

Manufacturing Export, ICT Infrastructure and Institutions in ECOWAS Countries

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Abstract

This study empirically examined the relationship between manufacturing export and ICT infrastructural provision, and underscored how institutional quality can influence such relationship using 15 ECOWAS countries (2000-2012). This stemmed from the fact that infrastructural provision in ECOWAS sub-region is low and there is a drive by the regional community to improve infrastructure for enhanced trade outcomes. We used the Systems Generalised Method of Moment-SGMM technique to address possible issues of endogeneity and reverse causality. Our result reveals that the current level of infrastructural provision in ECOWAS countries cannot translate into improved trade benefit. However, institutional development in this region can circumvent this shortcoming. The results are robust with the inclusion of some alternative estimates.

Keywords: Infrastructural provision; Manufacturing value added; Manufacturing export; Dynamic Panel data, Institutions, ECOWAS

JEI Codes: F13; F31.

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1 Introduction

The process of global competitiveness and internationalisation seems to place emphasis on the export of products from the manufacturing and services sectors, compared to the traditional export of primary products (such as those from agricultural and oil sectors). This is mainly due to the issue of value addition that are limited in the export of primary products. Furthermore, infrastructural provision has an important role to play as trade (like most economic activities) requires some measure of infrastructural provision to thrive. As recently noted by World Bank (2013a), infrastructure can help in determining the success of manufacturing and other agricultural activities. This is because poor infrastructure can prevent the development of markets for intermediate inputs and will impede manufacturing, leading to low export capacity.

Infrastructural provision has transcended the traditional focal emphasis on ‘roads and bridges’ to software and other forms of technology that can foster trade. The information and communication technology-ICT stands out in this regards because it aids diverse processes that can culminate in enhanced export. For instance, it promotes efficient and effective innovation process (Islam and Ekekwe, 2012; Aloini and Martini, 2012); it establishes the linkage between the manufacturing firms and the potential suppliers or market, through the use of the telephones and internet facility; it aids the communication processes that are required during the production process (Osabuohien and Efobi, 2012). This is especially for companies that operate factories at varying location and that require ICT for effective monitoring and directions during the production process. Finally, most modern factories are highly automated and the vintage of ICT cannot be denied to have contributed to the overall success stories.

Zeroing on specifics, ICT infrastructural provision in Economic Community of West African States (ECOWAS) has witnessed modicum progress in comparison to other countries of the world. Using some measures of ICT such as internet and telephone usage, the statistics from the World Bank (2013a) reveal that as at 2010, ECOWAS countries had an average of 7 out of 100 persons that use internet facility and 2 persons out of 100 makes use of telephone lines for communication. The mobile cellular line records more users of about 55 persons out of 100 that make use of this ICT infrastructure. Compare this situation to other regions such as East Asia and Pacific-EAP (about 23 internet users and 75 mobile line subscribers), Europe and Central Asia-ECA (38 internet users and 123 mobile line subscribers) and Latin America and the Caribbean (35 internet users and 97 mobile line subscribers), countries in ECOWAS are lagging behind. Subject to the trend of ICT infrastructure in ECOWAS region, the regional community is beginning to wake up to the realisation that there is the need for regional actions that will compel member states to put in place policies to enhance ICT infrastructural development. Some of these actions include the supplementary act of 2007 that focused on the harmonisation of policies and regulatory framework for the ICT sector in the regional community. Article 33 of the acts provides that member states should participate in the modernisation and development of ICT infrastructure in order to provide reliable interconnectedness, both for regional and international communication (ECOWAS, 2007). Among the notable achievements of this effort is the declaration for the support of the deployment of submarine cable project that links member countries to Southern Europe.

It is expected that the investment in infrastructural development, especially ICT infrastructure, will result to notable national progress. The United Nations Economic Commission for Africa-UNECA (2011) noted that the end-result of infrastructure bottleneck in Africa is that trade will be grossly affected. Longo and Sekkat (2001) earlier predicted this interrelationship by noting that a 1 percent increase in the stock of transportation and telecommunication in the exporting country will boost its export to other African countries by about 3 percent. Noting these expected benefits, we query why the ECOWAS sub-region is not able to effectively achieve high progress in ICT usage and the consequential effect on the manufacturing sector in the respective member countries. As at 2010, countries in the sub-region are able to boast of only 15.87 percent of merchandise export to be comprised of manufactured products. The bulk of this export is of course, traceable to export of agricultural and other resources. This trend is not suitable for global competitiveness and sustainable growth; there is the need to begin to consider manufacturing export. This is because the manufacturing sector, in particular labour-intensive industries, creates employment opportunities for the uneducated poor, sometimes even more dramatically than agriculture: small and medium-size enterprises account for approximately 60 percent of the workforce in urban areas and 25 percent of industrial output (UNECA, 2009).

Possibly, the role of institutional framework within countries of the sub-region cannot be denied. The above proposition is traceable to the fact that institutional weakness has been identified as one of the basic drawbacks for Africa's development¹. Empathetically, the ECOWAS and other regional economic communities (RECs) have championed the drive towards promoting better governance- inclusive of democracy- in the member countries (Economic Commission for Africa, 2009); however, the incremental impact of these actions is not clear. This is despite the importance of institutional quality in enhancing Africa's development that has been observed in recent literature. Fosu (2011) opines that the terms of trade of many African countries would improve except for the level of their institutional quality, while Osabuohien and Efobi (2011) suggest that RECs can improve their effectiveness in member states by stipulating institutional benchmarks just as they do for tariff and other national economic matters.

