Trade Integration in ECOWAS: Any Evidence of Market Size Effects and Knowledge Transfer?

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Abstract

This paper examined the degree of trade integration among selected ECOWAS countries vis-a-vis market size effects and knowledge transfer. In specific, the study examined if smaller countries in ECOWAS have benefitted from improved access to larger markets and tested the proposition that trade integration is capable of inducing knowledge transfers from more advanced to less advanced countries. Data from 2008 – 2018 sourced from the United Nation's UNCOMTRAD database and a sample of 10 ECOWAS countries were used to estimate a GMM panel regression. The estimated GMM panel regression revealed evidence of a causal relationship between annual growth and trade integration, country size, initial income, macroeconomic control variables, and interacting terms between trade integration, country size, and initial incomes. Specifically, the empirical findings indicated that size matters for economic performance, with smaller countries benefiting more from increased trade integration relative to larger countries. In addition, the study found that through increased trade integration, technologically more advanced countries transfer knowledge to less technologically advanced countries. These findings are consistent with the extant literature. Based on the findings, it is therefore recommended that for the ECOWAS sub-region to maximize the benefits from increased market access and experience knowledge transfer that are associated with trade integration, the composition of its bilateral trade flows must be focused on manufacturing rather than mineral fuels and oils.

Key Words: Knowledge Transfer, Market Size, Panel Regression, Trade Integration.
JEL Classification: F1, F15, F2.

1.0 Introduction

Trade integration is an integral component of economic integration, and it involves the establishment of free trade through agreements between member countries of a Regional Economic Community (REC). This agreement comprises but is not restricted to discrimination reduction and the ultimate removal of trade barriers. Such barriers include tariffs, non-tariff, and other forms of quantity restrictions. However, member countries that eliminate such trade barriers also create uniform barriers against non–members. Trade integration consists of the coordination of policies – trade, fiscal and monetary – with the objective of ensuring that member countries of the trade agreements benefit from access to larger markets as a trading bloc, specialization, and increased incentives for investments. The Economic Community of West African States (ECOWAS) is a regional economic community with the mandate of ensuring the economic integration of its member countries through the promotion of policies that ensure increased bilateral trade. The idea of ECOWAS as a regional trading bloc premises on the creation of a borderless region for easier access and exploitation of resources through the removal of trade restrictions and allowing free movement of people among member countries.

International trade plays an important role in fostering economic growth for developed and developing economies. Some economic scholars have argued that international trade serves as a channel for influencing economic activities. The nature and form of this influence depend largely

on the structure of trade; the nature of commodities traded; trade policies, and regional trade agreements (Lake, 2018). Despite the prevailing views of some economists and multilateral institutions like the IMF and the World Bank that more openness generates positive feedback on economic growth, a plethora of studies (Menyah, Nazlioglu & Wolde-Rufael, 2014; Rodriguez & Rodrik, 2000) still suggest the contrary, especially for developing economies.

There are varying findings about the impact of increasing international trade for countries. Some studies suggest that increased trade integration through trade liberalization tends to make poor countries poorer (Le Goff & Singh, 2014), may hinder economic growth if the developing countries are export dependent on a single commodity (Dollar & Kraay, 2001), and may encourage some form of club convergence among countries (Aghion & Howitt, 2009). Even when economic growth is enhanced, trade-induced economic growth may not lead to development (Greenaway, 1998; Rodrik, 2001). The factors commonly attributed to these propositions are the inability to have access to larger markets; trade costs and restrictions; misalignment of trade policies with foreign partners; reliance on the export of primary commodities; and an inadequate framework for Regional Corporations (Frankel & Romer, 1999). The formation of a regional economic community like ECOWAS moderates these constraining attributes and creates a single large trading bloc with improved access to larger markets.

ECOWAS member countries have had relatively unfavorable macroeconomic conditions, consisting of rising fiscal deficits and debt stock, political instability, and fragility that constrain revenue collection and mobilization, and challenges to investments and sustainable economic growth and the attendant constraints on developmental options (AfDB, 2019). These characteristics have necessitated the urgent need for some form of structural transformation to ensure the realization of set macroeconomic objectives. One possible way, which provides unrestricted access to larger markets (both regional and international), is through trade integration. Iyoha & Okim (2017) clearly show that increased trade integration serves as a channel for bringing about increases in the level of investment, income, and technological transfers among trading countries. These direct benefits will induce an even higher level of trade by increasing industry-wide competitiveness and increased productivity. Consequently, it creates a cycle of increased trade and income, which will eventually increase economic growth, making trade the engine of the growth process (Iyoha & Okim, 2017).

Apart from the conventional causal effects of trade on economic growth and its attendant controversies, the benefits of increased market access and possibilities of technology advancements through knowledge transfers have not been thoroughly explored in the literature, especially for the ECOWAS region. This paper examines the benefits of trade integration, focusing on ECOWAS member countries. First, it has been established that the formation of such regional economic communities increases the size of markets and the scale of production and ultimately provides positive externalities which induce learning–by–doing production processes (Alesina, Spolaore & Wacziarg, 2005). In this sense, increased market sizes, through trade integration in regional economic communities like ECOWAS, should provide access to larger markets for member countries. Nevertheless, the theory posits that this access becomes more important for smaller countries relative to bigger countries, with the smaller countries expected to benefit more from trade intensity than larger countries (Alesina & Spolaore, 2005)[1]. This expectation is

[1] Here, the reference to size is measured by the log of population.

constrained to smaller countries that increase market size through a higher proportion of openness when trade integration occurs. This market size effect operates through the profit component of national income, where technologically advanced producers sell to larger markets due to increased openness (Aghion and Howitt, 2009; Alesina & Spolaore, 2005). Thus, the first objective of this paper is to examine if smaller countries in ECOWAS have benefitted from improved access to larger markets.

