DBN
Development
Bank of Nigeria
RC1215724

...Financing Sustainable Growth

WORKING
PAPER
SERIES

216, 2020

Manufacturing Export and ICT Infrastructure in West Africa: Investigating the Roles of Economic and Political Institutions

Ibukun Beecroft
Dept. of Economics and Development Studies, Covenant University, Ota, Nigeria

Evans S. Osabuohien
Professor of Economics & Chair, Centre for Economic Policy and Development Research (CEPDeR)
Dept. of Economics and Development Studies, Covenant University, Ota, Nigeria
(Correspondence: evans.osabuohien@covenantuniversity.edu.ng; pecos4eva@gmail.com)

Uchenna R. Efobi
College of Business and Social Sciences, Covenant University, Ota, Nigeria

Isaiah Olurinola
Dept. of Economics and Development Studies, Covenant University, Ota, Nigeria

Romanus A. Osabohien
Dept. of Economics and Development Studies, Covenant University, Ota, Nigeria

Abstract

Investment in ICT infrastructure development is crucial to international trade through its provision of reliable interconnectedness via communication. This can be augmented via institutional intervention, which addresses opportunistic or rent-seeking behaviours of ICT infrastructure providers and reduces operational costs, among others. However, ICT infrastructural provision in West Africa remains low, necessitating the current drive by the regional economic community (ECOWAS) to make some advancement in this regard for enhanced trade outcomes of members. With the aim of unbundling institutional framework in the infrastructure-export nexus, this study empirically examines the relationship between manufacturing export and ICT infrastructure and articulates how economic and political institutions influence such interaction. Focusing on 14 West African countries, the study uses the Systems Generalised Method of Moments (SGMM) technique to address possible issues of endogeneity and reverse causality. The results reveal that in the face of improved economic and political institutions, particularly those related to enforcement of contracts, the influence of ICT infrastructure in strengthening the exporting capacity from the manufacturing sector is greater. In addition, some measures of economic and political institutions matter more than others. The study recommends that ECOWAS countries promote better institutional quality, particularly in terms of transparency, accountability, corruption control, regulatory quality, and the rule of law.

1. Introduction

Infrastructural provision has an important role to play on trade because most economic activities require some measure of infrastructure to thrive. Notably, infrastructural development aids national progress, facilitates trade by enhancing productivity and innovation, as well as improves the performance of manufacturing export (United Nations Economic Commission for Africa-UNECA, 2011; Matthew *et al.*, 2019).This includes information communication technology (ICT) infrastructure, which has been identified as a key driver of innovation (Oluwatobi *et al.*, 2015; Karakara and Osabuohien, 2019) and an enabler of exports from extant studies (Kotnik, Hagsten and Sweden, 2013).

The effect of ICT infrastructure on manufacturing export may be direct or indirect. In terms of the direct effect, the development of ICT infrastructure can enhance the productivity of manufacturing firms through the improvement of the internal economies of scale as a result of the transmission to a more mechanised production system. This is only possible in countries with improved ICT infrastructure: firms in these countries will tend towards enhancing their efficiency owing to the availability of ICT infrastructure that can boost such processes. For instance, with the ICT growth in Nigeria, firms are beginning to have a more harmonised system of control and their production systems are becoming more integrated (Onu, Olabode and Fakunmoju, 2014). This advancement will result in better production efficiency.

Also, an improvement in ICT infrastructure will enhance the rate of research and development, as well as innovative capacity owing to the development of internet facility and mobile network that makes access to information swifter and more efficient (Ejemeyovwi, Osabuohien and Osabohien, 2018). The impact of this on manufacturing export is seen in the increase in manufacturing productivity, which can enhance the volume of output for both domestic consumption and export. The evidence of the above is provided in Figure 1, which shows a significant positive effect between manufacturing export and ICT infrastructural provision among ECOWAS countries.

This current study relates to some literature on trade and infrastructure such as Meon and Sekkat (2008); Deen-Swarray, Adekunle and Odularu (2012); Efobi and Osabuohien (2014), which have paid attention to general trade and export in Africa or a specific African sub-region. Though some of these studies have emphasised the role of institutions in enhancing export, there exist some gaps. The major gap observed was the dearth of studies focusing on the manufacturing export of ECOWAS countries, except for Deen-Swarray, Adekunle and Odularu (2012) that

addressed the intra-regional trade of ECOWAS countries. However, the paper did not emphasise the role of institutional quality and how it affects the ICT infrastructure-export nexus. Another study, Efobi and Osabuohien (2016), that considered the issue of ICT infrastructure, manufacturing export and institutions in ECOWAS countries, failed to consider the unbundled institutional framework, which should provide a clearer understanding on which aspect of institutions matter more for export-infrastructure interplay. This begs the question as to what roles economic and political institutions play distinctively in improving manufacturing export through ICT infrastructure, and which of these institutions have a greater influence on the infrastructure-export relationship?

Noting the above, this study makes contribution by unbundling institutions into economic and political institutions using different indicators, which is novel given the fact that extant studies have not so done in the context of ICT infrastructure and manufacturing exports. The study then investigates how economic and political institutions in ECOWAS countries can improve the effect of ICT infrastructure on manufacturing export and examines the indicators of these institutions that matter more in the ICT infrastructure and manufacturing export relationship. Two main explanations are provided on the need to unbundle institutions that can affect ICT infrastructure in enhancing manufacturing export. The first is that economic institutions that support private property protection will restrain the tendency of state capture of private enterprises, constrain state coercion and provide legal protection to shareholders and creditors, leading to higher insurance premium on investment (La Porta*et al.*, 1999; Beck *et al.*, 2003; Cavalcanti, Magalhaes and Tavares, 2008). The resultant effect of these outcomes is that private investors that will provide ICT infrastructures will be encouraged to invest in these countries. Secondly, some of the indicators of political institutions have been noted to promote sound governance structure that enhances government's commitment to the overall development and growth of the country. For instance, democratic institutions push policy closer to the position of the median voters (Besley and Case, 2003): thus, implying that the interest of the electorate will most likely be catered for by the executive if the country is operating a democratic institution. More so, constraints on the executive and term limits will likely discourage the agenda of political leaders who are self-interested or "careerist" and will facilitate the election of citizen-legislators whose interest is to pursue policies that reflects the public will (Jo-Ansie, 2007).

Countries in West Africa present a veritable case in point because there is a wave within the sub-region to promote better governance principles to support the development of the ICT sector. Specifically, Articles 6, 7, 9, 10, 11, 12 and 13 of the ECOWAS Supplementary Act on the

harmonisation of policies and regulatory framework for the ICT sector elucidates the role of institutions and governance structure of member countries in enhancing the extent of ICT development (ECOWAS Commission, 2007). The Act was enacted with the intention of ensuring that ICT infrastructure is provided to enhance the ICT connectedness between member countries and the international community. Likewise, there is a need to improve the global relevance of ECOWAS countries through the development of the manufacturing sector. Thus, this study is of relevance as it offers empirical investigation on the issue of ICT infrastructure and manufacturing export and illustrates how political and economic institutions can play complementary roles (or otherwise), drawing from the West African sub-region.

With the intention to complement the literature and policy discuss on trade and infrastructure in Africa, this study achieves the following aims. First, it considers the extent to which there is a relationship between ICT infrastructural development in ECOWAS countries and manufacturing export. Second, it examines the extent to which relevant economic and political institutional structures can enhance the relationship between ICT infrastructure and manufacturing export in ECOWAS. Third, it highlights the most important economic and political institutional variables that can enhance this relationship. In the analysis, several checks were carried out to ensure that observed relationships were robust and reliable. The present study covers all the countries in West Africa (except Liberia and Mauritania; since Mauritania is no longer a member of ECOWAS; West Africa and ECOWAS are used synonymously in this study). The econometric model, which builds on Efobi and Osabuohien (2016), was estimated using the Systems Generalised Method of Moments (SGMM) approach.

Thestudy is structured into six sections: following this introductory section is section two which presents a brief background information on ECOWAS, while the literature review and research method are covered in the third and fourth sections, respectively. The fifth section encapsulates the empirical results while the sixth section concludes.

Figure 1: ICT Infrastructural Provision and Manufacturing Export
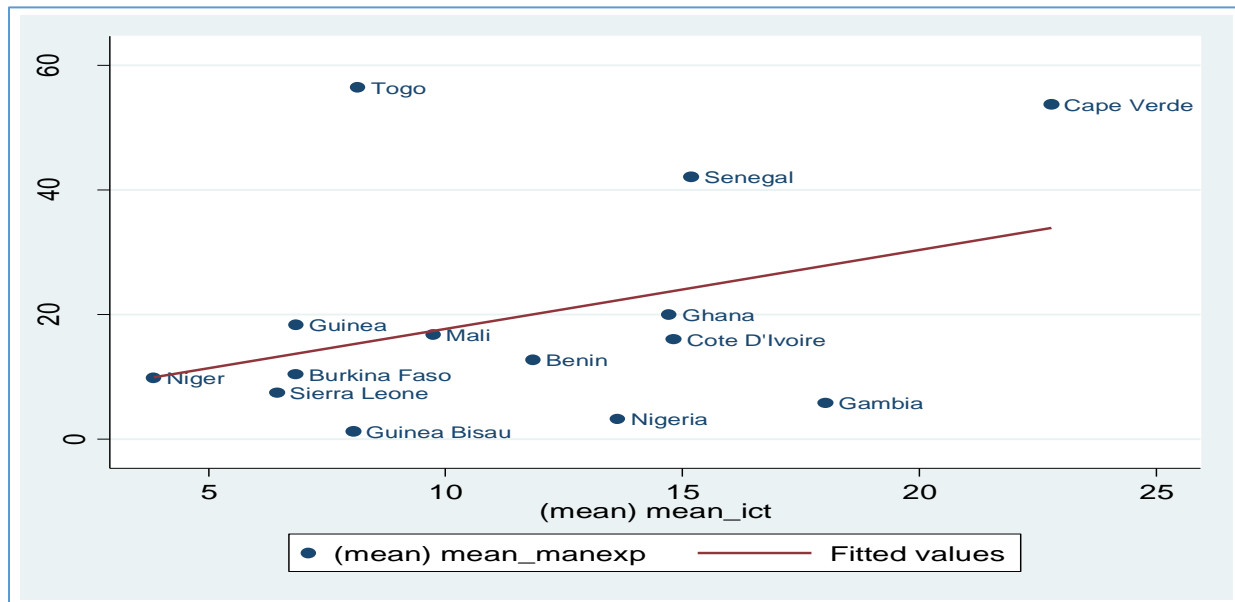
2. Brief Background Information about ECOWAS Countries

Manufacturing Export Performance

Manufacturing export is considered an important aspect of trade especially exports. This is because it involves processed and semi-processed, preserved, and stored products that are expected to have more value added than primary products (Olayiwola*et al.*, 2015). 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; Efobi and Osabuohien, 2016). In view of the above, this section presents the trend of manufacturing export of ECOWAS.