There is a dearth of empirical studies that have examined the relationship between manufacturing export and ICT infrastructure, while considering the role of institutions. A quick search of literature unveils a number of published empirical works on general trade and export in Africa or a specific African sub-region (Edwards and Alves, 2005; Meon and Sekkat, 2008; Osabuohien and Efobi, 2011; Deen-Swararray, Adekunle and Odularu, 2012). Though, these studies have emphasised the role of institutions in enhancing export, we observe some gaps. They did not focus on the manufacturing export of ECOWAS countries, except for Deen-Swararray, Adekunle and Odularu (2012) that focused on intra-regional trade of ECOWAS countries. This is despite the importance of manufacturing export in enhancing global competitiveness of African countries. For instance, the United Nations Conference on Trade and Development-UNCTAD (2012) reports that for countries to benefit from the opportunities of participating in the

¹Weak institutions entail issues of corruption, government ineffectiveness, and poor policies and so on and these have a spill-over effect in the increase of the cost of trading in ECOWAS region. For instance, it will not be too shocking to see about six checkpoints between Lagos (Nigeria) and Seme (Benin Republic) borders – a distance of less than 100km. Some of these checkpoints include customs, police, National Drug Law Enforcement Agency (NDLEA), immigration services, who more often than none will request for bribe, which add to trading cost including time.

international trading system, they require an increase in the value-added components of the manufacturing sector. Another gap is that attention was not given to the influence of institutional quality in the export-ICT infrastructure nexus. This requires emphasis as institutional development is relevant for effective budget allocation for capital projects and disbursement for infrastructural development. The analysis of the present study utilises an econometric model that was estimated with dynamic panel data technique. The data was sourced from the World Development Indicators (WDI) of the World Bank for the period 2000-2012 on 15 selected countries in ECOWAS.

The remaining part of the paper is structured as follows: the next section presents an overview of manufacturing export, ICT infrastructure and institutional quality in ECOWAS countries; brief review of literature follows next while the econometric specifications and the description of data was presented in the fourth section. The fifth section presents the empirical results and discussions and conclusion and policy recommendations were in the sixth section.

2 Brief Background Information in ECOWAS countries

Manufacturing export is considered an important aspect of trade especially exports. This is based on the fact that it involves processed and semi-processed, preserved and stored products that are expected to have more value added than primary products (Olayiwola, Osabuohien and Okodua, 2011). In other words, since manufactured products are processed, they have longer shelf-life than raw materials, which will enhance the possibility of accessing farther markets. This is deemed crucial stemming from the quest for most Sub-Saharan African (SSA) countries to industrialise for which the manufacturing sector has been noted to play important role in facilitating this process (Ogunrinola and Osabuohien, 2010). In view of the above, this paper presents the trend of manufacturing export of ECOWAS.

The values of manufacturing export for different ECOWAS countries presented in this section are the average of the respective countries and they show the contribution of manufacturing export in the economy, as they are presented as a percentage of GDP. This measure will also scale the regions manufacturing export by the total merchandise export and make them more comparable as possible economic size bias will be eliminated. This statistics is reported in Table 2.1 for the period 1991-2010 and discussed accordingly.

Table 2.1 reveals that amongst all the countries presented, only 3 countries performed above the average of SSA manufacturing export for the period 2006-2010. These countries include Cape Verde, Senegal and Togo. These countries have consistently performed above other countries and their manufacturing export has remained above 40 percent of their total merchandise export. The countries with the strongest economies in this region-Nigeria and Ghana have not performed as well; Nigeria records between 1 and 4 percent, while Ghana records between 2 and 23 percent. Generally, the percentage of manufacturing export to total merchandise export is low except for few countries, as identified earlier.

Table 2.1: Manufacturing Export as %Total Merchandise Export of ECOWAS Countries

	1991-95	1995-00	2001-05	2006-10
Benin	8.89	4.81	7.66	17.34
Burkina Faso	6.07	14.06	11.38	7.69
Cape Verde	76.66	82.23	84.51	28.12
Cote D'Ivoire	6.57	15.62	19.74	14.53
Gambia	35.97	15.57	22.16	19.26
Ghana	7.74	14.73	12.65	23.23
Guinea	24.29	22.46	16.56	9.14
Guinea Bissau	0.19	NA	0.75	NA
Liberia	NA	NA	NA	NA
Mali	NA	4.06	12.93	12.85
Niger	0.86	3.22	10.84	11.01
Nigeria	0.70	1.55	1.49	3.86
Senegal	30.50	46.16	42.93	40.19
Sierra Leone	NA	1.95	1.49	NA
Togo	7.22	14.91	51.27	47.76
SSA	0.00	25.69	17.83	27.03

Note: The values are the averages for the respective countries and periods. NA implies not available.

Source: Authors' Computations from World Bank (2013a).

Considering the extent of Information and Communication Technology (ICT) infrastructural development in ECOWAS countries, Table 2.2 presents some infrastructural indicators, such as internet and telephone usage. These infrastructural indicators were focused on in this discussion because other measures such as paved roads and rail lines did not have data for ECOWAS countries. Since the focus is on manufacturing export, ICT infrastructure is valuable as it can enhance the linkage between local manufacturers and the global market, in terms of the quotations for demand and supply. We imply that in the global market, ICT is needed to secure demand and supply and enhance the connectedness between local manufacturers and the global market. UNECA (2011) properly iterates our thought by noting that Africa's trade is hamstrung by the absence of market information, which is supposed to be enhanced through ICT usage.

Table 2.2: Extent of Infrastructure in ECOWAS Countries

	Internet Users (Per 100 People)				Telephone Users (Per 100 People)			
	1991-95	1995-00	2001-05	2006-10	1991-95	1995-00	2001-05	2006-10
Benin	NA	0.091	0.894	2.110	0.484	0.655	0.939	1.343
Burkina Faso	NA	0.041	0.320	1.167	1.137	0.363	0.538	0.841
Cape Verde	NA	0.739	4.384	16.018	20.053	9.440	15.200	14.740
Cote D'Ivoire	NA	0.088	0.708	1.865	3.420	1.158	1.576	1.515
Gambia	0.009	0.386	2.535	7.031	7.262	2.180	2.848	2.949
Ghana	NA	0.065	1.154	4.817	1.587	0.747	1.399	1.229
Guinea	0.001	0.034	0.416	0.856	0.797	0.238	0.295	0.235
Guinea Bissau	NA	0.078	1.277	2.274	3.102	0.683	0.776	0.357
Liberia	NA	0.008	0.026	0.778	1.034	0.242	0.231	0.080
Mali	NA	0.047	0.333	1.362	0.764	0.271	0.499	0.610
Niger	NA	0.014	0.160	0.595	0.659	0.174	0.190	0.403
Nigeria	NA	0.031	1.161	14.435	1.645	0.386	0.662	0.949
Senegal	NA	0.167	2.653	10.882	1.019	1.584	2.332	2.389
Sierra Leone	NA	0.038	0.189	0.312	0.377	0.447	0.534	0.494
Togo	NA	0.384	1.280	2.440	0.733	0.712	1.117	2.451
SSA	NA	0.257	1.316	6.412	1.033	1.297	1.460	1.487