The second objective of this paper is to test the proposition that trade integration is capable of inducing knowledge transfers from more advanced to less advanced countries (Aghion and Howitt, 2009; Keller, 2004). This form of technology transfer between countries can help explain productivity and income differences/convergence between countries, as technology remains an important factor in productivity. As highlighted by Keller (2004), through international trade, technological transfers from more technologically advanced countries to less technological countries occur when product quality innovations in more technologically advanced countries become available in less technologically advanced countries through the channel of international trade of investment. Keller (2004) argues that increased trade integration will enhance growth for less advanced economies relative to advanced countries[2] due to technology transfers increasing the productivity of research in less technologically advanced countries and producing a final product at a cheaper cost relative to a scenario of no technological transfers.

2.0 Literature Review

Although there is ample literature on the effects of trade and trade integration on economic growth, most of these studies have focused on the transmission channels, using different methodologies, data sets, and country sets. Despite significant interest, there exists a dearth in the literature concerning market size effects and knowledge transfers in the African context. Following the conceptualization of scale effects on growth in Alesina & Spolaroe (1997) and Alesina, Solare & Wacziarg (2000), this study explores the literature on why country size and knowledge transfers matter and their propagative channels on economic growth and wellbeing. Market size represents a stock of potential consumer demand by individuals, purchasing power and incomes, and their interactions in the market (Spolare & Wacziarg, 2005). The benefits of a larger market include advantages in internalizing positive externalities in the accumulation of capital and knowledge transfers (Grossman & Helpman, 1991) and increased intensity in product competition (Aghion et al., 1998; Aghion et al., 2002). However, these advantages posed by a larger market can be constrained if the trade is conditioned on the degree of openness defined by political borders. Thus, a strand of the literature has also focused on the creation, design, and evolution of borders and their effects on trade and economic growth (Gallup, Sachs & Mellinger, 1999; Venables, 2005). In addition, some findings indicate that more trade openness and integration could lead to smaller countries becoming more volatile due to shocks emanating from very large firms (Di Giovanni & Levchenko, 2012).

The underlying factor behind the drive for greater international trade and integration has been the potential for increased market access for exports originating from developing economies and the potential for economic growth and reduction in poverty. Nevertheless, this expected outcome is not automatic. The focus of the literature has been to understand the channels through which increased market access improves economic growth and income. In the presence of increasing

[2] Here, country advancement is measured by initial levels of income.

returns to scale, in both aggregate factor inputs and the country's production process, increased market access and indeed size encourages economic growth (Romer, 1987; Romero and Britto, 2017). The source of increasing returns differs; through learning by doing process (Parente, 1994; Pan and Li, 2016), through investments in research, technological innovation, and human capital (Nelson and Nelson, 2005; Wong et al., 2005; Fleisher et al., 2010), and through comparative advantages in the development of specialized inputs to production (Backus et al., 1992; Young, 1998).

Irrespective of the arguments for increased international trade among countries, in the presence of trade restrictions, greater trade integration and increased market access would benefit larger countries relative to smaller countries (Alesina et al., 2000). This probable reason, as argued by Gries & Grundmann (2012), and Galor & Mountford (2008), is their finding of asymmetric effects on the demand for human capital in developed and developing countries. This asymmetric effect arises as gains from trade in developed countries are directed towards investments in education and growth in per capita income, while for developing economies; they are directed at population growth. On the other hand, there is the argument by Haddad et al. (2013) that if the export base for smaller countries is diversified, increased international trade may benefit smaller countries. Eaton et al. (2011) also argued that increased market size increases exports, especially when sales distribution processes are similar between countries, irrespective of their individual sizes. Smaller countries could also benefit from increased market sizes when market competition with trade partners affects both exported product mix and range for the small countries (Mayer et al., 2014). In this study, the extent of market competition is determined by differences in market sizes and geographical characteristics. Tougher competition in specific export goods induces exporters in smaller countries to shift production to other less competitive goods. Thus, for smaller countries, increased access to larger markets pay-off when competitive pressures are favorable for their exportable goods.

With the established importance of increased market size to ensuring gains from international trade, trade agreements between countries often include limiting clauses on tariffs and non–tariff barriers. In the absence of trade agreements, regional economic communities like ECOWAS would have tariffs and non–tariff barriers serving as frictions to trade (Broda et al., 2008). They argue that while tariffs create consumption and production distortions, they also create terms of trade gain if the importer has market power. This strand of argument avers a rational association between the degree of market power a country has and its leaning towards tariffs. The elasticity of substitutability between goods traded among countries determines the degree of frictional impact tariffs would have. Krugman (1980) suggested that higher elasticity of substitution increases the impact of trade barriers like tariffs and hampers trade flows. However, Chaney (2008), Helpman et al. (2008), and Eaton et al. (2011), respectively, have challenged this argument. They argue that when the heterogeneity of firms in each country, the volume of trade, and the number of exporters are considered, the elasticity of substitution causes a reduced impact of tariffs on trade flows.

Another aspect of the argument is that trade integration and openness for less advanced economies encourage specialization and learning by doing processes (Matsuyama, 1992). Some authors emphasize the role of openness to trade in promoting innovation, technological diffusion, and catch-up (Grossman & Helpman, 1991; Rivera-Batiz & Romer, 1994; Eaton & Kortum, 1996; Lucas, 2009). While there is consensus in the literature that knowledge and innovations have

positive impacts on domestic and foreign country productivity, what is not clear is the international transmission channel to foreign country productivity (Fracasso & Marzetti, 2015). Various studies have put forward possible transmission channels; through inward foreign direct investments (Damoah, 2017), Total Factor Productivity (Keller, 2004), quality of institutions captured in the ease of doing business, and quality of higher education (Coe et al., 2009), and through trade in intermediate goods (Eaton & Kortum, 2002).

The literature on knowledge transfers through international trade acknowledges the process of learning which occurs through the transfer of technologically advanced intermediate commodities and induces growth and income convergence among countries[3]. The assertion put forward by researchers is that, for developing economies, trade openness allows for increased access to larger markets and advanced technological knowledge (Salomon & Jin, 2008). This provides an important determinant for their economic growth trajectory in relation to convergence with developed economies (Aghion and Howitt, 2009). The knowledge transferred could positively affect domestic productivity through horizontal transfers, suppliers through backward linkage transfer, and buyers through a forward linkage transfer (Cheewatrakoolpong & Potipiti, 2014). In Fracasso & Marzetti (2015), when closeness or distances differentiate trade partners, the nature of trade patterns becomes significant in understanding how knowledge transfers could occur. The postulates in Fracasso & Marzetti (2015) are important in understanding the knowledge transfers in ECOWAS, as there already exist fewer restrictions to trade and the movement of people. However, given that the countries of interest in this study are predominantly developing economies and trade mainly in primary products, the resulting expectations would be that there would be little possibility of knowledge transfers through trade. While this concern remains, the paper primarily focuses on the possibility of such knowledge transfers, with the assumption that increased trade integration and knowledge transfers may occur through the learning-by-doing process from the most technologically advanced country, which we assume is Nigeria, given its higher incomes and volume of trade.

