lot to the region but they don't really import from the region. This is interesting because the other countries in the region import more than they export to the region. There is a need to balance the trade flow within the region through capacity building, information dissemination and availability of adequate infrastructure.
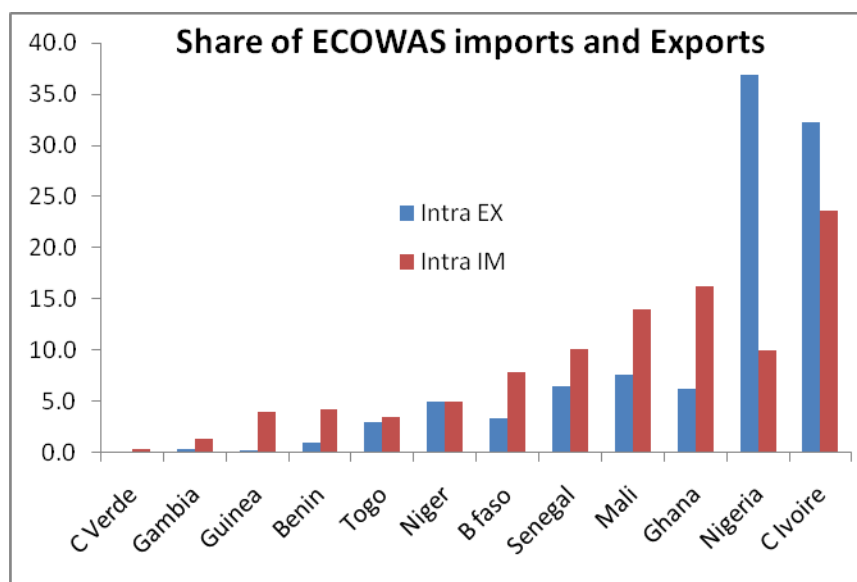
Figure 5: Country's share of intra-regional exports and imports

4.2.2 Infrastructure in the Sub-Region

This section provides an ex-post analysis on infrastructure-related projects and programmes in Africa, with specific focus on West Africa.

In Africa in general and in the ECOWAS sub-region in particular, rail networks are the least developed. There have hardly been any new additions or reconstruction of railway lines since after the colonial era. According to AICD, generally, the rail road in the region is poor and rarely used and close to non-existence. It was in West Africa that the first railway, the Sitarail, linking Burkina Faso and Ivory Coast was concessioned in 1995. This was the only rail network with significant cross border flow within the region. Though the rate of reform in this sub-sector picked up in the 2000s, the implementation process has proven to be slow. The 2007 statistics showed that of the 69,000 km of rail lines in Africa only 55,000km is in operation and the majority of these are in the Southern and Northern parts of the continent (AfDB, 2010).

The total road network in sub-Saharan Africa is still comparatively low at about 204 km per 1000km^2 of land area, with only about 25 percent paved. This is way below the world average of 944 km per 1000 km^2 of land area (AfDB, 2010). Road freight is slow and expensive because of ill-maintained road networks, corruption and unnecessary paper work along the borders (AICD, 2008, Adekunle, 2010). These roads are mostly in good conditions and the seven major corridors in ECOWAS are almost entirely paved, though some are in poor conditions. The regional corridors excludes Gambia, Sierra Leone, Liberia, Guinea Bissau and Guinea – these countries are totally neglected, and even in Nigeria there is no corridor passing through the country to Niger (as seen in AICD map – see appendix). The present state of major corridors is presented in Table 4.2 and a map on the present rail road, road network and airports in ECOWAS is presented in figure 6.

Table 4.2: Corridors in the ECOWAS Sub-Region and their current state:

Corridors	Good (%)	Fair (%)	Poor (%)	Paved (%)
Abidjan-Lagos	51	28	21	99
Tema-Ouagadougou-Bamako	67	31	2	100
Dakar-Bamako	48	20	32	100
Abidjan-Ouagadougou	33	23	44	100
Lome-Niamey	50	30	20	100
Cotonou-Niamey	50	8	42	99

Source: AICD, 2010

With the majority of the ECOWAS countries lying along the coast, making use of the sea as a major transport route will be expected. However there are a lot of challenges associated with the ports within the sub-region with regards to capacity, delays and bureaucracy. Ports are not of the best standards and lack the required capacity to deal with containers and goods processing. Though the ECOWAS sub-region has 25 significant ports, they are relatively small in size by world standards and statistics show that none of them are among the 70 largest ports in the world

(AICD, 2008). The use of container transport, though in its early stage is growing with an average annual growth rate of 13.8% in West Africa. The number of container trade handled by ports in the region increased by over 364 percent between 1995 and 2005, whilst that of general cargo increased by 5.1% during the same period (Mundy & Penfold, 2008). However, the region contributes very little to total global and Africa container traffic (about 1% and 2% respectively; AICD, 2008).

There is very little private investments in ports and with the increasing need for transshipment, it is important that this area be given the necessary attention. Within Africa, there are currently four regional hubs, two in East Africa, one in Southern Africa and one in West Africa (AfDB, 2010). However, due to the civil war, Abidjan which used to play the role of the sub-regional hub has suffered some set-backs. The company Maersk currently makes use of ports in Spain and Morocco as hubs for West Africa trade. Only 23% of containers going out of Africa are full and the sub-region accounts for 12% of these (AICD, 2008). The Tema harbor in Ghana which is one of the region's major ports lacks the capacity to handle large numbers of containers and is currently under pressure to handle general cargo. Analysis has shown that the location of many ports within ECOWAS contributes to the lack of sufficient capacity. The location of the Apapa port in a major urban area is one such example.

Airport connectivity remains a major challenge in the sub-region. Since the collapse of the major Air Afrique Airline in 2004 and the collapse of other significant airlines within the region, coupled with stringent regulatory restrictions, inter-connections with the region have been difficult and often expensive. As a result of the airline failure in 2004, 19 countries lost international connections and of these 16 are within the West Africa and Central Africa sub-

regions (AICD, 2008). The air traffic within the region is mostly between Lagos and Accra (two Anglophone countries in the region), with Nigeria offering the most number of connections within the continent and the world. The major gateways to the continent and the world in general are however located in the East and South of Africa, namely, Addis Ababa, Johannesburg and Nairobi. It is however believed that in the West, Nigeria has the potential to become its gateway but this is yet to be realized. The ECOWAS sub-region is yet to have a central air transport hub and smaller jets that can ply the West African route, linking countries to the hub.