Note and Source: Same as in Table 2.1

From Table 2.2, it could be identified that countries that performed better in manufacturing export have had better ICT infrastructural development. Countries such as Cape Verde, Gambia, Ghana and Senegal all had above 10 percent value of manufacturing exports to merchandise export. Generally, the rate of infrastructural development, in terms of internet and telephone usage in ECOWAS countries is low. This is not farfetched as infrastructural development in SSA countries is experiencing similar challenge.

Table 2.3: Benchmarking ICT Infrastructure across Regional Communities in Africa

	ECOWAS	CEMAC	COMESA	EAC	SADC
Broadband Subscribers*	0.03	0.01	0.04	0.02	0.36
International Internet Bandwidth (per Capita)	16	11	9	11	19
Internet Subscribers*	0.24	0.06	0.09	0.05	0.53
Main Telephone Lines Outside Largest City*	0.39	0.20	0.53	0.24	1.89
Mobile Telephone Subscribers*	25	22	12	21	31
Prepaid Mobile Price Basket**	14.04	15.11	9.09	12.18	11.32
Price of a 3 Minute Call to United States (US\$)	0.83	5.68	2.20	1.37	1.50
Price of 20 Hour Internet Basket**	79.98	67.97	50.91	95.70	75.60
Price of Fixed Telephone Price Basket **	9.35	12.59	6.85	13.33	13.27

Note: CEMAC-Economic and Monetary Community of Central Africa; COMESA-Common Market for Eastern and Southern Africa; EAC-East African Community; SADC-Southern African Development Community. Also, * and ** imply that the measures are in per 100 inhabitants and US\$ per month.

Source: Adapted from Ranganathan and Foster (2011)

Comparing the performance of ECOWAS countries with countries in other regional community, ECOWAS performs relatively well on access to ICT (see Table 2.3), but faces some challenges with high prices for critical ICT services. For instance, the price for a monthly prepaid mobile basket is higher in the regional community than others except for CEMAC; while the price for 20 hour internet basket, at 80 US\$, is exceeded only by EAC.

The prices of ICT infrastructure ECOWAS countries in Table 2.3 mask significant variations that exist across countries in the regional community. Table 2.4 reveal that some countries, such as; Burkina Faso, Cote D'Ivoire, Mali, Niger, Senegal and Togo, pay monthly tariffs above 10 US\$ for fixed-line phone baskets. More disturbing is that about 67 percent of countries in this region pay beyond 10 US\$ for prepaid mobile monthly basket; and almost the entire member countries pay beyond 20 US\$ for 20-hour internet basket. Some countries like Burkina Faso, Guinea Bissau, Niger and Nigeria pay above 50 US\$ for the same 20-hour internet services.

We further examined the institutional quality in these countries by summarising the average score for measures of control of corruption, government effectiveness and rule of law. These three measures were our focus because their developments are able to ensure property right protection and security of investments, which will in turn enhance industrial growth and development (Asiedu, 2006). Table 2.5 presents the average scores of the three variables for the period 2001-2005 and 2006-2010.

Table 2.4: Extent of Infrastructure in ECOWAS Countries

	Price of a Minutes Call to United States (US\$)	Price of the Fixed- Line Monthly Phone Basket (US\$)	Prepaid Mobile Monthly Basket (US\$)	Price of 20-Hour Internet Basket (US\$)
Benin	1.06	5.34	10.4	43.1
Burkina Faso	1.22	12	15.5	75.0
Cape Verde	3.61	8.02	12.9	44.2
Cote D'Ivoire	0.91	25.02	12.9	47.8
Gambia	1.85	4	6.9	17.8
Ghana	0.44	6.33	5.7	9.4
Guinea	4.61	7.10	3.8	26.8
Guinea Bissau	NA	NA	11.3	74.9
Liberia	NA	NA	NA	NA
Mali	1.73	11.01	14.7	28.4
Niger	1.93	12.64	15	51.2
Nigeria	0.28	7.39	16.3	118.9
Senegal	1.03	10.48	9.1	25.9
Sierra Leone	NA	2.11	19.4	9.9
Togo	2.43	13.86	16	20.3

Note and Source: Same as in Table 2.3

Table 2.5: State of Institutional Quality in ECOWAS Countries

	Control of Corruption		Government Effectiveness		Rule of Law	
	2001-05	2006-10	2001-05	2006-10	2001-05	2006-10
Benin	-0.664	-0.614	-0.393	-0.522	-0.462	-0.625
Burkina Faso	-0.088	-0.354	-0.616	-0.621	-0.598	-0.314
Cape Verde	0.283	0.746	-0.042	0.098	0.309	0.508
Cote D'Ivoire	-0.987	-1.119	-1.089	-1.234	-1.390	-1.379
Gambia	-0.496	-0.677	-0.560	-0.664	-0.167	-0.372
Ghana	-0.236	0.033	-0.121	0.009	-0.044	-0.044
Guinea	-0.774	-1.138	-0.896	-1.194	-1.221	-1.493
Guinea Bissau	-1.026	-1.078	-1.279	-1.079	-1.248	-1.348
Liberia	-3.032	-0.630	-3.954	-1.563	-4.369	-1.289
Mali	-0.527	-0.509	-0.676	-0.815	-0.224	-0.341
Niger	-0.921	-0.731	-0.839	-0.811	-0.779	-0.654
Nigeria	-1.248	-0.970	-0.955	-1.069	-1.380	-1.145
Senegal	-0.006	-0.552	-0.157	-0.366	-0.012	-0.311
Sierra Leone	-0.908	-0.915	-1.333	-1.181	-1.273	-0.980
Togo	-0.810	-0.991	-1.452	-1.469	-0.943	-0.894

Note: the three measures are valued from -2.5 (weak institutions) to +2.5 (strong institutions).