In summary, much of the extant literature reviewed in this study focused mainly on unrevealing the channels through which the effects of trade and trade integration impact more generally economic growth. Substantially, the studies (Romer, 1987; Romero and Britto, 2017, for example) agree that the expected impact is not automatic and accounts for the factors responsible. Another strand, including Gallup, Sachs & Mellinger (1999), and Venables (2005), were more specific in stating that the advantages posed by a larger market can be constrained if the trade is conditioned on the degree of openness defined by political borders. The third strand is those who considered the role of trade openness in promoting innovation, technological diffusion, and catch-up (Grossman & Helpman, 1991; Rivera-Batiz & Romer, 1994; Eaton & Kortum, 1996; Lucas, 2009). However, to the best of our knowledge, there is no existing empirical study that has examined the benefits of increased market access and possibilities of technology advancements through knowledge transfers for the ECOWAS sub-region, let alone incorporating ten member countries over the period 2008-2018. To the best of our knowledge, there is limited literature that has tested the proposition that trade integration is capable of inducing knowledge transfers from more advanced to less advanced countries in the ECOWAS context. These are the knowledge gaps that this study has robustly filled.

[3] Detailed survey of relevant literature can be found in Cerver-Romero et al. (2018).

4.0 Methodology

4.1 Theoretical Framework

The traditional Schumpeterian growth model presents a theory that explains how market size effects and knowledge transfer may occur among countries. The proponents of this model, Acemoglu et al. (2002) and Aghion and Howitt (2009), captured market size effects and knowledge transfer effects by allowing for the possibility of trade between two countries without any form of cost, and each country enters into a trade with the intention of taking advantage of greater productive efficiency. For a clear effect of market size, Aghion and Howitt (2009) simply compared the national income of the home country when it was closed and after it engaged in trade. This enables one to determine if the population is critical to the benefits of international trade. To distill market size effects from the model, they assumed that the home country and the foreign country have equal levels of technological advancement. When the home country opens up to international trade, producers who produce technologically advanced intermediate products can now sell their products to a larger market. Thus, the smaller the market was before opening up to trade, the larger the gains from trade.

For knowledge transfers, the model first controls for size by assuming that the home country and the foreign country are of equal size; the proportionate gain from trade becomes a simple comparison of the home country's national income before and after the trade. Opening up to trade in less advanced economies allow workers to work with more advanced intermediate inputs and become more productive. However, if the level of technological know-how is very low in all sectors, the profit income component will be eroded with international trade. This indicates an extreme instance in which the home country is technologically backward relative to the foreign country in all sectors. However, the model espoused by Acemoglu et al. (2002) and Aghion and Howitt (2009) predicts that as long as the home country lags behind the foreign country in technological advancement, it will gain from international trade. The gain is relative to how far behind the home country is; the further behind, the greater the gain from international trade.

The basic assumptions for the model include the following:

- There are *m* countries that do not exchange goods or factors of production but use each other's technological ideas
- Each country has a fixed population, which is normalized to unity, implying aggregate and per capita quantities are equal
- Individuals live for one period and have linear preferences in consumption
- There is one final good that is produced by labor and intermediate products
- The final good is produced under perfect competition

Abstracting from Aghion and Howitt (2009), the model's final good is represented by a production function of the form:

$$Y_t = L^{1-\alpha} \int_0^1 A_{it}^{1-\alpha} x_{it}^{\alpha} di, 0 < \alpha < 1 \qquad (1)$$

where $x_{it}(i)$ Is the input of the latest version of intermediate good *i* and $A_{it}(i)$ is the productivity parameter associated with it and measures the quality of the intermediate good. The final good is produced under perfect competition, so the price of each intermediate good equals its marginal product:

$$P_{it} = \alpha L^{1-\alpha} A_{it}^{1-\alpha} x_{it}^{\alpha-1} \qquad (2)$$

each intermediate good *i* is produced one for one by an innovator seeking monopolist profits. This monopolist innovator uses the final well as an input – the final good in one industry can serve as an intermediate good for another industry – and chooses x_{it} To maximize his profits:

$$\pi_{it} = P_{it}x_{it} - x_{it} = \alpha L^{1-\alpha} A_{it}^{1-\alpha} x_{it}^{\alpha} - x_{it} \qquad (3)$$

Which gives an equilibrium quantity $x_{it} = \alpha^{2/1-\alpha} A_{it} L$ and profits, $\pi_{it} = \pi A_{it} L^{*}$, where $\pi = (1-\alpha)\alpha^{\frac{1+\alpha}{1-\alpha}}$

A monopolist produces the intermediate product each period, using the final well as all input, one for one. That is, for each unit of an intermediate product, the monopolist must use one unit of the final good as the input. The final equilibrium output derived by substituting the intermediate good in the production function is represented as:

$$Y_t = \alpha^{\frac{2\alpha}{1-\alpha}} \int_0^1 A_{it}\, di\, L \qquad (4)$$

However, the final equilibrium output Y_t is actually different from the level of national income in the model. This is because a fraction of the final goods are used in the production of intermediate goods, which are then used in producing the final good. Thus, national income in the model comprises wage income and profit income. Wage income arises from the payment of the marginal product of an employed number of *L* workers in the final good sector, and the local monopolist earns profit income by selling intermediate goods to the final sector. While wage income, which is the fraction $(1-\alpha)$ of the final output is represented as:

$$W_t = L * \frac{dY_t}{dL} = (1-\alpha)Y_t \qquad (5)$$

The local monopolist charges a price equal to $1/\alpha$ And has a cost equal to 1. Thus, the profit margin for the local monopolist is $P_{it} - 1 = (1-\alpha)P_{it}$, with the profit equation being represented as;

$$\Pi_t = \int_0^1 (P_{it} - 1)x_{it}dt = (1-\alpha)\int_0^1 P_{it}x_{it}dt = (1-\alpha)\alpha Y_t \qquad (6)$$

As national income is the sum of wage income and profit income, the national income is thus written as:

$$N_t = W_t + \Pi_t = (1-\alpha^2)Y_t \qquad (7)$$

Substituting the equation for the equilibrium final output into the equation for national income,

$$N_t = (1-\alpha^2)\alpha^{\frac{2\alpha}{1-\alpha}} \int_0^1 A_{it}\, di\, L \qquad (8)$$

it becomes clear that the national income is proportional to the productivity parameter, A_{it} And to population, *L*.