ECOWAS countries are better in terms of accessibility to power as compared with other Sub-Saharan countries but the supply is still epileptic and expensive. There is relatively good access to signal and cables, though the services are still expensive (especially for internet access) but it's getting cheaper as a result of competition in the market. For example, there are presently more than 40 telecommunication companies in Nigeria, including MTN, Globacom and Zain (now Bharti Airtel). The fiber optic is working in the region but it is still cheaper to call US than to call some countries within ECOWAS but the region is better in terms of roaming than other regions in the continent. Some of the countries in the region, namely Sierra Leone, Liberia and Guinea which had been plagued by internal conflicts are still highly dependent on satellite for communication and are yet to fully tap into the benefits of the fiber optic cable. The 2008 ICT development index (IDI) showed that of the five top countries in the African region, only one was from the West African region (ITU, 2009). These countries however still lag behind, ranking 66th to 109th on a global scale. With financial assistance from the AfDB, a feasibility study for a Technology Park in Cape Verde to improve the ICT infrastructure is underway. The level of ICT concentration in the region is presented in figures 7-10 based on 2003 data. Although some

countries have gone through changes since that time, the changes are however not that different from what is shown in the maps. In fact, the accessibility to landlines has declined because of better access to mobile phones and inefficiency of the landline providers. A good example is Nigeria Telecommunication Limited (NITEL) that has not really lived up to expectations, leading to huge decline in subscription.

The ECOWAS, through funding from international donors has commissioned the construction of a 25 km Dakar toll road. This project once completed is expected to foster regional integration through an improvement of the Dakar Port. There are many other infrastructure projects being developed in Dakar to create a regional hub that is expected to not only enhance local economic activities, but also strengthen intra and inter-regional trade through the facilitation of the movement of goods and services. Efforts are also underway to reconstruct the Fulfuso-Sawla Road in Ghana that will form the major gateway from Tamale to the Upper West Region and Southern Burkina Faso. This is another project within the region that is expected to foster regional integration (AfDB Website).

The Trans-Gambia River Crossing project is also in the pipeline among the projects to be undertaken in the ECOWAS sub-region. This project will facilitate the flow of traffic between The Gambia and Senegal and also between member states of ECOWAS, through the international transport corridor between Dakar and Lagos. This is in line with the objectives of NEPAD in the area of transport that seeks to enhance regional co-operation through physical interconnections and is envisaged to promote economic trade within the region. This bridge is also part of the Dakar-Gambia-Bissau-Conakry-Trans-West African Highway that is part of the ECOWAS program and is expected to close a major gap on the Coastal Trans-African Highway

Cairo-Tanger-Dakar-Gambia-Bissau-Conakry-Lagos. This however remains a challenge as some of the countries within the Trans-West African Highway face national infrastructure challenges that will first need to be addressed. There is a new section of road network needed in Guinea connecting to the Boke border and one also in Liberia that will provide a link to the Ivorian border. In the case of Sierra Leone, the reconstruction of certain road networks need to be undertaken and a new road is essential linking to the Liberian border. These are all hurdles that need to be sorted before this highway project can be fully realized. The Sierra Leone government has recently embarked on major infrastructure projects mainly in roads and this is a step that though will result in delays, will contribute to the progress of linking the region through a Trans Highway.

4.2.3 Efforts towards Infrastructure Development

As a means of mitigating the high risks and transaction costs involved in infrastructure ventures, the ECOWAS is establishing bilateral or multi-lateral special purpose vehicles (SPVs), which would identify, prepare, and manage regional infrastructure projects and negotiate with private investors.

The ECOWAS sub-region works closely with the EU-Africa Partnership on Infrastructure as the project implementation body for projects designed for West Africa. This partnership aims among other things at improving economic growth, trade, regional integration and interconnectivity. The ECOWAS complements its efforts at improving physical infrastructure with that of the harmonization of legislation, regulations, and technical standards and have strategic regional bodies in place to help in facilitating trading activities.

Other organizations within the region have demonstrated their concern on the need to upgrade infrastructure within the continent. The African Development Bank in a bid to assist in the process of promoting regional infrastructure connectivity is working with several other continental initiatives. These include, the NEPAD Short-Term Action Plan (STAP), the NEPAD Medium-to-Long-Term Strategic Framework (MLTSF), the AU Infrastructure Master Plan Initiative and the Program for Infrastructure Development in Africa (PIDA).

The recently launched regional project by the ITU and the EU to facilitate the establishment of an integrated ICT market in West Africa is a commendable achievement by the regional body. The aim of ECOWAS in this regard is to adopt uniform legislative and regulatory frameworks, have an interconnection and integration of national networks so as to have a single liberalized telecommunications market in the sub-region.

Furthermore, ECOWAS commission needs a strategic plan with appropriate policy formulation tactics and implementation assessed by monitoring and evaluation by experts rather than politicians and their loyalist. We want to see an ECOWAS with borders that aid regional trade and movement of labour - 'borderless west Africa'. It is also extremely important to have a light rail - regional light rail - that will link all the countries especially the ones on the coast. Harmonization of decision making and centralized decision making through ECOWAS commission will make projects implementation across countries easier. We also hope that in a few years time we will have equivalent of inter-state roads (US) or 400 series (Canada) in ECOWAS. The ECOWAS version can be named ECOWAS Interstate Highway (EIH) with jointly managed toll-gates - e.g. well linked road from Canada-US-Mexico (NAFTA). This is different from ECOWAS Interstate Road Transit Scheme (ISRT). The ISRT allows the

movement of goods by road with customs approval in a member state that allows passage through other member states without duty, taxes and other restrictions while in transit. Trade will move in leaps if this infrastructural development is backed with mobile roam-able region and uninterrupted internet supply.