Currently, most West African countries have low export performance of their manufacturing sector, which is one of the prerequisites for global competitiveness. This is in tandem with the submission of United Nations Conference on Trade and Development-UNCTAD (2012) that for countries to benefit from the opportunities of participating in the international trading system, they require an increase in the value-added components of the manufacturing sector. The values of manufacturing export for the ECOWAS countries presented in this section are the average of the respective countries and they show the contribution of manufacturing export in

their economies. This measure will also scale the sub-regions manufacturing export by the total merchandise export and make them more comparable. The statistics reported in Table 1 reveal that for all the West African countries presented, only three of them performed above the average of SSA manufacturing export. These include Cape Verde, Senegal and Togo with manufacturing export remaining above 40 percent of their total merchandise export. The case of Cape Verde is worth noting because it is a small economy with sound macro-economic policy. More so, it operates policies that encourage foreign presence and presents a conducive business environment for foreign firms.

To buttress the above point, the value ranks highest (after Ghana) among the West African countries in the World Bank's Ease of Doing Business Statistics (World Bank, 2015). The countries with the largest economies in the sub-region-Nigeria and Ghana have not performed as well: Nigeria records between 1 and 4 percent, while Ghana records between 2 and 23 percent. These statistics revealed the import dependence of these countries and the inefficiency of the manufacturing sector. It is also important to state that the export of Nigeria has largely been driven by the extractive industries, with majority of the export commodity stemming from crude oil. The incentive, therefore, to develop the real sector that will drive value addition is insufficient and this may have accounted for the low ratio displayed in Table 1.

Table 1: Manufacturing Export as %Total Merchandise Export in West Africa

Countries	1991-1995	1995-2000	2001-2005	2006-2010	2011-2015
Benin	8.89	4.81	7.66	17.34	17.06
Burkina Faso	6.07	14.06	11.38	7.69	12.16
Cape Verde	76.66	82.23	84.51	28.12	13.92
Cote D'Ivoire	6.57	15.62	19.74	14.53	13.85
Gambia	35.97	15.57	22.16	19.26	24.56
Ghana	7.74	14.73	12.65	23.23	12.89
Guinea	24.29	22.46	16.56	9.14	14.49
Guinea Bissau	0.19	NA	0.75	NA	NA
Liberia	NA	NA	NA	NA	NA
Mali	NA	4.06	12.93	12.85	27.74
Niger	0.86	3.22	10.84	11.01	7.48
Nigeria	0.70	1.55	1.49	3.86	3.82
Senegal	30.50	46.16	42.93	40.19	37.67
Sierra Leone	NA	1.95	1.49	NA	9.99
Togo	7.22	14.91	51.27	47.76	53.84
SSA	0.00	25.69	17.83	27.03	21.85

Note: The values are the averages for the respective countries and periods. NA: not available.
Source: Authors'Computations using data from World Development Indicators

ICT Infrastructure

ICT infrastructural provision in West African countries has witnessed slight progress in comparison to other countries of the world. Subject to the trend of ICT infrastructure in Economic Community for West African States (ECOWAS), the West African sub-region is beginning to 'wake up' to the realisation that there is the need for regional actions that will propel member states to put in 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 sub-region. Article 33 of the Act 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 Commission, 2007).

Countries in the ECOWAS sub-region are evolving with some strategies to boost their industrialisation and export. Most importantly is the creation of cooperation among member countries by the move towards the formation of a strong Custom Union, where member countries charge relatively similar tariff for imported goods (including capital inputs for manufacturing). The aim of this move, which has begun by the creation of a common external tariff (CET) in 2004, is to have an improved industrialisation and private sector development since the CET applies in relation to non-member countries and aims to enhance sub-regional trade integration through the flow of goods and services, especially inputs and intermediate goods for the industrial sector (Olayinka, 2018).

Institutional Quality

Institutional quality in West Africa is examined by summarising the average score for measures of control of corruption, government effectiveness and rule of law. These three measures (essentially political institutions) are considered crucial as their developments are able to ensure property right protection and security of investments, which will in turn enhance industrial growth and development (Asiedu, 2006; Osabuohien and Efobi, 2013; Efobi and Osabuohien, 2015). Table 3 presents the average scores of the three variables for the period 2001-2005 and 2006-2010. In Table 3, 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.

Table 3:   **State of Institutional Quality in West Africa**

	Control of Corruption			Government Effectiveness			Rule of Law		
	2001-2005	2006-2010	2011-2015	2001-2005	2006-2010	2011-2015	2001-2005	2006-2010	2011-2015
Benin	-0.664	-0.614	-0.64	-0.393	-0.522	-0.53	-0.462	-0.625	-0.57
Burkina Faso	-0.088	-0.354	-0.22	-0.616	-0.621	-0.60	-0.598	-0.314	-0.48
Cape Verde	0.283	0.746	0.51	-0.042	0.098	0.12	0.309	0.508	0.56
Cote D'Ivoire	-0.987	-1.119	-1.05	-1.089	-1.234	-0.94	-1.39	-1.379	-0.89
Gambia	-0.496	-0.677	-0.66	-0.56	-0.664	-0.68	-0.167	-0.372	-0.63
Ghana	-0.236	0.033	-0.13	-0.121	0.009	-0.15	-0.044	-0.044	0.07
Guinea	-0.774	-1.138	-1.05	-0.896	-1.194	-1.19	-1.221	-1.493	-1.35
Guinea Bissau	-1.026	-1.078	-1.36	-1.279	-1.079	-1.38	-1.248	-1.348	-1.40
Liberia	-3.032	-0.63	-0.68	-3.954	-1.563	-1.31	-4.369	-1.289	-0.87
Mali	-0.527	-0.509	-0.74	-0.676	-0.815	-0.95	-0.224	-0.341	-0.66
Niger	-0.921	-0.731	-0.64	-0.839	-0.811	-0.67	-0.779	-0.654	-0.58
Nigeria	-1.248	-0.97	-1.18	-0.955	-1.069	-1.05	-1.38	-1.145	-1.09
Senegal	-0.006	-0.552	-0.16	-0.157	-0.366	-0.45	-0.012	-0.311	-0.24
Sierra Leone	-0.908	-0.915	-0.89	-1.333	-1.181	-1.23	-1.273	-0.98	-0.87
Togo	-0.81	-0.991	-0.93	-1.452	-1.469	-1.28	-0.943	-0.894	-0.89

Note: the three measures are valued from -2.5 (weakest institutions) to +2.5 (strongest institutions).
        Source: Authors'Computations using data from World Governance Indicators.

The major issue that can be underscored here is that most West African countries have not performed well in terms of manufacturing export and the level of infrastructural development is still low. Likewise, the institutional framework is quite low. 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, there is the need for an empirical validation to throw more light on the above cursory observations.

3. Theoretical Foundation and Main Issues from the Literature

Factors Influencing Trade Performance

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 paper suggests that trade liberalisation and the streamlining of the RTAs could be useful in promoting trade in the continent. In their study, Osabuohien and Efobi (2011) observe that institutional weakness constituted one of the major drawbacks to trade outcomes of Regional Economic Communities (RECs) in Africa. The study recommended that setting up institutional performance benchmarks, just like the macroeconomic convergence criteria can improve Africa's RECs trade outcome. The above is similar to the recommendation of Meon and Sekkat (2008) that used a panel data for the period 1990 to 2000 for 59 countries using the Fixed Effects and Two Stage Least Squares techniques. The paper 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.

Other studies like Baunsgaard and Keen (2010) observed a panel of 125 countries (1975-2000) and concluded that high-income economies easily recover 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 performance 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; Yang and Gupta, 2007; Djankov, Freund and Pham, 2010; Mbekeani, 2010). Subramanian and Tamirisa (2003) have equally established that the declining share of African countries trade in the world market can be traced to their growth in income, size of population, geography, and the nature of economic policy. Deen-Swarray, Adekunle and Odularu (2012) examined the extent of infrastructure development and its impact on trade integration in West Africa countries.

ICT Infrastructural Development and Exports
Competitiveness in global trade 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 (Bankole *et al.*, 2015). This is mainly due to the brevity of the value chain of the export of primary products and marginal value added. Looking at some of the factors that promote manufacturing export, the need for infrastructural development has been identified. As World Bank (2017) noted, infrastructure can help in determining the success of manufacturing and other agricultural activities. This is perhaps because poor infrastructure can prevent the

development of markets for intermediate inputs and will impede manufacturing, leading to low export capacity (Efobi and Osabuohien, 2016).

Infrastructural provision has transcended the traditional focal emphasis on 'roads and bridges' to software and other forms of technology that can foster trade. Information and communication technology-ICT stands out in this regard because it aids diverse processes that can culminate in enhanced export volume and inclusive growth (Ejemeyovwi, Osabuohien and Osabohien, 2018). For instance, it promotes efficient and effective innovation processes in the firm (Aloini and Martini, 2012); establishes the linkage between the manufacturing firms and the potential suppliers of resources or market for the finished products – through the use of the telephones and internet facility; and aids the communication processes that are required during the production process (Osabuohien and Efobi, 2012). Further, most modern factories are highly automated, and the dexterity of ICT cannot be overemphasised to have contributed to the overall process.

ICT infrastructure is expected to have a positive impact on export in ECOWAS. This was predicted by Longo and Sekkat (2001) who noted that a 1 percent increase in the stock of telecommunication and other infrastructures – in the exporting country – will boost export by about 3 percent. Furthermore, Yushi and Borojo (2019) noted that communication infrastructure has a positive influence on trade flows in Africa. However, the need for ICT infrastructure has been inadvertently neglected in the literature. This is particularly for the ECOWAS sub-region, despite the drive towards the improvement of the ICT provision by member countries and to enhance global integration. ICT provision is an important aspect of the drive towards the development of the manufacturing export of these countries. The reason being that the provision of ICT can enhance the communication between businesses and their suppliers as well as potential customers and market for their goods, improve the flow of capital as ICT presence can enhance speedy access to financial information and banking services, improve human capacity to enforce improvement in business operations. It enhances the internal economics of scale of the manufacturing sector (Alberto, Margarita and Fernando, 2013; Osabuohien et al, 2019).