To buttress market size and knowledge transfer effects, the model must first allow for the possibility of trade between the *m* number of countries. For simplicity, the model by Aghion and Howitt (2009) assumes two countries, which trade with each other without any form of cost, and each country enters into a trade with the intention of taking advantage of greater productive efficiency. The good final production for both the foreign country and the home country can be represented as,

Home country: $Y_t = L^{1-\alpha} \int_0^1 \hat{A}_{it}^{1-\alpha} x_{it}^{\alpha}\, di,\ 0 < \alpha < 1$

Foreign country: $Y_t^{*} = (L^{*})^{1-\alpha} \int_0^1 \hat{A}_{it}^{1-\alpha} (x_{it}^{*})^{\alpha}\, di,\ 0 < \alpha < 1$

$$\hat{A}_{it} = max\{A_{it}, A_{it}^{*}\}$$

If the monopolist charges a price P_{it} And can now sell in both countries, the good final producers in both countries will buy good *i* up to the point where marginal product equalsP_{it}. Thus, the demand functions facing the monopolist in both countries become:

$x_{it} = \hat{A}_{it} L \left({}^{P_{it}}/_{\alpha}\right)^{\frac{1}{\alpha-1}}$ and $x_{it}^{*} = \hat{A}_{it} L^{*} \left({}^{P_{it}}/_{\alpha}\right)^{\frac{1}{\alpha-1}}$, $0 < \alpha < 1$

The summation of these equilibrium quantities in both countries to arrive at a price equation will show that the demand equation arrived at in this open economy is the same as that in the closed economy. However, global sales will now depend on the global population:

$P_{it} = \alpha(L + L^{*})^{1-\alpha}\left(\hat{A}_{it}\right)^{1-\alpha} X_{it}^{\alpha-1}$, where $X_{it} = x_{it} + x_{it}^{*}$ (9)

With monopolist profits being the difference between revenue $P_{it}X_{it}$ and cost X_{it}

$\pi_{it} = P_{it}X_{it} - X_{it} = \alpha(L + L^{*})^{1-\alpha}\left(\hat{A}_{it}\right)^{1-\alpha} X_{it}^{\alpha} - X_{it}$ (10)

As in the case of no trade, the monopolist will choose the level of output that maximizesπ_{it}, which is:

$$X_{it} = \hat{A}_{it}(L + L^{*})\alpha^{{}^{2}/_{1-\alpha}}$$

$$\pi_{it} = (1-\alpha)\alpha^{\frac{1+\alpha}{1-\alpha}}\hat{A}_{it}(L + L^{*})$$

With similar prices and profit levels as in the case of no trade. Substituting the prices $P_{it} = {}^{1}/_{\alpha}$ in both home and foreign country demand functions yield,

$x_{it} = \hat{A}_{it} L \alpha^{{}^{2}/_{1-\alpha}}$ and $x_{it}^{*} = \hat{A}_{it} L^{*} \alpha^{{}^{2}/_{1-\alpha}}$ (11)

and substituting into their respective production functions,

$Y_t = \alpha^{\frac{2\alpha}{1-\alpha}} \int_0^1 A_{it}\, di\, L$ and $Y_t^{*} = \alpha^{\frac{2\alpha}{1-\alpha}} \int_0^1 \hat{A}_{it}\, di\, L^{*}$ (12)

From the production functions, one sees that the production of the final goods in both countries is proportional to their populations, L. As in the case of a closed economy, the model is interested in national income, which remains the sum of wage income and profit income. While wage income is earned in the final sector, profit in each country depends on the fraction γ_{it} Of the intermediate monopolies that reside in each country, where $\gamma_{it} = \begin{Bmatrix} 1 & if\ A_{it} > A_{it}^{*} \\ 0 & otherwise \end{Bmatrix}$. Therefore, wage income in both countries becomes:

Home Country:$W_t = (1-\alpha)\hat{A}_t L$

Foreign Country: $W_t^{*} = (1-\alpha)\hat{A}_t L^{*}$

and profit income,

Home country:$\Pi_t = \pi(L + L^{*}) \int_0^1 \gamma_{it}\hat{A}_{it} di$

Foreign Country: $\Pi_t^{*} = \pi(L + L^{*}) \int_0^1 (1-\gamma_{it})\hat{A}_{it} di$

With γ_{it} Representing when a monopoly resides in the home country and$1 - \gamma_{it}$, a representation of a monopoly residing in the foreign country. National income in both countries then becomes

$N_t = (1-\alpha)Y_t + \alpha(1-\alpha) \int_0^1 \gamma_{it}(Y_{it} + Y_{it}^{*})\, di$ (13)

$N_t^{*} = (1-\alpha)Y_t^{*} + \alpha(1-\alpha) \int_0^1 \gamma_{it}(Y_{it} + Y_{it}^{*})\, di$ (14)

This can be written as;

$N_t = \left[(1-\alpha)\hat{A}_t L + \alpha(1-\alpha) \int_0^1 \gamma_{it}\hat{A}_{it}(L + L^{*}) di\right] \alpha^{\frac{2\alpha}{1-\alpha}}$ (15)

$N_t^{*} = \left[(1-\alpha)\hat{A}_t L^{*} + \alpha(1-\alpha) \int_0^1 (1-\gamma_{it})\, \hat{A}_{it}(L + L^{*}) di\right] \alpha^{\frac{2\alpha}{1-\alpha}}$ (16)