Source: Authors' Computations from World Governance Indicators (World Bank, 2013b).

In Table 2.5, the level of institutional quality in Cape Verde, in terms of control of corruption, government effectiveness in making policy and pursuing such policy and the rule of law, is better than other ECOWAS countries. This is followed by Ghana in terms of control of corruption and government effectiveness. Other ECOWAS countries had poor institutional quality because the values for institutional quality were all negative for the entire period.

The major issue that can be underscored here is that most ECOWAS countries have not performed well in terms of manufacturing export and the level of infrastructural development is still low for these countries. Likewise, the institutional framework is not as developed. The basic question therefore is whether these variables have a significant link. This can readily be inferred because some of the countries, such as Cape Verde and Ghana, that have performed better with

regards to manufacturing export, have their infrastructures developed and a higher institutional quality as well. However, we cannot conclusive state that a link exists; the need for an empirical validation is brought to bear.

3 Insights from Literature

Broadly speaking, factors that can influence the performance of trade in a region or country have been documented in literature, but with varying conclusions. For example, Yang and Gupta (2007) noted that the regional trade agreements (RTAs) in Africa have not been very meaningful in enhancing trade. Some of the reasons for this were attributed to external trade barriers and low level of harmony in terms of resources among the member countries. The authors suggested that trade liberalisation and the streamlining of the RTAs could be useful in promoting trade in the continent. In a more recent study, Osabuohien and Efobi (2011) observed that institutional weakness constituted one of the major drawbacks to trade outcomes of Regional Economic Communities (RECs) in Africa. The authors recommended that setting up institutional performance benchmarks, just like the macroeconomic convergence criteria can improve Africa's RECs trade outcome. The above was similar to the recommendation of Meon and Sekkat (2008), who used a panel data for the period 1990 to 2000 on 59 countries (mainly in America and Asia except for eight African countries) using the Fixed Effects and Two Stage Least Square models. The authors found that institutional quality using rule of law, government effectiveness and lack of political violence as indicators was crucial in determining international trade performance especially manufacturing export.

Baunsgaard and Keen (2004) observed a panel of 125 countries for the period 1975-2000 and concluded that high-income economies easily recovers from loss of trade revenues, while middle-income economies recover an average of 35–55 percent trade revenues, but low-income countries, like those in SSA, recovered none. This implies that economic income matters in trade performance. Other reasons that have been advanced for low trade performance in Africa include: poor transport facilities, high trading costs and market size (Limao and Venables, 2001; Reddings and Venables, 2002; Yang and Gupta, 2007; Djankov, Freund and Pham, 2010; Mbekeani, 2010). Rodrik (1999) and Subramanian and Tamirisa (2003) have equally established that the declining share of African countries at the world market can be traced to their growth in income, size of population, geography, and the nature of economic policy.

Deen-Swarrray, Adekunle and Odularu (2012) examined the extent of infrastructure development and its impact on trade integration in West Africa countries. The authors used 12 West African countries for the period 1993 to 2008 and used gravity model to find out that infrastructure index had a negative impact on intra-regional trade. A possible explanation for their finding was that the negative impact of infrastructure index might be as a result of the complex nature of infrastructure and the possibility of indirect effects. They concluded that it is possible that better infrastructure might encourage a situation where countries prefer to source or purchase materials from countries outside the region to reduce transaction cost, thereby raising interest in bilateral agreements with developed countries. Cissokho et al (2012) further restated the need for countries in the ECOWAS region to address possible Non-Tariff Barriers (NTB) to trade (including transportation barrier as a result of poor infrastructure) in order to enhance agricultural trade within the region. They concluded that for West African countries to maximize their agricultural export there is the need to engage in investments in better infrastructure and institutional framework in the form of faster customs clearance and fewer police payoffs

Some other studies that have examined the determinant of manufacturing export in African context include Edwards and Alves (2005), who explored the extent to which the composition and level of manufacturing export respond to reform initiatives in the 1990s in South Africa and established that the reform policies were mixed in generating export growth due to the inability to re-structure exports towards dynamic, high-technology products. Edwards and Alves used export supply and demand functions to examine the determinants of South African manufacturing export performance and found among others that exports are predominantly supply driven. Aggrey, Eliab and Joseph (2010) using probit regression estimation technique, indicated that capital, foreign ownership, training, education level of managers of manufacturing firms are determinant of manufacturing export in Uganda; but in Kenya it was capital, training of workers and proportion of unskilled workers; while in Tanzania, firm size and foreign ownership positively influenced export participation of manufacturing firms. Morrissey and Mold (2006) used volume of exports, to estimate African trade performance based on a dynamic panel data analysis for 48 countries in Africa (1987-2002) and found that both foreign investment (Foreign Direct Investment stock) and domestic investment (Gross Fixed Capital Formation) influenced export values in Africa while per capita income was a major determinant of Africa export growth.

The role of infrastructure in enhancing the trade potential of African countries is evident especially for countries disadvantaged by isolation and distance (Redding and Venables, 2002). In most developing countries, this is an issue which if not resolved may hinder the crucibles of economic growth which includes trade. Limao and Venables (2001) investigated the relationship between infrastructures, geographical disadvantage, transport cost and trade and found out that infrastructure is an important determinant of transport costs especially for landlocked countries. Limao and Venables further went ahead to give an elasticity of trade flows with respect to trade cost and concluded that a deterioration of infrastructure from the median to the 75th percentile raises transport costs by 12 percentage points and reduces trade volumes by 28 percent. Mbekeani (2010) supports the position above by adding that inadequate infrastructure and poor transport system in many African countries pose a major challenge for producers with regards to meeting up with timely delivery of goods.