Institutional Intervention

The theoretical foundation on the role of institutions in enhancing the impact of ICT infrastructure on manufacturing export can be embedded in the role of institutions in economic transactions within the framework of New Institutional Economics (NIE). NIE integrates the theory of institutions

in economic analysis. In précis, institutions are those written and unwritten rules, norms and constraints that are devised by humans in order to reduce uncertainty and control their environment (North, 1991; Menard and Shirley, 2005; Ejemeyovwi *et al.*, 2018). It includes written rules and agreements that govern contractual agreements, constitutions, laws and rules that govern politics, government, finance, and society more broadly, and even unwritten codes of conduct, norms and beliefs (Mantzavinos*et al.*, 2004; Menard and Shirley, 2005; Efobi, 2015).

The implication of the foregoing is that if there is an institutional intervention within a country – in terms of the development of institutional framework – then there will likely be an improvement in the level at which ICT infrastructure influences manufacturing export. Three plausible reasons are provided to substantiate the intuition. First, when institutions are developed, the cost of transactions will be reduced and the implication is that those costs that would have hitherto been incurred as a result of poor institutions, will be saved and transferred to the production process of the manufacturing companies. Institutional development will, therefore, likely reduce the operational cost of ICT operators. For example, some of the attendant costs from poor institutional development, especially at the point of licencing ICT providers, will drastically be eliminated with institutional development.

The effect of this on the manufacturing sector and exports is enormous, which includes: the savings that stems from the reduction of the overhead costs that would have been paid, can be channelled into the production process and this will boost the output for export; the reduction in the cost of access will also reduce the overhead cost for manufacturing firms, especially in reaching potential markets and securing orders from suppliers. Thus, the economics of imperfect information, bounded rationality and transaction cost makes the institutional development overwhelmingly important for the growth of the manufacturing sector and their productivity in the light of ICT provision. Williamson (2005) avers these concepts as the science of contract, which includes adequate structure that infuses order, thereby mitigating conflict and realising mutual gain.

Second, the development of institutional framework will reduce the occurrences of opportunistic behaviours by ICT infrastructure providers and firms' rights can be protected in the light of contract enforcement. For instance, anecdotal evidences suggest that in some African countries (ECOWAS inclusive), ICT providers are not mandated to pay for man-hour loss or any form of interruption to the processes of other economic agents in the case of contingencies in their operations. Third, the strengthening of institutions will improve the robustness of policies that

will enhance the efficiency of ICT service providers with the aim of deepening its effect on the other dependant sectors. For example, in the absence of transparent and comprehensive policies that regulate the ICT sector in a country, ICT providers will be confronted with conflicting and confusing regulations that affect their efficiency and the consequent outcome includes the disruption, delay or inefficient service provision to other dependant sectors (e.g. manufacturing sector). Many ECOWAS countries are lagging in this area (Karakara and Osabuohien, 2019). In the case of Nigeria; it was in 2012 that a draft comprehensive ICT policy was initiated to regulate ICT service providers (Ministry of Communications Technology, 2012).

Kiessling (2007) examined institutions and ICT adoption across 82 countries, employing the ordinary least square (OLS) estimation technique and argued that the quality of institutions affects the adoption of ICT infrastructure. This includes economic, financial, and to some extent, political institutions. Likewise, Asongu and Biekpe (2017) considered institutional quality and ICT adoption in 49 sub-Saharan African (SSA) countries and applied the SGMM technique of estimation. The paper concluded that institutional quality (particularly rule of law and corruption control) is significant in determining ICT adoption in SSA. These and other studies (Andrés, Amavilah and Asongu, 2017; UNCTAD, 2014) point to the fact that institutions can drive ICT towards positive outcomes. Thus, if ICT infrastructure enhances manufacturing export and institutions are beneficial for ICT, it is expected that institutions will serve to propel manufacturing export through ICT infrastructure.

4   Model Specification, Estimation Technique and Description of Data

4.1 Model Specification

This study formulates an empirical model that builds on Efobi and Osabuohien (2016). The paper's estimable model focused on an analysis that is closely related; however, in this current paper, the institutional quality is *unbundled* into economic and political institutions. More so, in the current study, the exchange rate was excluded since the Francophone West African countries (which form the majority of ECOWAS) have their exchange rate pegged with the French CFA. The main explained variable (manufacturing export) is measured using the ratio of manufacturing export to total merchandise export. This measure is preferred because it captures the component of manufactured products in the trade 'basket'. This is unlike the ratio of manufacturing export to GDP, which considers manufacturing export contribution to the GDP

and may likely present a blurred evidence of the volume of manufactured export of the sampled countries, considering the fact that they are at varying levels of economic growth.

For the ICT infrastructure, a composite measure of ICT infrastructure was computed using the simple average of internet users, telephone users and mobile phone users. These indicators are popular in literature (e.g. Asiedu, 2006; Asiedu, 2011; Deen-Swarray*et al.*, 2012; Efobi and Osabuohien, 2015) as they have been used to capture some measures of infrastructure. Another reason is data availability, and the intuition that most international trade transaction will require ICT infrastructure to secure contract for sale and purchases of products abroad. As part of robustness check only mobile phone (*ICT _Infra2)* was also considered given its surge developing countries in recent time. More importantly, the ECOWAS supplementary act on the harmonisation of the regulatory frameworks for the ICT sector comprehensively focused on regulations that pertain to these measures of ICT infrastructure (ECOWAS Commission, 2007).

The second main variable of interest is 'institutional quality'. A battery of institutional indicators is applied: this was informed by the need to examine the role of institutions from a broader perspective to provide a holistic intuition on the intervening role of institutions in ICT infrastructure *vis-à-vis* the effects on manufacturing export. Two broad categorisations of institutions was made, namely: economic and political institutions[1]. Economic institutions include those measures of institutions that support private property protection such as: Fraser Institute's economic freedom index[2]; the World Bank's Ease of Doing Business ranking on the enforcement of contracts[3]. The political institutions entail the World Bank's Governance Indicators on the rule of law and regulatory quality inclusive of government's ability to make sound policies that promotes private sector development[4]. The second measure of political institutions focuses institutions that reflect the extent of the power of the political elite and their ability to use such powers for the overall interest of the state. The indicators included in this category are: the extent of democratic institutions, measured using a simple average of the political right and civil

---

[1]This classification was done to make the analysis clearer.
[2]The Economic Freedom Index measures the freedom of the society to encourage industrialisation such that economic agents are allowed to control and own labour and property, free to work, produce, consume, and invest in ventures they please. In such a society, the government allows the free movement of labour, capital, and goods and they refrain from any form of coercion or constraint to the extent that is necessary to protect and maintain order in the society
[3]The World Bank's data on enforcing contract measures the efficiency of the judicial system in a country in resolving a commercial dispute between economic agents. The time taken in enforcing contract include the time taken to file a lawsuit against an agent and the issuance of judgment (including the time for trial) and the recovery of the claim/the enforcement of the judgment.
[4]Three of the World Governance Indicators used include, rule of law, regulatory quality and control of corruption. Rule of law contains the extent to which economic agents have confidence in and abide by the rules of the society. The regulatory quality measures the quality of governance and the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The control of corruption reflects the extent to which public power is exercised for private gain.

liberty dataset from Freedom House dataset[5]; and the World Bank's Governance Indicators control of corruption[6].

The annual growth rate of the manufacturing value added[7], labour and capital were controlled for in accordance with trade literature. In essence, the theoretical and empirical underpinnings of the determinant of trade and the application of relative indicators to measure these variables have received considerable coverage in literature (Dollar and Kraay, 2002; Asiedu, 2006; Meon andSekkat, 2008; Asiedu and Lien, 2011; Efobi and Osabuohien, 2016)[8]. We also control for labour and capital, following standard determinant of manufacturing capacity.

To improve the efficiency of the model, we control for some heterogeneities including: (i) globalisation, which creates sustainable international relations among countries, and this will likely enhance cooperation – both in the transfer of capital and trade (Bandyopadhyay, Sanler and Younas, 2014; Bergh and Nilsson, 2014). (ii) The legal origin is based on the fact that countries will likely trade with countries of similar colonial heritage: this colonial heritage is tied to the legal system handed over to the former colonies by their colonial masters (La Porta *et al.*, 2008). (iii) Resource dependency and conflict affected features is based on the fact that countries that are natural resource dependence will most likely not focus on industrialisation and value addition for export (Asongu, 2014); (iv) national conflict will increase the cost and risk of investment in the respective country.

Therefore, the regression model is stated as:

$Manufacturing\_export_{it} = \beta_0 + B_1 ICT\_Infrastructure_{it} + \beta_2 Institution_{it} + \beta_3 Covariates + \beta_4 X + e_{it}$ (1)

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 indicators and infrastructure. With these variables, it is possible to test the main intuition of this study. In this wise, equation (2) is restated to include the interactive variable as:

---

[5]The political right variable measures the extent to which the country allows for freedom of the electoral process, political pluralism and participation and the presence of a functioning government. The civil liberty on the other hand considers the freedom of expression and belief, freedom to join an association and organization, the prevalence of the rule of law and other forms of personal autonomy and individual rights.

[6]A description of the measures of the variables and their sources is presented in Table 4, along with their summary statistics.

[7] This is because the productivity in the manufacturing sector can influence manufacturing export performance. It is important because it is able to capture the resource inputs into the manufacturing sector that translates to productive output. There could be the possibility that manufacturing output can be increasing, while manufacturing export is declining in GDP; however, this variable helps to show how the productivity of the manufacturing sector could influence manufacturing export.

[8]The inclusion of labour and capital in the model is because they are important component of production for export. Therefore, considering them individually will reduce the tendency of the stochastic model suffering from omitted variable bias. The Heckscher-Ohlin theoretical model of factor endowment postulates that the relative abundance of labour or capital, in an exporting country, will explain the trade focus of such country in the world market. Another variable that would have been appropriate in this analysis is the volume of labour and capital that were absorbed by the manufacturing sector. However, they were not available.

$$Manufacturing\_export_{it} = \beta_0 + B_1ICT\_Infrastructure_{it} + \beta_2Institution_{it} + \beta_3ICT\_Infrastructure_{it}$$

$$\times\ Institution_{it} + B_4Covariates + e_{it} \tag{3}$$

4.1 Estimation Technique

Considering the empirical model presented above, there are plausible reasons to expect a variety of reverse causation from manufacturing export to ICT infrastructure and some of the covariates; even expect some endogeneity issues with the inclusion of measures of institutions. For example, an economy that enjoys an increase in the growth of the manufacturing sector, culminating to increased production may attain the size necessary to break into export markets, so that the exports also increase. There is evidence of reverse causation in the sense that much of the observed correlation between manufacturing export and the demand for ICT infrastructure is driven by larger and more productive firms self-selecting into the improvement of their technology to gain more market share (McAfee and Brynjolfsson, 2008).