For a clear effect of market size, Aghion and Howitt (2009) simply compare the national income of the home country when it was closed and after it engaged in trade. This enables one to determine if the population is critical to the benefits of international trade. To distill market size effects from the model, they assume that the home country and the foreign country have equal levels of technological advancement. For this, half of the sectors in the home and foreign country start with

a higher productivity level and capture the monopoly. If the average productivity in both countries equals the global average, namely, $\hat{A}_t$, then the home country's national income after engaging in trade becomes,

$$N_t' = \left[(1-\alpha)\hat{A}_t L^* + \alpha(1-\alpha)(1/2)\hat{A}_{it}(L+L^*)\right]\alpha^{\frac{2\alpha}{1-\alpha}}$$

Therefore, the proportionate gain from trade becomes:

$$\frac{N_t'}{N_t} = \frac{\hat{A}_{it}}{A_t}\left(1 + \frac{\alpha}{2(1+\alpha)}\frac{L^*-L}{L}\right) \quad (17)$$

The proportionate representation clearly shows that the smaller the country, as measured by *L*, the larger the proportional gain from trade. According to Aghion and Howitt (2009), this is possible through the profit component of national income. When the home country opens up to international trade, producers who produce technologically advanced intermediate products can now sell their products to a larger market. Thus, the smaller the market was before opening up to trade, the larger the gains from trade.

For knowledge transfers, the model first controls for size by assuming that the home country and the foreign country are of equal size, i.e. $(L = L^*)$. The national income for the home country becomes:

$$N_t' = \left[(1-\alpha)\hat{A}_t L + \alpha(1-\alpha)\int_0^1 \gamma_{it}\hat{A}_{it}(L)di\right]\alpha^{\frac{2\alpha}{1-\alpha}}$$

The proportionate gain from trade becomes a simple comparison of the home country's national income before and after the trade. This can be represented as:

$$\frac{N_t'}{N_t} = \frac{1}{1+\alpha}\frac{\hat{A}_t}{A_t} + \frac{2\alpha\int_0^1 \gamma_{it}\hat{A}_{it}di}{(1+\alpha)A_t} \quad (18)$$

Where the first term on the right represents wage income and the second term represents profit income. Opening up to trade allows workers to work with more advanced intermediate inputs and become more productive. However, if $\gamma_{it} = 0$ in all sectors, the profit income component is eroded with international trade. This indicates an extreme case where the home country lags behind the foreign country in all sectors. However, the model predicts that as long as the home country lags behind the foreign country in technological advancement, it will gain from international trade. The gain is relative to how far behind the home country is; the further behind, the greater the gain from international trade. If the initial productivity levels of the home country A_t is less than $\frac{\hat{A}_t}{1+\alpha}$, then $\frac{N_t'}{N_t}$ will exceed unity, and the smaller A_t becomes, the higher $\frac{N_t'}{N_t}$ Will be.

4.2 Model Specification

In order to determine if the process of trade integration in ECOWAS has had any causal effects on growth, the study constructs two different measures of trade intensity, with a focus on bilateral trade among member countries of ECOWAS and trade openness. The two measures of trade intensity were derived following the works of Gouveia & Correia (2013) and Shin & Wang (2005), which are based on the pioneering work of Frankel and Rose (1998). The construction of this index focuses on intra-trade intensity between countries, using the flow of imports and exports between ECOWAS member countries. The trade index used in the paper is similar in construction to a

specific dimension[4] of the Africa Regional Integration Index (ARII). The advantage of the choice of the index over the ARII is the ability to a large span of data points and calculate cumulative averages for interval periods. Thus, trade integration is represented by the amount of bilateral trade among individual countries in the sample size. A trade intensity index is constructed and normalized using the total trade volume of all countries in the sample size. Consequently, trade intensity becomes:

$$Trade\ 1_{\ i,j} = \left(\frac{x_{i,j,t} + m_{i,j,t}}{x_{i,t} + m_{i,t}}\right) * 100 \qquad (19)$$

Where $x_{i,j,t}$ Is nominal exports from country *i* to the other nine member countries of ECOWAS at year *t*, $m_{i,j,t}$ are nominal imports of country *i* from the other 9 member countries of ECOWAS in year t, $x_{i,t}$ and $m_{i,t}$ Indicate, respectively, country *i* 's total export and imports at year *t*.

The second measure of trade intensity captured bilateral trade between member countries and normalized by the total volume of trade in ECOWAS. Thus, we have:

$$Trade\ 2_{\ i,j} = \left(\frac{x_{i,j,t} + m_{i,j,t}}{X_t + M_t}\right) * 100 \qquad (20)$$

Where X_t and M_t Represent total exports and total imports at time *t* for all the member countries used in this study. From the measures of trade intensity, larger values indicate more intensive trade between countries *i* and *j*. These measures are derived by taking aggregate annual bilateral trade data for the periods 2008 – 2018 from the United Nation's UN COMTRADE database. The use of these two measures of trade intensity is to ensure the robustness of estimates.

$$g_{it} = \beta_0 + \beta_1 TI_{it} + \beta_2 logS_{it} + \beta_3 TI_{it} * logS_{it} + \beta_4 logY_{it-T} + \beta_5' Z_{it} + \varepsilon_{it} \qquad (21)$$

Where g_i represents GDP growth rate in country *i* at time *t* and is measured as $Log\frac{Y_{it}}{Y_{it-T}}$. TI_{it} is a measure of trade integration, S_{it} Represents country size and was captured by the log of population and the log of GDP. The main estimation of interest in determining market size effects is the interaction term between country size and trade integration. Y_{it-T} represents the initial level of income in country *i* at time *t* and was measured as per capita income, while Z_{it} is a vector of control variables. The control variables of interest include a log of the country's initial income, exchange rate, inflation, fertility, financial development, and money supply as a fraction of GDP. For evidence of market size effects, the partial derivative of the form;

$$\frac{\partial g}{\partial TI_{it} * logS_{it}} = -\beta_3. \qquad (21a)$$

For technology transfer effects, the model estimated is similar to that of market size effects, with the exception of the interaction term between income levels and trade integration. To this effect, we would estimate the model of the form:

$$g_{it} = \alpha_0 + \alpha_1 TI_{it} + \alpha_2 logY_{it-T} + \alpha_3 TI_{it} * logY_{it-T} + \alpha_4 logY_{it-T} + \alpha_5' Z_{it} + \mu_{it} \qquad (22)$$