Finally, all this will happen if there is adequate data for making informed decisions and advising the policy makers. Thus, there is need for adequate collection of data on infrastructural variables within the ECOWAS commission.
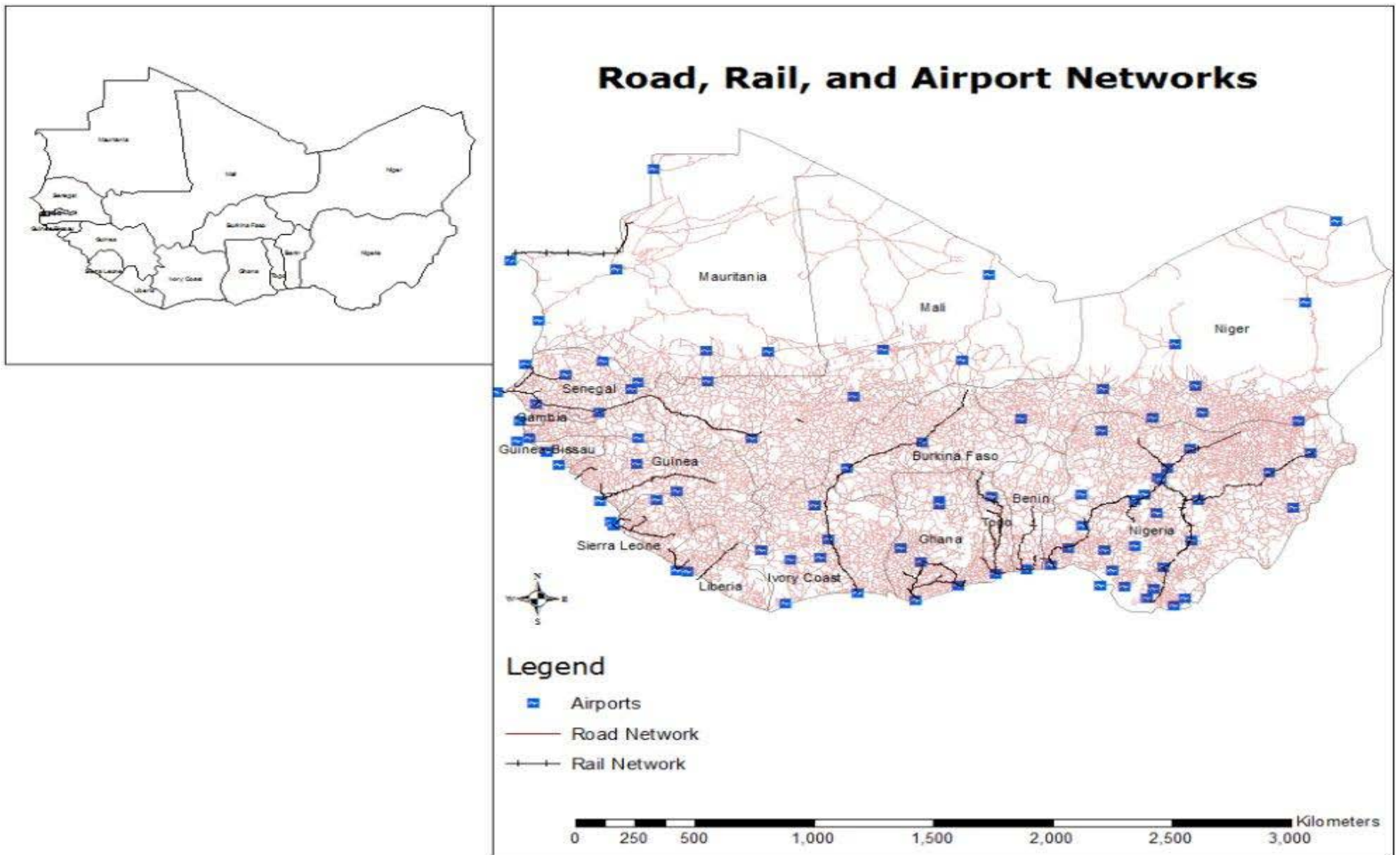
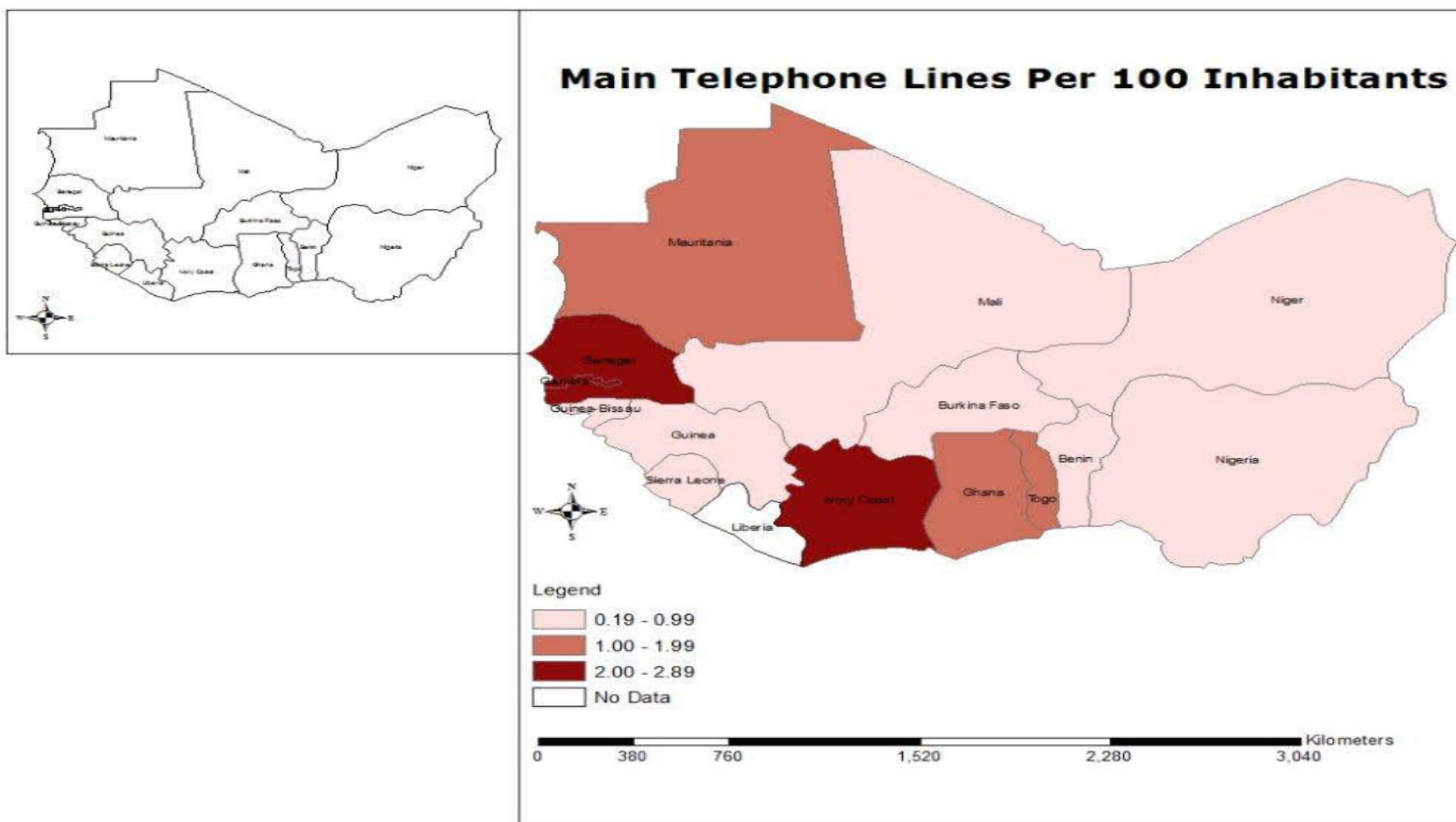Figure 6: Rail, Roads and Airports networks in ECOWAS