The above is germane as developing countries suffer far more from supply constraint than they do from a lack of market access. This is because the high input costs and other supply-side challenges like high cost of production, high cost of transportation, corruption in the process of import and export as well as cost of storage will make manufactured goods for export less profitable. However, these constraints may be cushioned by enhancing infrastructure in these countries (Limao and Vennables, 2001; Wilson *et al*, 2004). In support of this, Fujimura (2004) and Ndulu (2006) noted that infrastructure would enhance the rate of accessibility of country's products, which will invariably improve export performance.

Appreciably, the literatures on factors that promote manufacturing export have overtly echoed on the need for infrastructural development; inadvertently, the need for ICT infrastructure has been neglected. This is despite the global drive towards emphasis on innovative production process, which can be stalled if ICT is not promoted. This is because of the cutting-edge competitive advantage that new technology grants adopters against those not adopting similar technology in the same industry. Furthermore, empirically relating manufacturing export to ICT infrastructure in ECOWAS countries, has not received much attention. Most studies with similar focus have paid

attention to infrastructure that relates to transportation or an overall measure of quality of infrastructure in SSA countries or other African countries (e.g. Edwards and Alves, 2005; Aggrey, Eliab and Joseph, 2010; Mbekeani, 2010). This study therefore contributes by focussing on ECOWAS countries and examining the influence of institutional quality in this relationship. We also ‘interact’ these variables with institutional quality to understand if institutional quality serves as a complement or substitute in defining the relationships.

4 Model Specification and Description of Data

This paper formulates its empirical model by building on Meon and Sekkat (2008) model, who examined the determinant of trade performance (manufacturing and non-manufacturing export), but with emphasis on the institutional quality of the countries. Meon and Sekkat model was focused on an analysis that is closely related with ours, except that their main focus was on the extent of institutional quality of the country; we concentrate on both infrastructural development in ECOWAS countries and institutional quality in these countries. Manufacturing export is measured by using the ratio of manufacturing export to total merchandise export. We preferred this measure because it is able to capture the component of the trade ‘basket’ that is manufactured products. This is unlike the ratio of manufacturing export to GDP, used by Meon and Sekkat, which looked at manufactured export contribution to the GDP (economy).

We computed a composite measure of ICT infrastructure, using the simple average of internet users, telephone users and mobile phone users. These measures are popular in literature (e.g. Asiedu, 2006; Asiedu, 2011; Mijiyawa, 2010; Deen-Swarrray, Adekunle and Odularu, 2012) as they have been used extensively to capture infrastructural development in countries. The reason given for the use of these variables as measures of ICT infrastructure is partly due to data availability and most international trade transaction will require these kinds of infrastructure to secure contract for sale and purchases of products. Attempt was made to use the World Bank Logistics Performance Index (LPI) on Quality of Trade and Transportation and related Infrastructure. This data is expected to portray a holistic view of the extent of infrastructure in this region. However, this data was not available and very scanty for most ECOWAS countries; the data was only available for 2007, 2010 or 2012. A summary statistics is presented in Table A1 in the Appendix².

The second main variable is institutional development, which was captured using three measures: the control of corruption, government effectiveness and rule of law. These variables are used as the measure of institutional quality because they are able to explain those institutional factors that can inhibit or promote trade. For instance, the increase in the rate of corruption and poor rule of law will increase transaction cost through opportunistic behaviour of agents, especially in international trade transactions (Wysocki, 2011). Also, Ackah, Turkson and Opoku (2012) noted that corruption in most ECOWAS countries has brought about issues such as frequent and unwarranted road blocks on highways, which has resulted to increasing trade costs and poor intra-ECOWAS trade, causing countries to lose substantial revenues. Government effectiveness was included because studies have emphasized that ECOWAS countries require effective policy coordination by the governments to enhance intra-regional infrastructural co-operations (Deen-Swarrray, Adekunle and Odularu, 2012).

²Taking a peep in Table A1, will inform that almost all ECOWAS countries’ LPI values for the periods (2007, 2010 and 2012) where data was available are quite lower than the world average.

The annual growth rate of the manufacturing value added as one of the covariates was included. This is because the productivity in the manufacturing sector influences manufacturing export performance. This variable is also important because it is able to capture the resource inputs into the manufacturing sector that translates to productive output. Such inputs include labour, capital and other innovations that are associated with labour, which can translate into manufacturing outputs. Hence, labour and capital are not in the model, despite that they are important component of production for export. Labour and capital are major components of the manufacturing value added and to avoid multicollinearity, they were left out. Another option would have been the level of labour and capital that are absorbed by the manufacturing sector, which are not available. Since labour and capital are major components of the manufacturing sector, using manufacturing value added is deemed to be informative.

Other covariates that are likely to affect manufacturing export include the exchange rate. This measure reflects the relative stability or fluctuation of the local currency of the countries, which will affect the profit or performance from the manufacturing export transactions. Therefore the baseline model is depicted in a functional form in equation (1) as:

$$Mafex = f(Magr, Exch, Invest, Infra, Institution^k U) \quad (1)$$

Equation (1) is restated in an explicit form as thus:

$$Mafex_{it} = \beta_0 + B_1Magr_{it} + \beta_2Exch_{it} + \beta_3Infra_{it} + \beta_4Institution^k_{it} + \varepsilon_{it} \quad (2)$$

To test the relevance of institutions in the infrastructure-export nexus, an interactive variable was introduced in the model. The variable is a multiplicative of the different institutional variables and infrastructure. With these variables, it is possible to establish whether institutions perform a substitutive or complimentary role in the nexus. In this wise, equation (2) is restated to include the interactive variable as:

$$Mafex_{it} = \beta_0 + B_1Magr_{it} + \beta_2Exch_{it} + \beta_3Infra_{it} + \beta_4Institution_{it} + \beta_5Institution^k \times Infra_{it} + \varepsilon_{it} \quad (3)$$

- Mafex*: manufacturing export, measured as percentage of merchandise export.
Magr: annual growth rate of the manufacturing value added.
Exch: real exchange rate.
Infra: indicator of ICT infrastructural provision, measured as the average of internet users per 100 persons, mobile and fixed line telephone subscribers per 100 persons, and telephone users per 100 persons,
Institution: institutional quality measures, including control of corruption (CC), government effectiveness (GE) and rule of law (RL) with information regarding it methodology provided by Kaufmann *et al.* (2010). *CC* is the extent of corruption and the extent to which public offices are misused for private gains; *GE* captures the quality of government policies and the commitment of the government to such policies while *RL* measures the extent to which economic agents have confidence in and abide by the rules of a society, and in particular the quality of contract enforcement, property rights, the police, and the courts. These variables are

standardized on a scale from -2.5 (weakest institutions) to +2.5 (strongest institutions).

it: individual country identifier and the period, i.e. $i = 15$; $t = 13$ (2000-2012).