The definition of independent variables in the model remains unchanged, and evidence of technological transfer effects can be derived from the partial derivative;

$$\frac{\partial g}{\partial TI_{it} * logY_{it-T}} = -\alpha_3 \qquad (22a)$$

[4] The dimension is the share of intra – regional trade, measured as the sum of a country's exports and imports within the region as a proportion of the entire region's intra- regional trade. See https://www.integrate-africa.org/rankings/dimensions/trade-integration/

The measures of trade intensity include the summation of imports and exports. However, this may lead to obvious endogeneity problems, as a possible positive correlation among imports, exports, and growth may reflect that a booming country imports and exports more (Aghion and Howitt, 2009). To deal with this problem, the study employs Frankel & Romer's (1999) instrumentation. Frankel & Romer (1999) used a simple "gravity model" as an instrument for the positive correlation between import, export, and growth by making trade flows depend on a country's size (proxy by population and Gross Domestic Product). This form of instrumentation assures that the estimated model captures the effects of the trade intensity variable on economic growth and not the reverse causality or a third omitted variable (Aghion & Howitt, 2009). Also adopted was the panel - GMM estimation technique because of the possibility of endogeneity bias that arises from correlations between the components of trade and economic growth (Arellano and Bover, 1995; Blundell and Bond, 1998). In employing the panel – GMM, the instruments used were the first lag of independent variables (Chakalabbi, Matur & Neregal, 2018). Also conducted was the Sargan test for overidentifying restrictions on the instruments used, with the Sargan test statistic distributed as a $\chi(p-k)$, where k is the number of estimated coefficients and p is the instrument rank. The Sargan test helps to reject or fail to reject a null hypothesis that the overidentifying restrictions are valid.

The restriction on the scope of the data arises from the problem of missing data for some countries and for certain periods prior to 2008. In addition, we intended for the data scope to capture important trade integration policies. In 1997, eight ECOWAS countries which were part of the West African Economic and Monetary Union (WAEMU), adopted a Common External Tariff (CET) (operational in 2000), with their main objective being the promotion of value-added by applying low duties on essential goods. However, in 2006, both ECOWAS and WAEMU adopted a single common external tariff, which was revised in 2009 and a final structure agreed upon in 2013.

Another important trade policy regime in the region is the ECOWAS – EU Economic Partnership Agreement (EPA). The EPA negotiations started in 2002 and were completed in 2008[5]. The ECOWAS – EU EPAs were advanced to comply with WTO standards for reciprocity trade, promotion of ECOWAS member countries' trade, development, and insertion into the global economy, which will enhance regional integration (Coste & Uexkull, 2014). Despite the objectives of the EPA, concerns have emerged regarding its actual benefits. Concerns exist about the associated adjustment costs to ECOWAS member countries and their market access offer (Coste & Uexkull, 2014).

To empirically capture market size effects and technology transfer effects on the trade integration cum growth dynamics for ECOWAS, we brought equations 3 and 4 to the data. We abstracted from the models of Alesina, Spolaore & Wacziarg (2000) and Spolaore & Wacziarg (2005) to include interaction terms that capture market size effects and technology transfer effects. We estimate similar but different models to reveal market size effects and technology transfer effects. For market size effects, we focus on a growth model of the form: ??

[5] There has not been a consensus among ECOWAS member countries on the tenets of the EPA. For example, Nigeria has consistently refused to sign the EPA.

Although the literature on knowledge transfers indicates the use of foreign direct investments (Damoah, 2017) and trade components of imports and exports (Eaton and Kurtom, 2002), the choice of initial per capita income levels are informed by the arguments of Aghion and Howitt, (2009) and Kang (2002). They argue that income levels indicate a comparative measure of relative backwardness among countries, with countries with higher incomes being designated as more technologically advanced. Thus, countries with higher initial levels of income have the advantage of investing in innovation and R&D, as technological knowledge transfers through trade are often tactic and circumstantial (Evenson & Westphal, 1995). In Aghion and Howitt (2009), countries with higher initial levels of income tend to have better macroeconomic conditions, a conducive legal environment, an educational system, and credit markets, which are requisites for innovation. In addition, the composite index $Trade\,1_{i,j}$ Incorporates the possible transmission channels through trade, as suggested by Eaton and Kortum (2002). Another consideration in the choice of initial income levels over FDI and capital flows is the dominance of the European Union, the United States of America, and China, with low levels of FDI and capital, flows between ECOWAS member countries (Olakojo, 2017). Despite the appropriateness of using FDI to capture knowledge transfers, there is limited FDI among ECOWAS member countries, largely due to their relatively low-income status. For this study, a country with higher per capita income indicates the country's capacity to transfer knowledge. However, the paper uses per capita income as a necessary index for measuring the flow of knowledge transfers from a higher income country to lower ones, strictly as a necessary condition and not a sufficient one.

The sample size for this study includes 10 ECOWAS countries, namely Benin (BEN), Burkina Faso (BFA), Cape Verde (CPV), Cote d'Ivoire (CIV), Ghana (GHA), Niger (NER), Nigeria (NGA), Senegal (SEN), Togo (TGO) and The Gambia (GMB). Uniformity and availability of data determined country choices.

5.0 Results and Discussions

Tables 1 and 2 display the preliminary summary of statistics (pairwise correlations and descriptive statistics) for the variables of interest from 2008 to 2018. All data, with the exception of Trades 1 and Trade 2, were obtained from the World Bank's World Development Indicators (2017). The mean annual growth rate for the entire sample is 4.687, with a standard deviation of 3.127. As stressed by Ekpo and Chuku (2017), variations in growth rates are attributed to differences in country-specific growth rates over time. However, the low standard deviation values for the two measures of trade integration, *Trade 1* and *Trade 2*, indicate some homogeneity. This assertion is clearly collaborated by the pairwise correlation statistics of both measures of trade integration in *Table 2*.