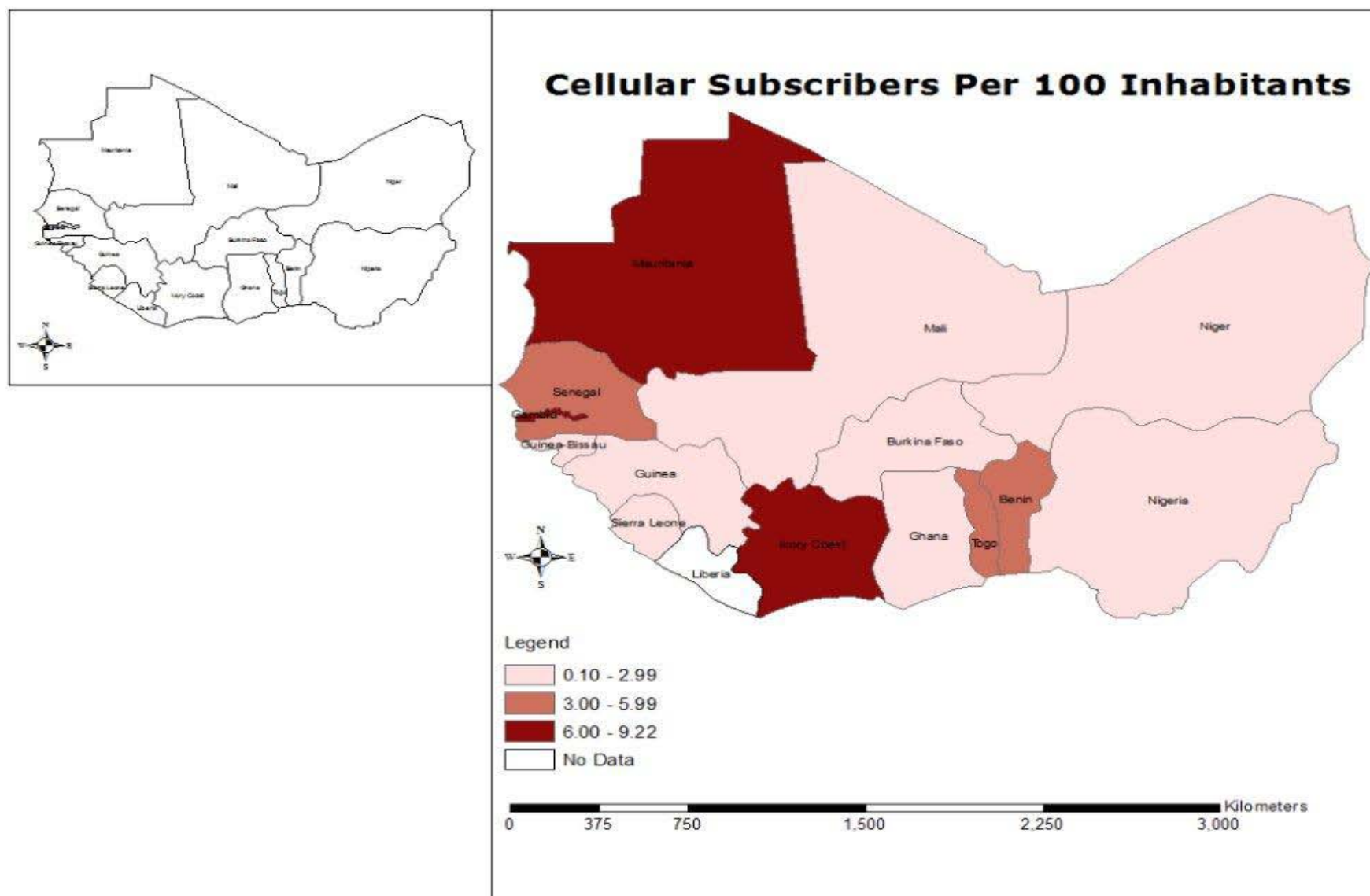Figure 7: Main telephone line (Landlines) per 100 inhabitants