Similarly, trade have informed the metamorphosis of institutions to reduce incidences and risk of economic losses and to protect private properties from state capture and other forms of expropriations (Shirley, 2008). These arguments portray the possibility of reverse causality challenges in the empirical model. The issue of endogeneity is also a possible challenge that may likely occur from the kind of explanatory variables, especially economic and political institutions, included in the model above, which may occur due to possible correlations between some of the explanatory variables and the error term (Osabuohien and Efobi, 2013; Oluwatobi *et al.*, 2014).

The control of these two major shortcomings of the stochastic estimable model developed for this study, and to avoid misleading inferences and biased estimates requires that we apply an estimation technique that can efficiently resolve these issues. The Systems Generalised Method of Moments (SGMM) estimation technique was preferred. Apart from the fact that this technique has been favoured by recent empirical studies (e.g. Asiedu and Lien, 2011; Osabuohien and Efobi, 2013; Bandyopadhyay *et al.*, 2014; Oluwatobi *et al.*, 2014), the SGMM technique is able to efficiently address the issues of endogeneity by using internal instruments. This has been seen to be more efficient than applying a technique that would have used externally generated instruments (Blundell and Bond, 1998; 2000). The SGMM also has other merits like its inclusion of reasonable stationary restrictions on its initial condition process and additional moment conditions to properly deal with the endogeneity issues. Furthermore, the SGMM is robust to heteroscedasticity and distributional assumptions (Bandyopadhyay *et al.*, 2014).

The dynamic panel regression is presented as:

$$Manufacturing\_export_{i,t} = \beta_0 + B_1Manufacturing\_export_{i,t-1} + B_2ICT\_Infrastructure_{i,t} +$$
$$\beta_3Institution_{i,t} + \beta_4ICT\_Infrastructure_{i,t} \times Institution_{i,t} +$$
$$B_5Covariates + e_{it} \qquad (4)$$

X is the set of the country's unobserved heterogeneous factors (economic and political globalisation, the legal origin, resource dependency and conflict affected features). The country-specific effect is i, while the time-specific effect is t. The error term remains e. Other variables are as earlier defined. All the variables are expected to have positive influence on manufacturing export, *ceteris paribus.*

The SGMM is confronted with the challenge of its reassurance that the internally generated instrument applied in the estimation process is not over-identified nor proliferated (Roodman, 2009). To ensure that this is not the case, the test for autocorrelation- AR (2) and Sargan test for instrument over-identification are reported. As a rule of thumb, it is expected that the probability value of the AR(2) and Sargan test should be ≥ 0.05. The instrument ratio was also reported and it is expected that *it* lies within the range of ≥ 1.00 (Roodman, 2009)

4.3 Data
The data for the variables included in the model were sourced from different databases as shown in Table 4. The sample for this study contains 14 ECOWAS countries for the period 2002-2014. Liberia was excluded from our estimations because it does not have data for our main explained variable. Guinea Bissau and Sierra Leone had some missing data for some years. Therefore, we conducted some sensitivity checks by excluding them and re-estimating the model to observe whether there was marked difference in the results. This was also done to improve the robustness and the reliability of our results. The sampled countries are: Benin, Burkina, Cape Verde, Cote D'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. The period of study was based on data availability for variables of interest.

Table 4. **Summary Statistics of Variables**

Variable	Measure, *Identifier*: Source	Mean	Std. Dev
Manufacturing Export	Ratio of manufacturing export to total merchandise export, *Man _Exp*: World Development Indicators- WDI	21.71	21.16
ICT	Average of telephone, internet and mobile cellular usage per 100	11.51	10.90

Category	Variable description		
Infrastructure	persons, *ICT _Infra1*: WDI		
	Mobile cellular usage per 100 persons, *ICT _Infra2*: WDI.	27.96	27.34
Economic Institutions	Economic Freedom Index measured as 0 (least freedom) to 100 (most free), *Eco _Free*: Fraser Institute's Economic Freedom of the World.	5.94	0.51
	Time in enforcing contract, measured in days, *Contract_Enf*: World Bank's Doing Business - WBDB.	577.4	167.37
	Procedure of enforcing contract, measured in the number of procedures to enforce contract, *Contract_Proc*: WBDB	39.45	3.95
Political institution	Rule of law, measured as -2.5 poor rule of law to +2.5 strong rule of law, *Rule_Law*: World Governance Indicator - WGI.	-0.72	0.57
	Regulatory quality, measured as -2.5 poor regulatory quality to +2.5 strong regulatory quality, *Reg_Qual*: WGI.	-0.66	0.42
	Democratic institution (simple average of the political right and civil liberty). Recoded such that it ranges from 0 (poor democracy) to 7 (strong democracy), *Dem*: Freedom House dataset.	4.33	1.44
	Control of corruption, measured as -2.5 poor control of corruption to +2.5 strong control of corruption, *Corr_Cont*: WGI.	-0.63	0.48
Covariates	Manufacturing value added, measured in constant 2005 US$, *Man_Value*: WDI	661 Million	1, 200 Million
	Labour, total labour force in the country, *Labour*: WDI	6 Million	11 Million
	Foreign Direct Investment, ratio of FDI net inflow to GDP in Capital: Constant 2005 US$, *FDI*:WDI	5.62	10.68
Unobserved Heterogeneous Factors	Globalisation, an index where the higher value imply intense political integration with the rest of the world, *Globalisation*: KOF Index by Dreher *et al.* (2008)	67.28	15.51
	Resource dependency, dummy variable where 1 represent oil producing country and otherwise, *Resources*: Asongu (2014)	0 0.07	0.25

Source: Authors' computation

5. Empirical Results and Implications of Findings

To begin the estimation of the stochastic model, a pairwise correlation analysis was conducted to check the bivariate association between the explanatory variables[9]. This study proceeds to the empirical result in Table 5. The manufacturing value added was positive suggesting the importance of this variable in the manufacturing sector, especially in the model that contains mobile network i.e. *ICT_Infra2* – as a measure of ICT infrastructure. The variables '*labour*' and *'FDI'*

---

[9] The result (not reported) informs that there is no issue of multicollinearity among the explanatory variables.

were significant with FDI being negative. The negative effect of the FDI is probably because most of the foreign investments in ECOWAS are market and resource driven (Asiedu, 2006; Asiedu and Lien, 2011). The institutional variables, especially the measures of political institutions (i.e. the rule of law, regulatory quality, democratic institutions and control of corruption) all showed that the development of these institutions significantly matters for the improvement of the manufacturing export of West African countries. The institutions that show contract enforcement revealed that an increase in the time and procedure to secure contract will improve manufacturing export. However, emphasis is placed on the interaction term as subsequently considered.

Table 5: SGMM Regression – Manufacturing Export and ICT Infrastructure

	1	2	3	4	5	6	7	8	9	10
Man _Exp (Lag)	-0.476a (0.001)	-0.304a (0.003)	-0.027 (0.561)	-0.092a (0.000)	-0.045 (0.200)	-0.065 (0.265)	-0.032 (0.555)	-0.040 (0.514)	-0.209b (0.022)	-0.304a (0.006)
ICT _Infra1	0.673a (0.002)	---	0.812a (0.000)	---	0.838a (0.000)	---	0.759a (0.000)	---	0.663a (0.000)	---
ICT _Infra2	---	10.133a (0.000)	---	3.058a (0.001)	---	0.163b (0.015)	---	0.271a (0.000)	---	0.210a (0.005)
Man_Value	0.168 (0.850)	3.650a (0.001)	---	---	---	---	---	---	---	---
Labour	---	---	5.449a (0.000)	5.644a (0.000)	---	---	---	---	---	---
FDI	---	---	---	---	-0.739a (0.000)	-0.289c (0.053)	---	---	---	---
Eco_Free	---	---	---	---	---	---	0.262 (0.898)	1.234 (0.655)	---	---
Contract _Enf	---	---	---	---	---	---	---	---	15.337a (0.005)	15.587a (0.002)
AR(2)	0.294	0.394	0.203	0.062	0.232	0.139	0.193	0.258	0.085	0.062
Hansen	0.133	0.115	0.114	0.107	0.203	0.189	0.136	0.139	0.349	0.286

Table 5. Baseline Econometric Results, *Continued*

	11	12	13	14	15	16	17	18	19	20
Man _Exp (Lag)	0.017 (0.819)	-0.002 (0.918)	0.194a (0.001)	0.212a (0.010)	0.042 (0.255)	0.040 (0.336)	0.142a (0.000)	0.142a (0.005)	0.091b (0.018)	0.089 (0.147)
ICT _Infra1	1.233a (0.000)	---	0.611a (0.002)	---	0.854a (0.001)	---	0.840a (0.000)	---	0.600a (0.001)	---
ICT _Infra2	---	0.414a (0.001)	---	0.132b (0.027)	---	0.211b (0.021)	---	0.236a (0.000)	---	0.182a (0.006)
Contract_Proc	1.296a (0.002)	1.547a (0.001)	---	---	---	---	---	---	---	---
Rule_Law	---	---	16.384a (0.000)	18.905a (0.000)	---	---	---	---	---	---
Reg_Qual	---	---	---	---	13.910a (0.001)	16.683a (0.000)	---	---	---	---
Dem	---	---	---	---	---	---	6.415a (0.000)	7.191a (0.000)	---	---
Corr_Cont	---	---	---	---	---	---	---	---	19.257a (0.000)	20.873a (0.000)
Constant	-50.848a (0.002)	-56.140a (0.003)	22.421a (0.000)	27.095a (0.000)	18.784a (0.000)	24.276a (0.000)	-19.972a (0.000)	-19.714a (0.000)	25.069a (0.000)	27.897a (0.000)
AR(2)	0.534	0.196	0.138	0.063	0.108	0.047	0.524	0.309	0.319	0.171
Hansen	0.327	0.444	0.026	0.257	0.271	0.274	0.130	0.154	0.263	0.267

Note: The mobile phone users per 100 persons *'ICT_Infrastructure2'*, manufacturing value added *'Manufact_Value'*, Labour *'Labour'*, time taken to enforce contract *'Contract_Enf'* were presented in their loggedform. The values in parenthesis are the probability values. The superscripts [a], [b] and [c] indicate significant at 1, 5 and 10 percent, respectively. The # cross-section (n) =15; the # instrument is 11; therefore, the instrument ratio (n/i) = 1.36. All estimations include constant but not all were reported for space.