Table 1: Summary of Descriptive Statistics (2008 – 2018)

	Mean	Maximum	Minimum	Standard Deviation	Number of Observations
Annual Growth Rate	4.687	14.046	-4.387	3.127	90
Trade 1	0.011	0.0508	0.004	0.0128	90
Trade 2	0.0007	0.0034	0.000	0.0008	90
Log of population	16.201	19.041	13.106	1.490	90
Log of initial Income	6.846	8.146	5.768	0.676	90
Exchange rates	333.3	593.008	1.058	222.001	90

Financial Inclusion	24.260	65.742	10.176	14.380	90
Log of GDP	23.080	26.864	20.549	1.639	90

Source: Compiled by Authors

The descriptive statistics on exchange rates indicate no form of inertia, with the standard deviation indicating wild dispersions. The pairwise correlation matrix in *Table 2* reveals that both measures of trade integration are highly correlated, implying their substitutability and the justification for using only one of the measures for estimation rather than both measures. We would use *Trade 1* in estimating the specified model in equations *21* and *22*[6]. Also of importance is the correlation between the measures of trade integration and country size, as well as the initial level of income. We expect a negative association between both measures of trade integration, country size, and initial levels of income. However, the correlation results indicate a positive association between them.

Table 2: Pairwise Correlations for Main Variables of Interest (2008 – 2018)

	Annual Growth Rates	*Trade 1*	*Trade 2*	*Log of Population*	*Log of initial income*	*Exchange rates*	*Financial inclusion*	*Log of GDP*
Annual Growth Rates	1							
Trade 1	0.280	1.000						
Trade 2	0.280	0.997	1.000					
Log of Population	0.301	0.608	0.608	1.000				
Log of initial income	-0.113	0.335	0.335	-0.035	1.000			
Exchange rates	0.068	0.010	0.010	0.242	-0.455	1.000		
Financial inclusion	-0.269	-0.280	-0.280	-0.612	0.549	-0.164	1.000	
Log of GDP	0.231	0.702	0.702	0.908	0.380	0.011	-0.323	1

Source: Compiled by Authors

We present the conditional correlation between our measure of trade intensity (using only *Trade 1*) and growth conditional on country size is greater or lower than the sample median. In addition, we present the conditional correlation between country size and growth conditional on trade intensity being greater or lower than the sample median. Assuming only the log of the population as the measure of country size, from Table 3, it is clear that the correlation between trade intensity and growth for small countries is 0.66 and 0.27 for larger countries. Likewise, the correlation

[6] Estimation results using *Trade 2* are available on request.

between country size and growth is 0.7 for countries that are less integrated through trade and 0.44 for countries that are more integrated through trade. The same conclusions apply when using *Log GDP* as the measure for country size. The implications of these conditional correlations are similar to those of Alesina, Spolaore, and Wacziarg (2000), who asserted that the correlation between country size and growth falls with the degree of trade integration. We return to the estimates of our panel regression to appraise this assertion.

Table 3: Conditioning Correlations (2008 – 2018)

Variable	Conditioning Statement	Correlation with growth	Number of Observation
Trade 1	Log of population > median = 16.52747	0.27	90
Trade 1	Log of population ≤ median = 16.52747	0.66	90
Trade 1	Log of GDP > median = 22.88256	0.29	90
Trade 1	Log of GDP ≤ median = 22.88256	0.704	90
Log of population	Trade 1 > median = 0.00489	0.44	90
Log of population	Trade 1 ≤ median= 0.00489	0.70	90
Log of GDP	Trade 1 > median = 0.00489	0.409	90
Log of GDP	Trade 1 ≤ median = 0.00489	0.69	90

Notes: *Medians are computed from individual samples, while conditioning correlations are common sample correlations.*

Tables 4 – 6 present the Panel GMM estimates of the model specified in equations *(21)* and *(22).* The estimated regressions show the causal relationship between annual growth and trade integration, country size, initial income, macroeconomic control variables, and interacting terms between trade integration, country size, and initial incomes. In models 1, 2, 3, and 4 of Table 4, we estimate the relationship between growth, trade integration, and country size (population). We replicate this estimation in models 1^a, 2^a, 3^a, and 4^a in Table 5 but now use the log of GDP as the measure of country size.

Table 4: Panel GMM Growth Estimations: Dependent Variable Annual Growth Rate

	Model 1	Model 2	Model 3	Model 4
Trade 1	66.277***	73.271***	126.233***	138.37***
	(13.886)	(13.345)	(33.378)	(36.093)
*Trade 1*Log Population*	-3.568***	-4.027***	-6.804***	-7.485***
	(0.715)	(0.701)	(1.756)	(1.8678)
Log Population	3.107	-1.417	-23.658*	-15.77
	(7.459)	(8.396)	(12.239)	(12.158)
log Initial Income		4.52	4.178	6.492*
		(8.3962)	(3.308)	(3.2622)
Exchange Rate			0.057***	0.064***
			(0.018)	(0.021)
Financial Development			-0.096	-0.0309
			(0.0638)	(0.0702)

inflation				-0.119
				(0.223)
Fertility				6.312
				(8.820)
M2/GDP				-0.026
				(0.0205)
Constant	-51.047	-7.486	332.399	152.65
	(0.672)	(128.745)	(0.063)	(236.94)
Number of Countries (Periods)	10(8)	10(8)	10(8)	10(8)
J-Statistics	18.453	17.355	2.9483	1.027
Sargan(p)	0.42	0.36	0.99	0.99
Instrument rank	17	16	14	11

Source: *Generated by the author from the study's data.*
Notes: *The dependent variable is the annual growth rate of GDP for each country in the sample; robust standard errors are reported in parentheses, and *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.*

All the variants of our model results presented in Table 4 indicate evidence of market–size transfer effects among the data sample. As indicated in equation (21a), evidence of market size effects is found when the estimated parameter is negative and significant. The coefficient of the market size variable in equation (21a) was negative and significant in all variants of the model. The estimate of the interaction term holds whether we enter the variable alone (as in model 1); we control for the level of initial income (model 2); control for macroeconomic idiosyncrasies that exist within each selected country (model 3), and when we control for other important macroeconomic variables (model 4)[7].