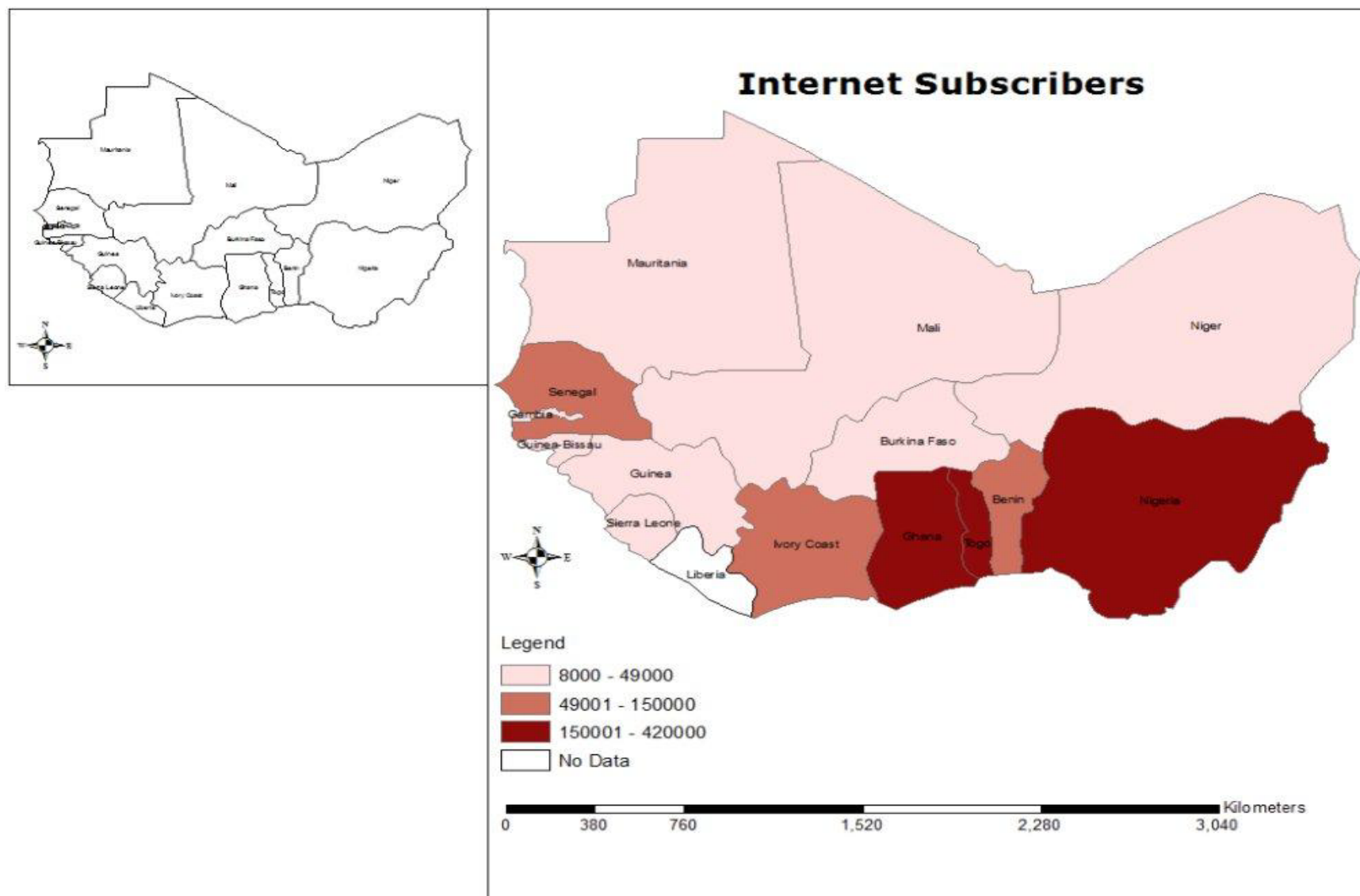Figure 8: Cellular subscribers per 100 inhabitants
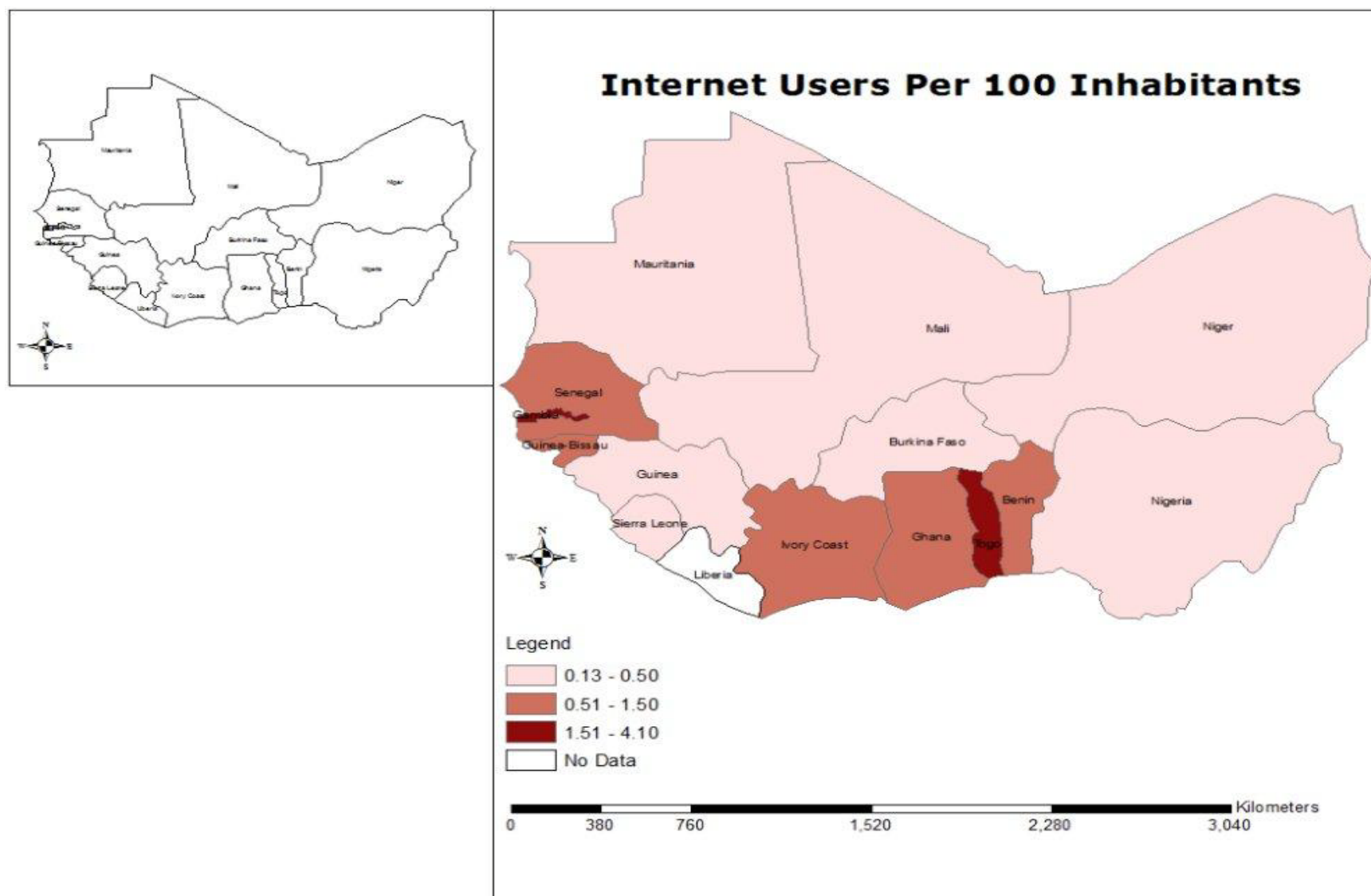
Figure 9: Internet subscribers in ECOWAS

Figure 10: Internet users per 100 inhabitants

5. Empirical Analysis

In this section, we present the regression results of the panel data (1993-2008). We analyzed three models with total trade, exports and imports as the dependent variables. We also used the three dominant models (Pooled model, fixed effects model, and random effects) usually considered before the preferred model is selected in panel regression. The results are below in Tables 5.1-5.3. We did the Hausman test to confirm the most suitable out of the fixed or random effect model. The analysis indicated a Chi-square of 12.68 (Prob>Chi^2 = 0.03), 10.86 (Prob>Chi^2 = 0.05), 27.58 (Prob >Chi^2 = 0.00) for the total trade, exports and imports models respectively. These results led to the rejection of the null hypothesis (H$_0$): difference in coefficient not systematic. In other words, the fixed effect model was better than the random effects model.