Source: Authors'

In Table 5, the ICT infrastructure variables behaved in a consistent manner across the columns. The variable was significant at 5 percent. The intuition being that an increase in the ICT infrastructure in an average ECOWAS country, will result to an improvement in the volume of manufacturing export in the total merchandise export. The magnitude of this estimated impact indicates that one standard deviation (SD=10.90) increase in the composite ICT infrastructure induces an increase in manufacturing export to total merchandise export of 8.592 (=10.90×0.788)[10]. In the same vein, when considering only mobile phone (*ICT _Infra2)*, a one standard deviation increase in the supply of mobile network (i.e. SD= 27.96) induces an increase in manufacturing export to the total merchandise export of 21.55 (=27.96×0.788). The results from the estimations suggest that on the average, ECOWAS countries can increase export from the manufacturing sector by improving on the level of ICT infrastructure.

Relating this to the action plan of the regional economic community to improve the ICT infrastructural provision of member countries; this will be a laudable step towards the development of the manufacturing sector. One main channel through which the ICT infrastructure can enhance the manufacturing export of ECOWAS countries is by providing

---

[10]The value 0.788 was the average of the coefficients of *ICT_Ifra1* in Table 5. The average was used in order to present a holistic figure that includes the magnitude effect when considering the different combinations of the covariates.

access that will enhance their linkage to the global community. This will create a leeway for them to access potential market, customers and suppliers, and the process of globalisation will be made easier as manufacturing firms will easily benchmark their operations with the global community. The substantial effect of the mobile network also appeals to the role of the mobile network in the global integration of the manufacturing sector, resulting into significant improvement in the volume of manufacturing trade. The mobile network is more important for the volume of manufacturing export compared to the telephone line usage and internet access. This is agreeable based on the fact that the mobile network has wider diffusion than other indicators of ICT infrastructure (Efobi and Osabuohien, 2015).

The coefficients and inferences garnered from the estimations in Table 5 are reliable and are not susceptible to a type 1 error. The preliminary checks, such as the AR(2), Hansen test and the number of instruments included in the analysis suggest that the results is not influenced by the presence of a second order serial correlation between the instruments and the error term, and the instruments included in the estimations were not proliferated. The estimations do not suffer from the inclusion of too many instruments. The instrument ratio meets the criteria as stipulated by Roodman (2009).

5.1 Considering the Interaction Term

Moving on to the interaction term, the measures of institutions are included as a multiplicative of the ICT infrastructure variables. The interaction terms are presented in Tables 6 and 7.

Table 6: SGMM Regression – Manufacturing Export and ICT Infrastructure, Including Interaction Terms

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Man Exp (Lag)	-4.81ᵃ (0.00)	-4.64ᵃ (0.00)	-0.61ᵃ (0.01)	-0.38ᶜ (0.06)	-0.39 (0.12)	-0.09 (0.66)	-0.05 (0.71)	0.06 (0.65)	-0.15 (0.41)	-4.33ᵃ (0.01)	0.39 (0.76)	0.69ᵃ (0.01)	-0.08 (0.44)	0.27 (0.22)
ICT Infra1	16.69ᵃ (0.00)	—	33.87ᵃ (0.00)	—	3.53b (0.03)	—	2.44b (0.05)	—	3.15ᵃ (0.01)	—	0.67 (0.26)	—	5.68 (0.00)	—
ICT Infra2	—	49.55ᵃ (0.00)	—	26.92ᵃ (0.00)	—	-20.16ᵃ (0.01)	—	17.26ᵃ (0.00)	—	24.65ᵃ (0.00)	—	7.21 (0.32)	—	48.81ᵃ (0.00)
Man Value	-17.49ᵃ (0.00)	-9.64ᵃ (0.00)	-2.78ᶜ (0.08)	-6.59ᵃ (0.00)	-5.74 (0.11)	-7.87ᵃ (0.00)	6.10ᵃ (0.00)	6.31ᵃ (0.01)	6.15ᶜ (0.06)	3.51ᶜ (0.09)	0.39 (0.76)	0.31 (0.62)	6.03ᵃ (0.00)	10.67ᵃ (0.00)
Eco Free	-10.44 (0.53)	-29.04b (0.02)	—	—	—	—	—	—	—	—	—	—	—	—
Eco Free ×ICT Infra	-2.53ᵃ (0.00)	-7.05ᵃ (0.01)	—	—	—	—	—	—	—	—	—	—	—	—
Contract Enf	—	—	-74.33ᵃ (0.00)	-20.87ᵃ (0.00)	—	—	—	—	—	—	—	—	—	—
Contract_Enf ×ICT Infra	—	—	-5.47ᵃ (0.00)	-69.29ᵃ (0.00)	—	—	—	—	—	—	—	—	—	—
Contract Proc	—	—	—	—	1.45b (0.04)	7.20b (0.04)	—	—	—	—	—	—	—	—
Contract_Proc ×ICT Infra	—	—	—	—	0.10ᵃ (0.01)	3.16ᵃ (0.01)	—	—	—	—	—	—	—	—
Rule Law	—	—	—	—	—	—	5.27 (0.70)	26.46 (0.17)	—	—	—	—	—	—
Rule Law ×ICT Infra	—	—	—	—	—	—	3.25ᵃ (0.00)	21.59ᵃ (0.00)	—	—	—	—	—	—
Reg Qual	—	—	—	—	—	—	—	—	14.40 (0.33)	55.23ᵃ (0.01)	—	—	—	—
Reg Qual ×ICT Infra	—	—	—	—	—	—	—	—	4.39ᵃ (0.00)	30.55ᵃ (0.00)	—	—	—	—
Dem	—	—	—	—	—	—	—	—	—	—	22.20ᵃ (0.00)	31.87ᵃ (0.00)	—	—
Dem ×ICT Infra	—	—	—	—	—	—	—	—	—	—	0.22 (0.29)	3.75 (0.14)	—	—
Corr Cont	—	—	—	—	—	—	—	—	—	—	—	—	33.15ᵃ (0.00)	12.30ᵃ (0.00)
Corr Cont ×ICT Infra	—	—	—	—	—	—	—	—	—	—	—	—	7.92ᵃ (0.00)	74.01ᵃ (0.00)
AR(2)	0.42	0.33	0.60	0.45	0.55	0.22	0.35	0.11	0.46	0.36	0.79	0.66	0.30	0.50
Hansen	0.52	0.12	0.64	0.58	0.18	0.26	0.22	0.32	0.45	0.24	0.09	0.22	0.47	0.96

Note: The mobile phone users per 100 persons *'ICT_Infrastructure2'*, manufacturing value added *'Manufact_Value'*, time taken to enforce contract *'Contract_Enf'* were presented in their logged form. The values in parenthesis are the probability values. The superscripts ᵃ, ᵇ and ᶜ indicate significant at 1, 5 and 10 percent, respectively. The # cross-section (n) =15, while the # instrument is 11. Therefore, the instrument ratio (n/i) = 1.36. Constant was not included for space. The values in the Table are presented in two decimal places for space.
Source: Authors'

Table 6 was generated for the estimations that include only the manufacturing value added as covariates alongside the ICT infrastructure variables and the measures of institutions. On the other hand, Table 7 includes the estimations that pertain to the inclusion of labour and FDI, ICT infrastructure and measures of institutions. The reason for separating these covariates into different Tables is to have a clear view by unbundling results. More so, the behaviour of the interaction term in the two Tables will show the robustness of the results in order to draw an inference on the role of the measures of institutions on the ICT infrastructure-manufacturing export nexus.

Table 7: SGMM Regression – Manufacturing Export and ICT Infrastructure, Including Interaction Terms, Labour and FDI

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Man Exp	-0.22[a] (0.00)	-0.24[a] (0.01)	0.03 (0.81)	-0.47[b] (0.03)	0.04 (0.73)	0.19 (0.12)	0.02 (0.86)	0.20 (0.46)	0.03 (0.80)	-0.19 (0.29)	0.99[a] (0.01)	0.63[a] (0.00)	0.05 (0.50)	0.08 (0.47)
ICT Infra1	16.29[a] (0.00)	—	18.45[b] (0.05)	—	3.61 (0.04)	—	2.24[a] (0.00)	—	4.20[a] (0.00)	—	5.48[b] (0.05)	—	2.27[c] (0.06)	—
ICT Infra2	—	32.07[b] (0.02)	—	-93.26[a] (0.00)	—	26.21 (0.67)	—	15.03[a] (0.00)	—	37.03[a] (0.01)	—	14.44 (0.30)	—	7.50[a] (0.01)
Labour	-8.87[a] (0.00)	3.37 (0.39)	8.30[a] (0.01)	-5.67 (0.17)	-6.72 (0.00)	-7.87[a] (0.00)	9.90[b] (0.03)	10.61 (0.13)	15.04[a] (0.01)	1.25 (0.75)	3.50 (0.15)	-0.63 (0.85)	16.02[a] (0.00)	0.81 (0.89)
FDI	-3.41[a] (0.00)	0.77 (0.22)	1.00 (0.35)	-1.35 (0.74)	-2.30 (0.03)	-0.88[c] (0.08)	-2.39 (0.16)	-0.16 (0.86)	2.65 (0.11)	-1.80 (0.12)	-0.26 (0.80)	-2.23[a] (0.01)	1.00 (0.37)	-7.18[a] (0.01)
Eco Free	37.00[a] (0.00)	33.08[b] (0.03)	—	—	—	—	—	—	—	—	—	—	—	—
Eco Free ×ICT Infra	-2.68[a] (0.00)	-42.19[b] (0.02)	—	—	—	—	—	—	—	—	—	—	—	—
Contract Enf	—	—	-61.15 (0.11)	-54.02[b] (0.02)	—	—	—	—	—	—	—	—	—	—
Contract_Enf ×ICT Infra	—	—	-3.21[b] (0.05)	-80.17[a] (0.01)	—	—	—	—	—	—	—	—	—	—
Contract Proc	—	—	—	—	-0.04 (0.96)	4.53 (0.45)	—	—	—	—	—	—	—	—
Contract_Proc ×ICT Infra	—	—	—	—	0.11[b] (0.02)	-0.23[c] (0.07)	—	—	—	—	—	—	—	—
Rule Law	—	—	—	—	—	—	4.39 (0.49)	24.97[c] (0.08)	—	—	—	—	—	—
Rule Law ×ICT Infra	—	—	—	—	—	—	2.11[a] (0.00)	18.43[a] (0.00)	—	—	—	—	—	—
Reg Qual	—	—	—	—	—	—	—	—	43.92 (0.14)	26.56[b] (0.02)	—	—	—	—
Reg Qual ×ICT Infra	—	—	—	—	—	—	—	—	4.90[a] (0.01)	40.42[b] (0.05)	—	—	—	—
Dem	—	—	—	—	—	—	—	—	—	—	1.16[c] (0.07)	31.78[a] (0.01)	—	—
Dem ×ICT Infra	—	—	—	—	—	—	—	—	—	—	46.52 (0.11)	2.96 (0.35)	—	—
Corr Cont	—	—	—	—	—	—	—	—	—	—	—	—	9.88 (0.70)	15.97[b] (0.03)
Corr_Cont ×ICT Infra	—	—	—	—	—	—	—	—	—	—	—	—	2.42[c] (0.10)	90.73[a] (0.01)
AR(2)	0.60	0.93	0.97	0.58	0.68	0.48	0.12	0.89	0.42	0.50	0.09	0.33	0.72	0.64
Hansen	0.10	0.12	0.96	0.57	0.10	0.16	0.84	0.38	0.83	0.28	0.27	0.17	0.50	0.45