The *a priori* expectation is that the growth in manufacturing value added; indicators of infrastructural provision and institutional quality should have positive influence on manufacturing export. For the interactive variable, a positive relationship implies that institutions will enhance the impact of infrastructural development on manufacturing export. While, a negative relationship connotes that institutions will enhance manufacturing export in countries with poorer infrastructural development. By relaxing infrastructural development, institutions will have compensated for the inefficiency of the manufacturing sector that is caused by poor infrastructures.

The System Generalised Method of Moments (SGMM) was used for the estimation of the model. This is because most economic variables (such as institutions and infrastructural development) are endogenous and their values are determined outside the model. The SGMM is able to efficiently handle the problem of endogeneity by generating internal instruments to proffer robust estimates. Also, the SGMM technique is most preferable for small sample sizes (Blundell and Bond, 1998; Osabuohien and Efobi, 2013), just like the present study.

The SGMM equation can be written thus:

$$Mafex_{it} = \Phi_1 + \nu Mafex_{it-1} + \beta_1 Magr_{it} + \beta_2 Exch_{it} + \beta_3 Infra_{it} + B_4 Institution^k_{it} + \beta_5 Institution \times Infra^k_{it} + \varepsilon_{it} \quad (4)$$

Where Φ_1 is the period specific effect that captures changes that are common to all the countries in the sample and $Mafex_{it-1}$ is the lag dependent variable (dynamic component).

The data used were sourced from World Development Indicators (WDI) of the World Bank. The 15 ECOWAS countries were included in the study for the period 2000 to 2012. The sampled countries include: Benin, Burkina Faso, Cape Verde, Cote D'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. The summary statistics are in Table 4.1.

Table 4.1 Summary Statistics of Variables

Name	Description of Variables	Mean	Std. Dev	Min.	Max.
<i>Mafex</i>	Ratio of Manufacturing Export to Total Merchandise Export	25.85	21.33	0.08	95.68
<i>Magr</i>	Manufacturing Value Added	8.16	4.73	2.24	21.68
<i>Exch</i>	Real Exchange Rate	793.09	1161.88	0.54	6658.03
<i>Infra</i>	Indicator of Infrastructural provision	10.58	10.80	0.08	44.27
<i>CC</i>	Control of Corruption (an indicator of institutions)	-0.60	0.48	-1.37	0.80
<i>GE</i>	Government Effectiveness (an indicator of institution)	-0.79	0.49	-1.84	0.33
<i>RL</i>	Rule of Law (an indicator of institution)	-0.68	0.58	-2.12	0.63

Source: Authors' computation

5. Empirical Results and Implications for Policy

To begin the discussion of the empirical results, the validity of the internal instruments used in the SGMM estimations was examined using the Sargan and AR (2) techniques. It is expected

that the probability value of the both test should be above 0.05. Considering the statistics of Sargan and AR (2) test in all the columns in Table 5.1, the over-identifying restrictions hypothesis cannot be reject. Therefore, it is confirmed that the instrument set can be considered valid (i.e., all the instruments being exogenous).

The results in all the columns in Table 5.1 report a positive and significant relationship between the lag and the current volume of manufacturing. This signifies that the current volume of manufacturing export can explain its future situation. In this case, it can be expected that policy makers would rely on current volume of manufacturing export in making future policies for the manufacturing sector. For succinct discussion of the results, we will focus on mainly the behaviours of the variables of interest (infrastructure and institutions). However, other explanatory variables follow the expected signs; some were significant, while the contrary suffice for others.

	1	2	3	4	5	6
Manufacturing Exports (-1)	0.381 ^a (0.000) 0.564 ^b	0.364 ^a (0.000) 0.453 ^c	0.373 ^a (0.000) 0.585 ^b	0.350 ^a (0.000) 0.544 ^b	0.390 ^a (0.000) 0.607 ^b	0.376 ^a (0.000) 0.594 ^b
Manufacturing Value Added	(0.025)	(0.073)	(0.018)	(0.032)	(0.018)	(0.022)
Real Exchange Rate	0.245 (0.347)	0.250 (0.337)	0.101 (0.698)	0.1458 (0.549)	0.313 (0.258)	0.348 (0.216)
Infrastructure	0.103 (0.325)	-0.291 ^c (0.095)	0.120 (0.252)	-0.190 (0.327)	0.104 (0.316)	-0.099 (0.567)
Control of Corruption	1.887 (0.487)	8.971 ^b (0.016) -0.761 ^a				
Control of Corruption × Infrastructure		(0.005)				
Government Effectiveness			-4.124 (0.140)	1.340 (0.741)		
Government Effectiveness × Infrastructure				-0.552 ^c (0.058)		
Rule of Law					2.363 (0.364)	5.729 ^c (0.100)
Rule of Law × Infrastructure						-0.420 (0.145)
Constant	9.152 (0.016)	14.465 (0.001)	5.460 (0.148)	9.968 (0.028)	8.538 (0.017)	10.776 (0.009)
AR (1)	0.005	0.003	0.001	0.001	0.003	0.003
AR (2)	0.657	0.718	0.639	0.647	0.665	0.679
Sargan Test	0.393	0.568	0.435	0.473	0.238	0.322

Note: The values in parenthesis are the probability values. The superscript a, b and c are the significant levels of 1, 5 and 10 percent levels of significance.