Although the fixed model was selected based on the Hausman test, most of the variables were not significant. In order to have a logical result that will contribute to the objective of our study - determinants of intra-regional trade - we decided to assume that there was no significant country or time based effects. We also assumed that any latent heterogeneity that fixed effects or random effects can take care of has been averaged out – due to the presence of both large and small countries. Pooled model is also fine when the sample size is small (Hoogstrate et.al, 2000).

As seen in Table 5.1, Gross Domestic Product (GDP) had a positive and significant effect on the total trade within the region. The result indicated that a percent increase in GDP will increase total trade by 0.74%. Common currency and language also had positive effect. This proved that the use of CFA (common currency) and English Language (common language) increased the value of total trade by 1.39 and 1.28 units respectively. The other variable that was significant in the model was distance. This variable (distance) had a negative effect on total trade within the

region. This is consistent with apriori expectation and it also confirms the negative impact of transportation and transaction cost within the region. An increase by 10% in the distance between countries (in kilometre) led to a decline in total trade by 20.5% within the region. This might be due to delays along all the major trade routes / corridors in West Africa, bad road networks and the cost of doing business involved with travelling long distance.

Table 5.1: Determinants of intra-regional total trade in ECOWAS

Variable	Pooled Model	Fixed Effects Model	Random Effects Model
LNGDP	0.74 (0.11)***	3.92 (0.88)***	0.98 (0.27) ***
LNGDPC	0.65 (0.36)	-2.91 (1.12)*	0.62 (0.48)
LND	-2.05 (0.76)**		- 1.37 (2.11)
GOVER	0.34 (0.39)	0.67 (0.39)	0.37 (0.39)
POLSTB	0.05 (0.66)	- 0.81 (0.64)	-0.41 (0.64)
CURRN	1.39 (0.32)***		1.15 (0.97)
LANG	1.28 (0.38)***		0.96 (1.08)
INFRIND	-0.01 (0.01)	- 0.01 (0.01)	-0.01 (0.01)
ACC	0.06 (0.28)		0.03 (0.80)
CONSTANT	10.79 (5.71)	-28.79 (6.95)	2.77 (15.83)
N	192	192	192
R^2	0.60	0.24	
Adjusted R^2	0.58	0.17	

Legend: * $p<0.05$; ** $p<0.01$; *** $p<0.01$. Standard errors are in parenthesis.

In the case of determinants of exports within ECOWAS, we discovered that two variables were significant. GDP had a positive effect and a percent increase in GDP of a particular country will increase its export to another country within ECOWAS by 1.34%. Distance also had a negative effect on the exports out of countries to member countries. The result indicated that an increase in distance between countries led to decline in exports by 2.87%. Thus, there is a need to improve the state of air, road and sea transportation in such a way that transaction cost as a result of long distance will be reduced. The determinants of intra-regional exports are presented in Table 5.2 below.

Table 5.2: Determinants of intra-regional exports in ECOWAS

Variable	Pooled Model	Fixed Effects Model	Random Effects Model
LNGDP	1.34 (0.12)***	4.51 (0.97)***	1.62(0.31)***
LNGDPC	-0.54 (0.40)	-3.95 (1.25)	-0.49 (0.54)
LND	-2.87 (0.85)***		-2.29 (2.42)
GOVER	0.72 (0.44)	0.93 (0.43)	0.65 (0.43)
POLSTB	0.26 (0.74)	-0.80 (0.71)	-0.38 (0.71)
CURRN	3.60 (0.36)		3.40 (1.12)
LANG	2.62 (0.43)		2.35 (1.24)
INFRIND	0.002 (0.01)	-0.001 (0.01)	0.002 (0.01)
ACC	-0.51 (0.32)		-0.33 (0.91)
CONSTANT	11.23 (6.41)	-33.60 (7.73)	2.76 (18.14)
N	191	191	191
R^2	0.78	0.21	
Adjusted R^2	0.76	0.13	

Legend: * $p<0.05$; ** $p<0.01$; *** $p<0.01$. Standard errors are in parenthesis.

To improve our understanding of the trade dynamics within the region we did the same analysis that we did on total trade and exports on intra-regional imports (See Table 5.3). This model gave the highest number of significant variables. This might be an indication of the importance of imports to ECOWAS countries as compared to exports. The variables that affected imports positively were GDP, GDP per capita, common currency, common language and access. Belonging to the CFA zone increased the intra-regional imports and being an Anglophone country also increased imports by 1.15 units. A country that is landlocked is also better accessed than countries that are not landlocked. This is an indication that sea and air transports are not really in vogue in the region.

Distance was significant and was a negative predictor of imports as seen in the total trade and export models. Apart from distance, government stability and infrastructure index also had negative impact. Periods of military government had a negative impact on imports, an indication that military governance can be a disincentive to intra-regional trade. The negative impact of infrastructure index might be as result of the complex nature of infrastructure and the possibility

of indirect effects. It is also possible that better infrastructure measured using an additive index of infrastructure variables such as road density (kilometre of road per 100 sq. km of land area), air transport – freight (million ton-km), telephone mainlines (per 1000 persons) and mobile phone subscribers (per 100 people) might encourage a situation when countries prefer to source or purchase materials from countries outside the region, reduction in transaction cost and interest in bilateral agreements with developed countries.

Table 5.3: Determinants of intra-regional imports in ECOWAS

Variable	Pooled Model	Fixed Effects Model	Random Effects Model
LNGDP	0.42 (0.05)***	1.84 (0.39)***	0.47 (0.09)***
LNGDPC	0.88 (0.18)***	-0.48 (0.50)	1.08 (0.19)***
LND	-3.23 (0.38)***		-3.36 (0.71)***
GOVER	-0.63 (0.20)**	-1.00 (0.17)	-0.32 (0.18)
POLSTB	-0.27 (0.33)	-0.59 (0.28)*	-0.40 (0.29)
CURRN	1.20 (0.16)***		1.22 (0.32)***
LANG	1.15 (0.19)***		1.15 (0.36)**
INFRIND	-0.01 (0.003)**	-0.01 (0.002)***	-0.01 (0.003)**
ACC	0.59 (0.14)***		0.70 (0.26)**
CONSTANT	22.25 (2.89)***	-12.74 (3.09)***	21.19 (5.28)***
N	190	190	190
R^2	0.80	0.55	
Adjusted R^2	0.79	0.51	

Legend: * $p<0.05$; ** $p<0.01$; *** $p<0.01$. Standard errors are in parenthesis.