Source: Authors' computation

The analysis in both Tables 6 and 7 shows that the results were not plagued by instrument proliferation and can be relied on for inference. The interaction term between economic freedom and measures of ICT infrastructure (i.e. *Eco_Free ×ICT_Infra,*) behaved contrary to expectations. The variable was significantly negative in both Tables suggesting that economic freedom of ECOWAS countries will reduce the impact of ICT infrastructure on manufacturing export. This measure of institution (i.e. economic freedom) captures the openness of the economy and the reduction of the interference of state power in the market. This kind of institution is expected to support the industrial development of the ECOWAS community, resulting to improved provision of ICT infrastructure that will aid manufacturing export. However, just the openness of the economy and probably the reduction of state interference, will not be enough to yield increasing productivity of the manufacturing sector despite the presence of ICT. This may likely be attributed to the absence of definite rules to monitor and regulate economic agents and reduce the transaction cost that comes with economic freedom. In essence, just expecting economic freedom to translate the presence of ICT into productivity of the manufacturing sector will be basing the estimates on the assumption of bounded rationality;

that is not considering the possibility of self-interest, on the side of the service providers and likely cascading the expected outcome from their presence in the economy. Williamson (2005) noted that adequate structure infuses order resulting to the realisation of mutual gain.

The contract enforcement variables–in terms of time in enforcing contract and procedure of enforcing contract – displays a negative and significant effect on the ICT-manufacturing export nexus. In all the columns in Tables 6 and 7, the contract enforcement variable plays a complementary role in enhancing the effect of ICT infrastructure on manufacturing export. The negative effect of these variables imply that the provision of ICT infrastructure will translate into manufacturing export in the face of reducing time and procedure of enforcing contracts. What this implies is that ICT provision will be cheaper and budding-manufacturing businesses will maximise their output for possible export through the cost saving benefit from the reduced ICT prices that comes with efficient contract enforcement. This is also applicable when considering political institutions that reflect the strength of the rule of law, regulatory quality and control of corruption. These aspects of institutions also act as complementary to the improvement of ICT provisions and the resultant effect on manufacturing export.

Unexpectedly, the democracy variable was not significant in Tables 6 and 7. This suggests that the democratisation of West African countries matter less for the realisation of the manufacturing export benefits from ICT provisions. This can be situated in the light of the effectiveness of rule and regulatory-based institutional framework in ensuring the benefits from ICT presence. It stresses the need of taking those institutional patterns that relates to contract enforcement, effectiveness of governance in making and enforcing sound policies without private interest and of moving beyond the narrow assumption that democracy and opening up the economy will yield immense benefit to the global competitiveness of indigenous industry. In essence, despite the anticipated positive effect of ICT infrastructures on manufacturing export, when some economic and political are not developed to complement it, the volume of manufacturing export will be affected.

5.2   Robustness: Considering Other Country Heterogeneity
Some robustness checks were carried out to test the consistency of the results, particularly the interactive variables, by considering the country's heterogeneities. In this case, two specific heterogeneous factors were considered. Tables 8a and 8b present the different estimates when considering the extent of globalisation and the dependence on natural resources using only labour and capital as the main covariates for space and brevity of presentations.

Table 8a: SGMM Regression – Manufacturing Export and ICT Infrastructure, Including Interaction Terms, FDI and Globalisation

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Man_Exp	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICT_Infra1	Yes	---	Yes	---	Yes	---	Yes	---	Yes	---	Yes	---	Yes	---
ICT_Infra2	---	Yes	---	Yes	---	Yes	---	Yes	---	Yes	---	Yes	---	Yes
Labour	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FDI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eco_Free	Yes	Yes	---	---	---	---	---	---	---	---	---	---	---	---
	-0.69	-7.41[c]												
	(0.15)	(0.10)												
Eco_Free ×ICT_Infra	---	---			---	---	---	---	---	---	---	---	---	---
Contract_Enf	---	---	Yes	Yes	---	---	---	---	---	---	---	---	---	---
			-7.58[b]	-99.01[b]										
			(0.05)	(0.04)										
Contract_Enf ×ICT_Infra	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Contract_Proc	---	---	---	---	Yes	Yes	---	---	---	---	---	---	---	---
					-0.33[a]	-10.60[c]								
					(0.01)	(0.09)								
Contract_Proc ×ICT_Infra	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Rule_Law	---	---	---	---	---	---	Yes	Yes	---	---	---	---	---	---
							4.34[a]	25.16[a]						
							(0.00)	(0.00)						
Rule_Law ×ICT_Infra	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Reg_Qual	---	---	---	---	---	---	---	---	Yes	Yes	---	---	---	---
									5.75[c]	36.39[b]				
									(0.10)	(0.04)				
Reg_Qual ×ICT_Infra	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Dem	---	---	---	---	---	---	---	---	---	---	Yes	Yes	---	---
											-1.46	-2.41		
											(0.24)	(0.53)		
Dem ×ICT_Infra	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Corruption_Control	---	---	---	---	---	---	---	---	---	---	---	---	Yes	Yes
													5.22[b]	29.22[a]
													(0.03)	(0.01)
Corr_Cont ×ICT_Infra	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	1.66[a]	1.30[b]	1.79	-1.27	-0.42	12.46[c]	-0.92	-1.39	-0.69	0.14	0.68	0.79	2.14[b]	0.57
Globalisation	(0.00)	(0.02)	(0.58)	(0.17)	(0.56)	(0.10)	(0.47)	(0.23)	(0.64)	(0.87)	(0.18)	(0.14)	(0.05)	(0.47)
AR(2)	0.89	0.68	0.83	0.97	0.13	0.57	0.54	0.59	0.52	0.52	0.10	0.13	0.66	0.67
Hansen	0.51	0.50	0.99	1.00	1.00	1.00	0.97	0.82	0.93	0.25	0.87	0.13	0.75	0.59

Note: Same as in Table 7. 'Yes' implies that the respective variable was included in the specific estimation. Due to space, only the variables of interest were reported in the Table

Source: Authors' computation

In Table 8a, the globalisation variable was included, and this variable behaved expectedly in some of the columns with the coefficients assuming significant and positive signs. Considering the interaction terms, there was not much difference from the behaviour of the variable as it was in the earlier Tables (Tables 6 and 7). The interaction between the measure of rule of law, regulatory quality and the control of corruption, and ICT infrastructure (i.e. *Rule_Law×ICT_Infra, Reg_Qual ×ICT_Infra* and *Corr_Cont ×ICT_Infra)* was positive and significant in Table 8a, which is not significantly different from the behaviour in Tables 6 and 7.

The estimations when including the heterogeneous factor – resource dependence – was presented in Table 8b. This variable was significant and negative in most of the columns suggesting that resource dependency will likely repress the incentive to develop the manufacturing sector for export. However, moving on to the variable of interest, the behaviours of the interaction term was examined across the columns in the Table. There was not much difference observed. In effect, the implication of these robustness checks is that the main variables of interest were not in any form influenced by the inconsideration of the globalisation and the resource dependence factors that may likely affect ECOWAS countries' export. That is,

the result is consistent irrespective of the extent of globalisation that is being considered and resource dependence of the countries being observed.

Table 8b: SGMM Regression – Manufacturing Export and ICT Infrastructure, Including Interaction Terms, FDI and Dummy for Oil Producing Countries

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Man_Exp	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICT_Infra1	Yes	---	Yes	---	Yes	---	Yes	---	Yes	---	Yes	---	Yes	---
ICT_Infra2	---	Yes	---	Yes	---	Yes	---	Yes	---	Yes	---	Yes	---	Yes
Labour	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FDI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eco_Free	Yes	Yes	---	---	---	---	---	---	---	---	---	---	---	---
Eco_Free ×ICT_Infra	-3.08[c] (0.08)	-44.81[b] (0.04)	---	---	---	---	---	---	---	---	---	---	---	---
Contract_Enf	---	---	Yes	Yes	---	---	---	---	---	---	---	---	---	---
Contract_Enf ×ICT_Infra	---	---	-4.40[c] (0.06)	-15.34[a] (0.00)	---	---	---	---	---	---	---	---	---	---
Contract_Proc	---	---	---	---	Yes	Yes	---	---	---	---	---	---	---	---
Contract_Proc ×ICT_Infra	---	---	---	---	-0.08[a] (0.00)	-4.59[c] (0.10)	---	---	---	---	---	---	---	---
Rule_Law	---	---	---	---	---	---	Yes		---	---	---	---	---	---
Rule_Law ×ICT_Infra	---	---	---	---	---	---	3.67[a] (0.01)	4.17[c] (0.09)	---	---	---	---	---	---
Reg_Qual	---	---	---	---	---	---	---	---	Yes	Yes	---	---	---	---
Reg_Qual ×ICT_Infra	---	---	---	---	---	---	---	---	4.78[b] (0.04)	60.60[b] (0.03)	---	---	---	---
Dem	---	---	---	---	---	---	---	---	---	---	Yes	Yes	---	---
Dem ×ICT_Infra	---	---	---	---	---	---	---	---	---	---	1.38 (0.15)	-3.19 (0.27)	---	---
Corruption_Control	---	---	---	---	---	---	---	---	---	---	---	---	Yes	Yes
Corr_Cont ×ICT_Infra	---	---	---	---	---	---	---	---	---	---	---	---	4.30[a] (0.01)	32.52[c] (0.10)
Resources	6.67 (0.82)	-40.52[c] (0.09)	39.20[c] (0.10)	-23.43 (0.19)	-33.51[b] (0.04)	-33.82[a] (0.01)	-1.21 (0.97)	-7.13 (0.61)	-1.25 (0.96)	-5.62 (0.61)	-44.58[c] (0.09)	-10.24 (0.46)	-40.76[b] (0.04)	-26.23 (0.12)
AR(2)	0.78	0.04	0.15	0.51	0.10	0.80	0.87	0.74	0.43	**0.73**	0.34	0.57	0.95	0.17
Hansen	0.13	0.11	0.67	0.99	0.60	1.00	0.98	0.87	0.87	0.18	0.71	0.10	1.00	0.78