From the Table 5.1, ICT infrastructure was negatively signed and significant in columns 2 and 6 but was not significant in the rest of the columns. This result is rather startling, noting the expected contribution of ICT infrastructure to manufacturing production process and its consequent effect on export. We perceive that the result may be from our measures of ICT infrastructure (internet, telephone and mobile phone usage) and explains that the development of the current measures of infrastructure does not significantly translate to the growth of manufacturing export. Nevertheless, skipping to the estimates in Table 5.2, the results bring to

the fore that infrastructure is positive in all the estimations (Columns I to IV), suggesting its tendency to exert direct influence on manufacturing export. But the coefficients were not significant at 10 percent. Although the infrastructure variable exhibited inconsistent signs (columns 1, 3 and 5 were positively signed, while others were negatively signed), a salient implication of this is that ECOWAS countries have not been able to consistently harness the quality of infrastructural improvement needed to enhance their trade outcomes. Our result is somewhat agreeing with Deen-Swararay, Adekunle and Odularu (2012), who found that the available infrastructural provision in ECOWAS countries has not been able to improve their intra-regional trade.

One interesting result from Table 5.1 is the behaviour of the measures of institutional quality and its intermediating role in the infrastructure-manufacturing export nexus. Institutional quality measures, such as control of corruption and rule of law, were positive and significant in Columns 2 and 6, signifying the role of better institutional quality in enhancing manufacturing export. This concurs with the *apriori* expectations; noting that a reduction in corrupt practices, the efficient security of property right and the strength of the judiciary, will enhance investment and reduce transaction cost in foreign trade, particularly manufacturing export. Government effectiveness was not significant in any of the Columns. Furthermore, when we consider the intermediating role of institutions (the interaction variables) as presented in columns 2, 4 and 6, we observe a negative and significant behaviour. This is rather unexpected and implies that institutional quality is acting as a substitute for infrastructural development in enhancing manufacturing export. Putting this differently, the impact of the insignificant role of infrastructure on manufacturing export in ECOWAS countries can be circumvented by improved institutions.

The policy implication that stems from this finding is the need for a joint provision of institutional stipulations as well as pushing forward the possibility of embarking on joint infrastructural provisions within the sub-region. The role of the ECOWAS commission in ensuring this policy implementation cannot be overemphasised. This is because it will be possible to involve: Heads of States and Government, Council of Ministers, and the legislative arm (the Parliament) in ensuring that all organs of governments for the ECOWAS members see the need to work towards the common goal of providing joint infrastructure. The above is also essential to pursuing a renewed commitment for conquering the *age-long monster* of corruption and ensuring the rule of law on economic and political affairs within the ECOWAS sub-region.

In other words, from the findings on the interaction variables, there is the need for ECOWAS countries to work more assiduously in strengthening institutional quality in the face of *aching* infrastructural challenges such as poor road networks especially in the corridors of their borders. The role of the ECOWAS Commission, through the instrumentality of her various organs, in pushing this agenda further and ensuring compliance by the member countries is very paramount. This will lead to the engendering and the possibility of building joint infrastructure that can promote regional trade as it is being witnessed within the European Union. As Osabuohien and Efobi (2011) had mentioned, the process will involve including the stipulation institutional standards along those of other macroeconomic and trade variables.

The essence of the above policy recommendation is that poor infrastructure can act as a leeway for institutional failure such as corrupt practices; because officers that are in charge of

determining the allocation of infrastructural facility can exert opportunistic behaviours and hence increase transaction cost in trading. Despite this challenge, ECOWAS countries can put up measures to reduce corrupt practices and government should be effective to ensure that those measures are properly implemented. For instance, the Nigerian Corrupt Practices and Other Related Offences Act 2000 brought about the establishment of the Independent Corrupt Practices and other Related Offences Commission, which has since been responsible for controlling and ensuring the reduction of both public and private sector corruption. This process can be extended, with the ECOWAS Commission championing the course to ensure that member countries comply with institutional tenets and laid down rules of the commission.

Robustness Checks

It is important to mention, at this point, that there are crucial concerns connected with the manner in which institutional quality is measured in most growth literature. Rodrik (2004) noted that most institutional measures are prodded with surveys of domestic and foreign investors; this is a shortcoming as perceptions are different from actual institutional setting and perceptions are shaped not just by institutional environment but by many other economic factors. This creates the problem of endogeneity and reverse causality. We took note of this shortcoming by carrying out a robustness check based on other measures of institutions from the Freedom House data on political right and civil liberty³. The results are presented in Table 5.2.

The result from the robustness check, as presented in Table 5.2, reveals similar outcome as those of Table 5.1. The behaviours of institutional variables, such as civil liberty and political right, when intermediated with the relationship between infrastructure and manufacturing export, were negative as well. Though this was not significant, the signs still reveal that our result is robust with the measures of institutions that were applied in our empirical analysis. The insignificance estimates portrays the sensitivity of the nexus (infrastructure and export) to the type of institutions. Since a positive outlook was still experienced, there is no much query, other than the need for ECOWAS countries to evaluate the type of institutions that can have a significant effect on their export volume.

A second robustness check was carried out by considering the possibility that the result of this study is conditioned by the inclusion of Nigeria. Nigeria can likely present an outlier in the average performance of the indicators. For instance, it is possible that Nigeria's manufacturing export, GDP values and population, is more than half of the entire ECOWAS. Therefore, including this country in a sample with other smaller countries, can likely bias our results towards the situations in Nigeria. We re-estimated a different model, where Nigeria was excluded from the list of sampled countries. The robust estimation is presented in Table 5.3.

³Political Right-PR measures the level of freedom to participate in the political process, which includes: the right to vote freely in legitimate elections, compete for public office, join political parties and organisation and elect representatives that have decisive impact on public policies and are accountable to the electorate. Civil Liberty-CL indicates the freedom of expression and belief, associational and organisational right and rule of law, without interference from the State (Freedom House, 2013). PR and CL are reported on a scale of 1 (best/freest) to 7 (worst).