6. Conclusions and Policy Recommendations

This study used both qualitative and quantitative analysis to analyze the impact of infrastructural development on trade and regional integration in West Africa. Thus, this section summarizes the outcomes from these two analytical approaches and proffer policies for the optimal utilization of infrastructural facilities for fostering regional trade and integration in ECOWAS.

Policy Lessons from the Qualitative Analysis

Within the period under study (1993 – 2008), the volume of trade in the sub-region rose from approximately US$4 billion to about US$20 billion, representing a 400 per cent increase in 15 years, which is partly an indication of desirable and workable macroeconomic policies. More specifically, 55 – 90 per cent of ECOWAS exports take place within the SSA, with Nigeria and Cote d'Ivoire recording the largest volume of about 23.2 per cent and 28.8 per cent respectively. However, on the other hand, ECOWAS member states significantly import from outside SSA. Thus, there is a dire need for a balance of trade flow within the sub-region through a policy direction towards capacity strengthening, information dissemination and expansion of infrastructural facilities.

With respect to infrastructural-related projects and programmes in West Africa, rail network is the least developed. In fact, the pace of rail policy reforms was accelerated in the 2000s, the implementation process has proven to be slow partly due to inadequate technical capacity in the sub-region.

On the other hand, major roads are mostly in good conditions and the seven major corridors in ECOWAS are almost entirely paved, though some are in poor conditions (Adekunle, 2010). It is important to note that within about three decades of existence of ECOWAS, major countries like Gambia, Sierra Leone, Liberia, Guinea Bissau and Guinea do not have regional corridors of trade. Thus, a need to urgently implement policies which will be targeted at the maintenance and expansion of ECOWAS corridors of trade.

Though majority of ECOWAS member states are located along the coastlines, and also have 25 large sea-ports (by African standards), they hardly utilize the sea as a major transport route. This is partly due to the lack of required capacity to process goods and manage containers. This is evident in the fact that ECOWAS as a regional bloc contributes very little to total Africa and global container traffic (about 1 per cent in terms of number of container trade handled; and about 2 per cent with respect to general cargo). Thus, the regional government needs to initiate policies and programmes which are targeted at developing the sea-port sub-sector of the infrastructure industry.

The airline sub-sector suffered a drastic setback since the collapse of the major Air Afrique Airline in 2004. Though Nigeria has the potential to serve as the airline hub for the sub-region, it is yet to realize this partly due to lack of willpower. Sub-regional coordinated policies should therefore be pursed in order to have a central air transport hub, in which smaller jets can ply the West African routes, and also linking various cities to the central hub.

Though ECOWAS countries are partly connected to electricity when compared to their counterparts in SSA, the supply is still largely epileptic and expensive. With respect to telecommunications, West African countries lag behind, ranking between 66th and 109th on a global scale. Thus, West Africa still needs to implement policies and programmes which will be targeted at providing affordable power supply, telecommunication services, internet access and other ICT facilities.

In summary, the qualitative and ex-post analysis indicate that West Africa has witnessed some developments but there are still lack of institutions that can create incentive for promoting infrastructural development in the region.

Policy Lessons from the Quantitative Analysis

In the empirical analysis, using a gravity model, the paper introduces a number of variables which prove to be significant in the analysis. GDP has a positive and significant effect on total trade in West Africa. Thus, the need for expansionary macroeconomic policies to further boost the sub-regional economy. The impact of common currency and language is also positive, therefore enhancing the strength of an effective policy stance to promote regional integration through a common currency like the CFA (francophone West Africa) or ECO (anglophone West Africa) within the sub-region.

Interestingly and in line with a priori expectations, distance has a significant and negative impact on total trade (as well as exports) in West Africa. In other words, this reveals that the importance of distance diminishes as the level of infrastructure improves. Since distance is a proxy for trade

costs, and according to several studies quoted in this paper, trade costs are largely determined by the quality of infrastructure. This conclusion is not unexpected because it could be partly explained that bad roads and numerous road-blocks along all the major trade routes / corridors in West Africa, contribute to the high cost of transacting businesses, as well as the adverse impact on total trade (and export). In this vein, the policy direction could be the provision and expansion of quality infrastructure, in order to reduce distance, which proxies for trade costs in this study. The adverse impact of governance indicators on intra-regional trade in West Africa explains the cases of political instabilities in the sub-region, thereby impeding free flow of goods and people. Therefore, a policy is being recommended to promote sub-regional peer-review on governance indicators among the member states. Further, structures should be established to strengthen governance in West Africa.

In addition to the fact that these findings have important policy implications for ECOWAS member states, improvement in the quality of infrastructure in West Africa will enhance trade, growth and regional integration. From this study, infrastructure has a significant and relatively large impact on bilateral flows. These findings support recent research on these sectors suggesting the need to propose policies which are targeted at investing in financing road-related infrastructural facilities in the sub-region. In order to promote regional trade and integration as well as a **'borderless ECOWAS of people and goods'**, there is a need to embark on the construction and expansion of more infrastructure within the sub-region. In addition to ECOWAS's increasing efforts towards fostering infrastructural development (such as bilateral / multilateral special purpose vehicles (SPVs), other quality-enhancing and efficiency-oriented financing policies in infrastructure would include:

- Preserving the current levels of state / sub-regional government expenditure on infrastructure expressed as a percentage of GDP.

- The role of private sector in the provisions of infrastructural facilities should be emphasized and increased.

- While emphasizing the need to provide adequate financing for infrastructure-related projects, innovative ways of financing such infrastructure-related initiatives include use of external sovereign bond, World Bank funded private-public partnership; AfDB African legal Support Facility; et cetera.

- Allocation of financial resources should be redistributed within the various sectors and concentrated on priority sectors – road, airline, telecommunication, ICTs, rail, et cetera.

- Another measure to improve the efficiency of the contribution of infrastructure to regional trade and integration in West Africa include the establishment of some linkages between financing of infrastructure facilities and their performance. The application of the basic elements of performance-oriented budgeting should be more effective than input-based financing system in analyzing the efficiency of available infrastructure in West Africa.