Source: Authors' computation

5.3 Excluding Guinea-Bissau and Sierra Leone

As a further robustness check, we exclude Guinea-Bissau and Sierra Leone from the estimation because they do not have data in some of the years. We therefore re-examined the signs and significant values of the individual effect of the variables and those of the interaction terms. Therefore, we re-estimated only the initial regression presented in Table 5 in order to extract the residuals of the regression. With the residual of this new estimate, we are able to compare it with that of the previous estimations in order to ascertain whether they follow a similar pattern. In the case they are of similar pattern, and then we can conclude that the inclusion or exclusion of the countries with incomplete observation does not significantly alter the estimates that are predicted in the regression results. The result of this exercise is displayed in Figure 2.

Figure 2: Comparing Residuals of the Initial Regression in Table 5 and Regression from Sensitivity Check
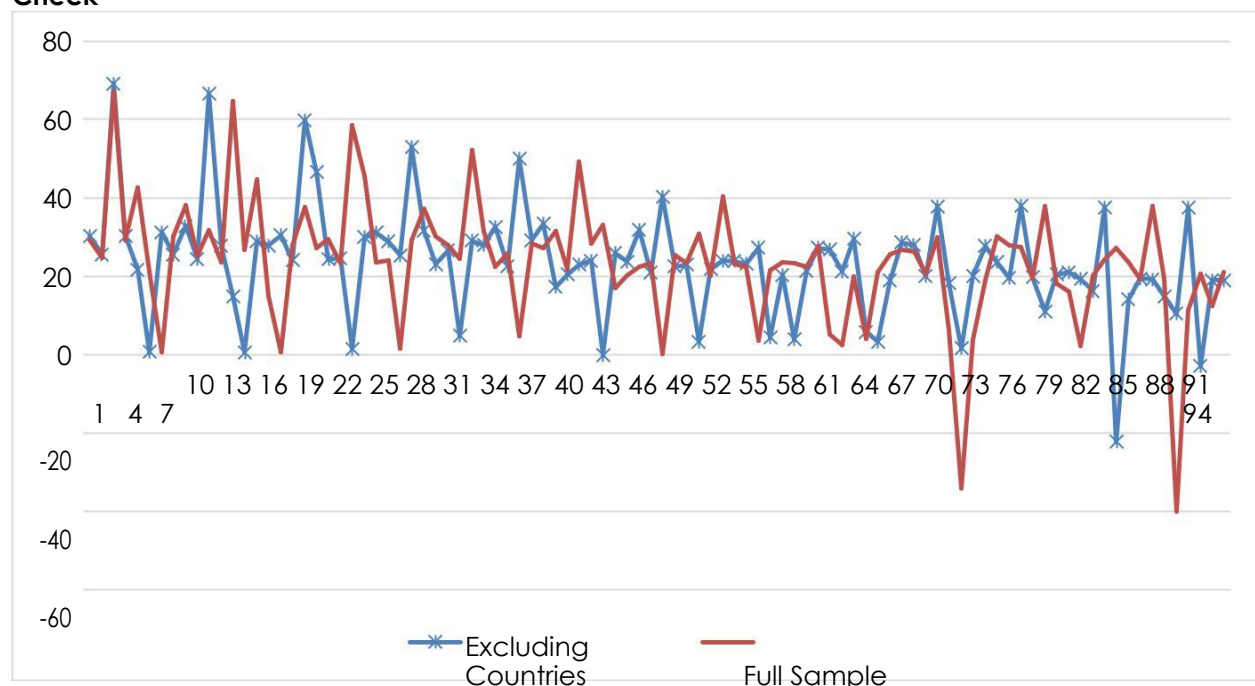
Source: Authors'

From Figure 2, it is observed that the residual of the both graphs follow similar pattern, but at different intervals. The residual for the regression for samples that excludes the three countries behaved similarly to the full sample. This similarity, which is positive in nature, is significant at 5 percent levels of significant (result not reported for space). This connotes that there will not be any significant deviation in the coefficients of the variables that are earlier discussed irrespective of the combination of the sample, i.e. whether Guinea Bissau and Sierra Leone were included or not.

6.   Conclusion

This study presents new insights on the discourse between manufacturing exports and infrastructure (focusing on Information Communication Technology-ICT) by elaborating on the possible role that economic and political institutions can play in such relationship. It provides empirical analysis for the period between 2002 and 2014 using 14 countries in West African sub-region that are also members of the Economic Community of West African States (ECOWAS). Estimating the formulated model using System GMM, several important findings were made, some of which are highlighted herein. It was established that an increase in the ICT infrastructure in West Africa holds the possibility of improving the volume of manufacturing export, which implicates that, on the average; the exporting capacity of the manufacturing sector in West

Africa can be enhanced by improving the level of ICT infrastructure in the sub-region. This is of essence, as improvement of ICT infrastructure can enhance the manufacturing export of ECOWAS countries through the provision of enhanced access that will create better linkage to the global economy.

The results from the analyses equally show that indicators of economic and political institutions exhibit some multiplicative influence on the *nexus* between ICT Infrastructure and manufacturing exports. It was observed that in the face of improved economic and political institutions particularly those that are related to enforcement of contracts, the influence of ICT infrastructure on manufacturing export will be greatly increased. Thus, the main policy implication of these findings is that the Economic Community of West African States (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 the member states. One of such roles should be the tasking of member countries with regards to promoting their institutional quality such as 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 ICT infrastructural provision for enhanced impact on trade and the development of efficient institutions.

Other policy recommendations can include the use of formidable regulations, anchoring and adherence to the tenets of the rule of law becomes very pivotal. This will significantly reduce both transaction cost and time. The role of the ECOWAS Commission in pursuing the realisation of this recommendation cannot be underplayed. This is because the Commission can help to propel and galvanise the involvement as well as the political will of Heads of States and Government, Council of Ministers, and the Parliament and other relevant organs of the governments in the sub-region on the need to work towards this common goal. This will also help in pursuing and overcoming the *age-long monster* of corruption by ensuring the rule of law on economic and political issues in the ECOWAS member countries.

This study did not take into consideration the issue of ICT infrastructure and manufacturing export in the light of sectoral analysis, which can be taken up in future studies. A sectoral analysis would have provided deeper insight on how ICT affects the productivity of different sectors in the economy. This can be addressed in future studies to provide clearer understanding on the discourse on manufacturing export, ICT infrastructure and institutions.

References

Alberto, B., Margarita B., Fernando, L., (2013). Perceived performance effects of ICT in manufacturing SMEs. *Industrial Management and Data Systems*, 113(1): 117 – 135. DOI: https://doi.org/10.1108/02635571311289700.

Aloini, D., and Martini, A., (2012). How Firms Deal with Discontinuous Innovation: An Empirical Analysis, In Ekekwe, N., and Islam, N, (Eds.), *Disruptive Technologies,Innovation and Global Redesign: Emerging Implications*, IGI Global. DOI: 10.4018/978-1-4666-0134-5.ch008.

Andrés, A. R, Amavilah, V. and Asongu, S. (2017). Linkages between formal institutions, ICT adoption and inclusive human development in sub-Saharan Africa.In: Kaur H., Lechman E., Marszk A. (eds) Catalyzing Development through ICT Adoption. Springer, Cham. DOI: https://doi.org/10.1007/978-3-319-56523-1_10.

Asiedu, E. (2006). Foreign Direct Investment in Africa: The Role of Natural Resources, Market Size, Government Policy, Institutions and Political Stability. *World Economy*, 29(1): 63-72. https://doi.org/10.1111/j.1467-9701.2006.00758.x.

Asiedu, E., and Lien, D. (2011). Democracy, Foreign Direct Investment and Natural Resources. *Journal of International Economics*, 84: 99-111 https://doi.org/10.1016/j.jinteco.2010.12.001.

Asongu, S. (2014). On Taxation, Political Accountability and Foreign Aid: Empirics to a Celebrated Literature. South African Journal of Economics. 83(2), 180 – 198. https://doi.org/10.1111/saje.12064.

Asongu, S. and Biekpe, N. (2017). Government quality determinants of ICTadoption in dub-Saharan Africa. *African Governance Development Institution (AGDI) Working Paper*, WP/17/024.

Bandyopadhyay, S., Sandler, T., and Younas, J., (2014). Foreign Direct Investment, Aid and Terrorism. Oxford Economic Papers, 25-50.https://doi.org/10.1093/oep/gpt026.

Bankole, F, O., Osei-Bryson, K., and Brown, I. (2015). The Impact of Information and Communications Technology Infrastructure and Complementary Factors on Intra-African Trade, *Information Technology for Development, 31(1):12-28*. https://doi.org/10.1080/02681102.2013.832128.

Baunsgaard, T., and Keen, M. (2010). Tax revenue and (or?) trade liberalization. *Journal of Public Economics*, 94(9-10), 563-577.https://doi.org/10.1016/j.jpubeco.2009.11.007.

Beck, T., Demirguc-Kunt, A., and Levine, R. (2003). Law, Endowments, and Finance. *Journalof Financial Economic*.70: 137–81. https://doi.org/10.1016/S0304-405X(03)00144-2.

Bergh, A. and Nilsson, T. (2014). Is globalization decreasing absolute poverty? *World Development*, 62: 42-61. https://doi.org/10.1016/j.worlddev.2014.04.007.