Table 5.2 SGMM Results using Freedom House Measures of Institutions

	I	II	III	IV
Manufacturing Exports (-1)	0.430 ^a (0.000)	0.454 ^a (0.000)	0.419 ^a (0.000)	0.423 ^a (0.000)
Manufacturing Value Added	0.492 ^b (0.028)	0.481 ^b (0.031)	0.504 ^b (0.023)	0.517 ^b (0.020)
Real Exchange Rate	0.264 (0.237)	0.289 (0.204)	0.300 (0.150)	0.391 ^c (0.100)
Infrastructure	0.061 (0.494)	0.323 (0.343)	0.067 (0.455)	0.403 (0.113)
Civil Liberty	0.274 (0.777)	0.784 (0.553)		
Civil Liberty × Infrastructure		-0.057 (0.422)		
Political Right			0.407 (0.514)	1.319 (0.148)
Political Right × Infrastructure				-0.070 (0.153)
Const	6.369 (0.264)	3.636 (0.607)	5.834 (0.184)	1.266 (0.817)
AR (1)	0.001	0.002	0.010	0.023
AR (2)	0.220	0.235	0.226	0.298
Sargan Test	0.224	0.088	0.248	0.116

Note: Same as Table 5.1**Table 5.3 SGMM Results Excluding Nigeria**

	1	2	3	4	5	6
Manufacturing Exports (-1)	0.376 ^a (0.000)	0.363 ^a (0.000)	0.369 ^a (0.000)	0.343 ^a (0.000)	0.376 ^a (0.000)	0.366 ^a (0.000)
Manufacturing Value Added	0.516 ^b (0.045)	0.432 ^c (0.093)	0.502 ^b (0.047)	0.474 ^c (0.066)	0.531 ^c (0.053)	0.553 ^b (0.047)
Real Exchange Rate	0.001 (0.490)	0.218 (0.427)	0.020 (0.941)	0.068 (0.807)	0.205 (0.503)	0.277 (0.381)
Infrastructure	0.063 (0.546)	-0.290 ^c (0.100)	0.085 (0.429)	-0.200 (0.310)	0.075 (0.500)	-0.092 (0.631)
Corruption	0.743 (0.726)	8.248 ^b (0.049)				
Corruption × Infrastructure		-0.733 ^c (0.009)				
Government Effectiveness			-4.688 ^c (0.100)	0.428 (0.919)		
Government Effectiveness × Infrastructure				-0.514 ^c (0.083)		
Rule of Law					1.047 (0.727)	4.499 (0.296)
Rule of Law × Infrastructure						-0.369 (0.236)
Constant	10.274 (0.010)	14.647 (0.001)	6.988 (0.082)	11.102 (0.018)	9.807 (0.012)	11.304 (0.007)
AR (1)	0.004	0.004	0.011	0.002	0.006	0.006
AR (2)	0.655	0.714	0.644	0.649	0.651	0.668
Sargan Test	0.471	0.633	0.494	0.555	0.357	0.426

Note: Same as Table 5.1

From the Table 5.3, the outlook of the estimation results was not considerably different from that of the earlier findings as reported in Table 5.1. The signs and the level of significance of the variables (infrastructure and institutional measures) and the interactive variable (institutional measures and infrastructure), were not different. Infrastructural development could not significantly affect manufacturing export in ECOWAS countries, and the interactive variable still shows a substitutive effect between institution and infrastructure in affecting manufacturing export. In effect, the results surmise that Nigeria as the biggest ECOWAS member does not portend the challenge of outlier effect in the analysis of this study. This means that the result is applicable to all ECOWAS countries despite the inclusion or exclusion of Nigeria.

6. Conclusion

The main result from the study is that the infrastructural provision of ECOWAS countries has not been able to enhance their manufacturing export. Also, the extent of institutions in ECOWAS countries can act as a substitutive mechanism to the infrastructural provision for enhanced trade outcome. This result is robust to the inclusion of some alternative estimation.

Following these findings, ECOWAS, as a recognised Regional Economic Communities (RECs) in Africa, is capable of playing supportive role for the desired enhancement of trade performance, in particular and economic development, in general, for her member countries. One of such is the tasking of member countries with regards to promoting their institutional quality. This is focusing on better transparency, accountability and resolution to fighting corruption with all dexterity. Countries in the ECOWAS sub-region have made some efforts in ensuring that they brace up to the task by improving their infrastructural provision for enhanced impact on trade and the development of efficient institutions such as putting up agencies to reduce cross-border bribes and other forms of corrupt practices by law enforcement agencies. This has been witnessed in a number of measures to promote intra-regional trade. However, there are a lot to be done as the reality on the ground suggest.

The use of formidable regulations, anchoring and adherence to the tenets of the rule of law becomes very pivotal. This is especially relevant as the cascaded provision of joint infrastructure, such as regional trains that can easily commute people and goods within the ECOWAS sub-region, will in no small measure; enhance trade performance in the sub-region. This will significantly reduce both trading cost and time. However, such transmutation of joint infrastructural provision requires strong institutional quality for member countries. This has been one of the main reasons why such intra-regional trade has thrived within the European Union.

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Appendix

Table A1: Logistics Performance Index on Quality of Trade and Transportation and related Infrastructure

	2007	2010	2012
Benin	1.89	2.48	2.57
Burkina Faso	1.89	1.89	2.40
Cape Verde	NA	NA	NA
Cote D'Ivoire	2.22	2.37	2.31
Gambia	2.33	2.17	2.19
Ghana	2.25	2.52	2.05
Guinea	2.33	2.10	2.34
Guinea Bissau	2.25	1.56	2.68
Liberia	2.14	2.00	2.41
Mali	1.90	2.00	2.00
Niger	1.40	2.28	2.45
Nigeria	2.23	2.43	2.27
Senegal	2.23	2.43	2.27
Sierra Leone	2.09	2.64	2.31
Togo	1.83	1.61	2.50
ECOWAS	2.07	2.18	2.34
World Average	2.58	2.64	2.76

Source: Authors' compilation from World Trade Indicators