Improvements in the quality and quantity of infrastructure can, however be costly and in the short term beyond the means of the Member States Government. Other studies have shown that liberalization of the infrastructure sector has substantially improved efficiency in many developing countries. This is a policy option that has modest costs and, if well designed, would significantly improve regional trade performance. In fact, internal and external liberalization of infrastructural services has improved efficiency of key infrastructure services in the short to

medium term. Thus, the establishment of ECOWAS Export Processing Zones or Special Economic Zones which are also characterized by innovation platforms where exporters, importers, entrepreneurs, bankers, governmental parastatals and other stakeholders, alike, have access to and are charged the full cost of the infrastructure.

In addition to the bold steps by ECOWAS Commission such as the establishment of the bilateral / multi-lateral special purpose vehicles (SPVs); implementation of EU-Africa Partnership on Infrastructure; implementation of NEPAD Short-Term Action Plan (STAP); implementation of NEPAD Medium-to-Long-Term Strategic Framework (MLTST); implementation of AU Infrastructure Master Plan Initiative and the Programme for Infrastructure Development in Africa (PIDA), ECOWAS commission needs a strategic plan with appropriate policy formulation tactics and implementation assessed by monitoring and evaluation by experts rather than politicians and their loyalist. We want to see an ECOWAS with borders that aid regional trade and movement of labour - 'borderless West Africa'. It is also extremely important to have a light rail - regional light rail - that will link all the countries especially the ones on the coast. Harmonization of decision making and centralized decision making through ECOWAS commission will make project implementation across countries easier. We also hope that in a few years time we will have the equivalent of inter-state roads (US) or 400 series (Canada) in ECOWAS. The ECOWAS version can be named ECOWAS Interstate Highway (EIH) with jointly managed toll-gates - e.g. well linked road from Canada-US-Mexico (NAFTA). This is different from ECOWAS Interstate Road Transit Scheme (ISRT). The ISRT allows the movement of goods by road with customs approval in a member state that allows passage through other member states without duty, taxes and other restrictions while in transit. Trade will

move in leaps if this infrastructural development is backed with mobile roam-able region and uninterrupted internet supply.

Finally, all these recommendations will be realized if there is adequate data for making informed decisions and advising the policy makers. Thus, there is need for ECOWAS commission to strengthen its capacity on the collection of reliable data on infrastructural variables and other indicators of regional trade and integration.

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APPENDIX 1: Major Corridors in ECOWAS
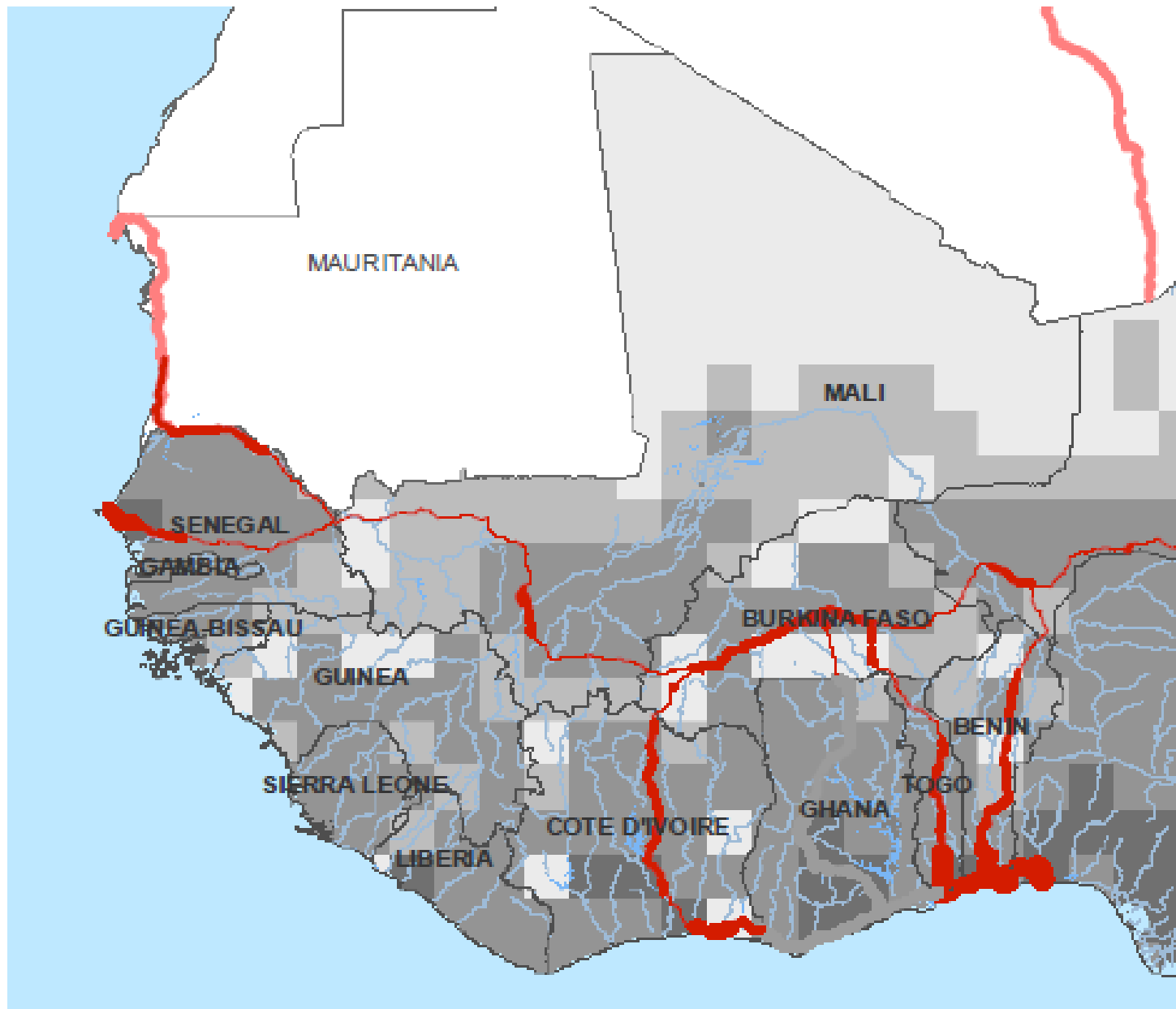
A Map showing the major corridors in ECOWAS (Source AICD, 2010)