Besley, T. and Case, A. (2003). Political institutions and policy choices: Evidence from the United States. *Journal of Economic Literature*.41(1), 7-73.https://www.aeaweb.org/articles?id=10.1257/002205103321544693.

Blundell, R. and Bond. S. (2000). GMM estimation with persistent panel data: an application to production functions. *Econometric Reviews*, 19(3), 321-340.

Blundell, R., and Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics*, 87: 115-143.https://doi.org/10.1016/S0304-4076(98)00009-8.

Cavalcanti, T., Magalhaes, A. M., Tavares, J. (2008). Institutions and Economic Development in Brazil.*The Quarterly Review of Economics and Finance*.48: 412-432.https://doi.org/10.1016/j.qref.2006.12.019.

Deen-Swarray, M., Adekunle, B., and Odularu, G. (2012). Infrastructure Development and Intra-Regional Trade: The Case of ECOWAS, *Journal of West African Integration*, 1 (1), 161-186.

Djankov, S., Freund, C. and Pham, C. S. (2010). Trading on Time. *The Review of Economics and Statistics*, 92 (1), 166-172. https://doi.org/10.1162/rest.2009.11498.

Dollar, D., and Kraay, A. (2002). Growth is Good for the Poor. Journal of Economic Growth. 7(3): 195-225. https://link.springer.com/article/10.1023/A:1020139631000.

ECOWAS (2007).*Supplementary Act A/SA.1/01/07 on the Harmonization of Policies and of theRegulatory Framework for the Information and Communication Technology (ICT) Sector*, Abuja: ECOWAS Commission.

Efobi, U. (2015). Politicians' attributes and institutional quality in Africa: A focus on corruption. *Journal of Economic Issues*, *49*(3), 787-813. https://doi.org/10.1080/00213624.2015.1072393.

Efobi, U. and Osabuohien, E. (2016). Manufacturing exports, Infrastructure and Institutions in Africa: Reflections from ECOWAS. In, Seck. D (Ed.) *In Accelerated Economic Growth inWest Africa* (pp. 157-179), Geneva: Springer International Publishing. DOI: 10.1007/978-3-319-16826-5_8

Efobi, U. R., and Osabuohien, E. (2015). Technological Utilisation in Africa: How do Institutions Matter? In Majumdar, S., Guha, S., and Marakkath, N., (Eds.), Technology and Innovation for Social Change, Springer: India. DOI: 10.1007/978-81-322-2071-8_5.

Ejemeyovwi, J. O., Osabuohien, E. S., and Osabohien, R. (2018). ICT investments, human capital development and institutions in ECOWAS.International Journal of Economics and Business Research, 15(4), 463-474. https://doi.org/10.1504/IJEBR.2018.092151.

Jo-Ansie, V.W. (2007). Political leaders in Africa: presidents, patrons and profiteers? African Centre for the Constructive Resolution of Disputes (ACCORD), Occasional Paper Series, 2(1) 2007.https://hdl.handle.net/10520/AJA16083954_4.

Karakara, A. A. and Osabuohien, E. (2019).Households' ICT Access and Bank Patronage in West Africa: Empirical Insights from Burkina Faso and Ghana. *Technology in Society*, 56, 116-125. DOI: https://doi.org/10.1016/j.techsoc.2018.09.010.

Kiessling, J. (2007). Institutions and ICT technology adoption.Department of Economics. Sweden: Stockholm University. http://www2.ne.su.se/paper/wp06_07.pdf.

Kotnik, P., Hagsten, E., and Sweden, S. (2013). ICT as Enabler of Exports. https://www.frbatlanta.org/-/media/documents/news/conferences/2013/caed/E2Kotnik.pdf.

La Porta, R., Florencio, L.S., Andrei, S., and Robert, W. V. (1999). The Quality of Government.*Journal of Law, Economic and Organization*.15: 222–79. https://doi.org/10.1093/jleo/15.1.222.

La Porta, R., Lopez, F., andShleifer, A. (2008). The economic consequences of legal origins.*Journal of Economic Literature*, 4(2): 285 - 332.DOI:10.3386/w13608.

Limao, N. and Venables, A. (2001). Infrastructure, Geographical Disadvantage, Transport Cost and Trade.*World Bank Economic Review*, Vol. 15 (3), 451-479. https://doi.org/10.1093/wber/15.3.451.

Longo, R. and Sekkat, K. (2001). Obstacle to Expanding Intra-African Trade. OECD Development Centre, *Technical Papers* No. 169. https://doi.org/10.1787/18151949.

Mantzavinos, C., North, D. C., and Shariq, S. (2004). Learning, institutions, and economic performance.Perspectives on politics, 2(1), 75-84.https://doi.org/10.1017/S1537592704000635.

Matthew, O. A., Ede, C. Osabohien, R., Ejemeyovwi, J., Ayanda, T., and Okunbor. J. (2019). Interaction Effect of Tourism and Foreign Exchange Earnings on Economic Growth in Nigeria.*Global Business Review*, 1-16.https://doi.org/10.1177/0972150918812985.

Mbekeani, K. (2010). Infrastructure, Trade Expansion and Regional Integration: Global Experience and Lessons for Africa. *Journal of African Economies*, 19(1), 88-113.https://doi.org/10.1093/jae/ejp021.

McAfee, A., and Brynjolfsson, E. (2008). Investing in the IT that makes a competitive difference. *Harvard Business Review*, *86*(7/8), 98. https://hbr.org/2008/07/investing-in-the-it-that-makes-a-competitive-difference%20(20/02/2015).

Menard, C., and Shirley, M. (2005). *Handbook of New Institutional Economics*. Springer.

Meon, P. and Sekkat, K. (2008). Institutional Quality and Trade: Which Institutions? Which Trade? *Economic Inquiry*, p46 (2), 227-240.https://doi.org/10.1111/j.1465-7295.2007.00064.x.

Ministry of Communications Technology (2012).National information communication technology (ICT) policy. Draft by the Ministerial Committee on ICT Policy Harmonization. https://www.researchictafrica.net/countries/nigeria/Nigeria_National_ICT_Policy_(draft)_2012.pdf.

North, D. C., (1991), Institutions.*Journal of Economic Perspectives, 5*(1), 97-112.

Ogunrinola, I. O., and Osabuohien, E. S. (2010).Globalisation and Employment Generation inNigeria's Manufacturing Sector (1990-2006).*European Journal of Social Sciences,* 12 (4), 581-593.http://eprints.covenantuniversity.edu.ng/id/eprint/151.

Olayinka, I. K., (2018), The Impact of Common External Tariffs on Household's Welfare in a Rich African Country with Poor People. *Advances in Economics and Business* 6(2): 114-124. DOI:DOI: 10.13189/aeb.2018.060204.

Olayiwola, K. W, K.W, Osabuohien, E.S., Okodua, H., & Ola-David, O. (2015). Economic Integration, Trade Facilitation and Agricultural Exports Performance in ECOWAS Sub-Region. In M. Ncube, I. Faye & A. Verdier-Chouchane (Eds.), *Regional Integration and Trade in Africa* (pp.31-46). New York: Palgrave Macmillan.

Oluwatobi, S., Efobi, U., Olurinola, I., and Alege, P. (2015). Innovation in Africa: Why Institutions Matter. *South African Journal of Economics*, *83*(3), 390-410.https://doi.org/10.1111/saje.12071.

Onu, C. A., Olabode, I. O., and Fakunmoju, S. K. (2014). Effect of Information Technology on SMEs Productivity and Growth. European Journal of Humanities and Social Sciences, 32(1): 1718-1737.

Osabuohien, E. and Efobi, U. (2011). Trade Outcomes in Africa's Regional Economic Communities and Institutional Quality: Some Policy Prescriptions. *Petroleum-GasUniversity of Ploiesti Economic Sciences Series*. LXIII, (4), 19-32.https://ssrn.com/abstract=2388426.

Osabuohien, E. S. and Efobi, U. (2012) Technological Diffusion and Economic Progress in Africa: Challenges and Opportunities, in N. Ekekwe and N. Islam (eds.) *Disruptive Technologies Innovation and Global Redesign: Emerging Implications,* (New York: IGI-Global), 425-440. doi:10.4018/978-1-4666-0134-5.ch024.

Osabuohien, E. S. and Efobi, U. R (2013). Africa's Money in Africa, *South African Journal ofEconomics*, 81 (2), 292-306.https://doi.org/10.1111/saje.12012.

Osabuohien, E., Efobi, U., Odebiyi, J, Fayomi, O. and Salami, A. (2019). Bilateral Trade Performance in West Africa: A Gravity Model Estimation. *African Development Review*, DOI:10.1111/1467-8268.12359

Roodman, D. (2009). A note on the theme of too many instruments.*Oxford Bulletin of Economicsand Statistics*, 71, 135-58.https://doi.org/10.1111/j.1468-0084.2008.00542.x.

Shirley, M. (2008). Institutions and Development. Edward Elgar Publishing.

Subramanian, A. and Tamirisa, N. (2003). Is Africa Integrated in the Global Economy? *IMF StaffPapers*, 50(3), 352–372. https://www.jstor.org/stable/4149937.

United Nations Conference on Trade and Development-UNCTAD (2012). *Trade and Developmen tReport, 1981-2011*, New York: United Nations.

United Nations Conference on Trade and Development-UNCTAD (2014). A framework for information and communications technology policy reviews: Helping countries leverage ICT for development. New York and Geneva: United Nations. https://unctad.org/en/PublicationsLibrary/dtlstict2013d6_en.pdf.

United Nations Economic Commission for Africa-UNECA (2009). *Africa Governance Report II*. Addis Ababa: UNECA.

United Nations Economic Commission for Africa-UNECA (2011), *Seventh Session of the Committee on Trade, Regional Cooperation and Integration*. Addis Ababa: UNECA.

World Bank (2015). Doing Business 2015: Going Beyond Efficiency, Washington: World Bank. http://www.worldcat.org/oclc/1029485590.

World Bank (2017). *World Development Indicators.* Available online at http://data.worldbank.org/data-catalog/world-development-indicators.(Accessed March 2017).

Yang, Y. and Gupta, S. (2007). Regional Trade Arrangements in Africa: Past Performance and the Way Forward. *African Development Review*.19 (3), 399-431.https://doi.org/10.1111/j.1467-8268.2007.00169.x.

Yushi, J. and Borojo, D. G. (2019). The impacts of institutional quality and infrastructure on overall and intra-Africa trade.*Economics e-Journal*. No. 2019-10. http://dx.doi.org/10.5018/economics-ejournal.ja.2019-10.