From Table 5, the same conclusions can be derived, as the results of the estimated regression in models 1^a, 2^a, 3^a, and 4^a, show little change when we measure country size by the log of GDP. The implication of a negative and significant estimate of growth – trade integration – country size relationship is that, with increased trade integration among ECOWAS countries, smaller countries – defined by their either population or economic size (GDP) – will benefit more relative to larger countries. This benefit is in the form of enhanced economic growth arising from increased trade integration, as compared to larger countries. This claim conforms to the findings of Alesina, Spolaore, and Wacziarg (2000) and Spolaore and Wacziarg (2005).

Table 5: Panel GMM Growth Estimations: Dependent Variable Annual Growth Rate

	Model 1^a	Model 2^a	Model 3^a	Model 4^a
Trade 1	57.989***	66.091***	139.698***	153.24***
	(13.8)	(14.059)	(49.99)	(51.423)
*Trade 1*Log GDP*	-2.216***	-2.584***	-5.34***	-5.88***
	(0.512)	(0.527)	(1.878)	(1.9)
LogGDP	2.455	-1.22	-21.581*	-19.122
	(3.934)	(5.393)	(11.658)	(12.07)
log Initial Income		5.02*	8.706*	10.623***

[7] These other control variables are gotten from Alesina, Spolaore and Wacziarg (2000)

		(2.709)	(4.976)	(2.94)
Exchange Rate			0.073**	0.08**
			(0.028)	(0.03)
Financial Development			-0.117	-0.056
			(0.083)	(0.091)
inflation				-0.141
				(0.2105)
Fertility				3.68
				(12.361)
M2/GDP				-0.029
				(0.025)
Constant	-56.418	-4.951	409.97	318.25
	(90.286)	(112.689)	(234.53)	(316.27)
Number of Countries (Periods)	10(8)	10(8)	10(8)	10(8)
J-Statistics	20.159	18.887	1.889	1.343
Sargan(p)	0.26	0.27	0.99	0.99
Instruments	17	16	14	11

Source: *Generated by the author from the study's data.*
Notes*: The dependent variable is the annual growth rate of GDP for each country in our sample; robust standard errors are reported in parentheses, and *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.*

Reflecting more on the estimates in Tables 4 and 5, we can see clearly that there is evidence that trade integration induces economic growth. The trade integration variable *Trade 1* remains positive and statistically significant in all variants of the model. This finding supports the proponents of increased trade integration among regional entities as well as the trade liberalization theories. The finding is in conformity with other related studies (Tinta et al., 2018; Baldwin et al., 2006; Yanikkaya, 2003)

Another important finding from the regression estimates is the rejection of any evidence of conditional convergence. This is evident from the positive sign and non-significance of the *Initial Income* variable in Tables 4 and 5. The evidence of no conditional convergence indicates that, though trade will enhance economic growth, the growth rate for countries that are far behind – defined by the level of their initial incomes – will not catch up with countries with higher levels of income. This finding is in line with those of some recent studies (Amalia et al., 2018; Zulfiqar et al., 2018). There is also evidence from the estimates of the exchange rate in Tables 4 and 5 that exchange rate depreciations are expansionary in ECOWAS. This suggests that with exchange rate depreciations, there is a substitution from imports to domestically produced commodities, which enhances the export sector and encourages increases in aggregate demand. In addition, with the expansion of the export sector, the economy becomes more open to trade, which places the country on a developmental path for sustained economic growth (Dornbusch & Werner, 1994; Kamin & Rogers, 2000).

Table 6 presents our regression estimates in determining the capacity of knowledge - transfer within the union. For the presence of knowledge transfer, we expected the interaction term between trade integration and the initial level of income to be negative and statistically significant (Aghion

& Howitt, 2009; Keller, 2004). Intuitively, the specification of the model presupposes that technological knowledge can be transferred through international trade between countries (Eaton & Kortum 2002). The estimated results clearly show that there is a capacity for knowledge–transfers, as the interaction term between trade integration and initial levels of per capita income is negative and statistically significant. The implication of this finding is that countries that are more technologically advanced – defined by their levels of initial per capita income – through trade integration have the capacity to transfer some technical knowledge to countries that are less technologically advanced. This result is in agreement with the findings of Aghion & Howitt (2009). Given our index of trade integration, the nature of the knowledge transfers would stem from innovations inherent in imported and exported goods within the ECOWAS region. Nigeria accounts for approximately 76% of trade flows in the region[8], with mineral fuels and oils accounting for 94% and the share of manufacturing accounting for 5.4% as of 2010[9]. It, therefore, follows that the capacity for knowledge transfers may emanate from the production, exportation, and importation of mineral fuels and oils.

A possible explanation of how knowledge transfers may occur follows from the findings of Poole (2013) that labour mobility was a primary channel for absorbing knowledge transfers. Workers in industries that had benefitted from investments from multinationals could carry acquired knowledge to other countries and industries if mobility was frictionless. An example is Nigeria's capacity to transfer knowledge through its booming extractive industry. The booming extractive industry induces multinational corporations to invest in Nigeria through direct FDI in both upstream and downstream petroleum sectors. These investments are the direct knowledge transfer to the domestic labour force in Nigeria, who in turn start – up their own petroleum-affiliated companies. As ECOWAS member countries predominantly depend on Nigeria for mineral fuels and oils, the export of these fuels presents business opportunities for these domestic companies to expand their services beyond Nigeria. The free movement and ease of doing business among ECOWAS member countries allow for these domestic companies to be the channel for knowledge transfer to other ECOWAS member countries in pursuit of expanded opportunities that arise due to the imports of mineral fuels and oils from Nigeria.

Table 6: Panel GMM Growth Estimations: Dependent Variable Annual Growth Rate

	Model 5	Model 6	Model 7
Trade 1	19.64**	36.052***	99.79**
	(9.206)	(5.643)	(43.04)
*Trade 1*log Initial Income*	-2.658**	-4.514***	-12.626**
	(1.257)	(0.66)	(5.231)
log Initial Income	4.920	2.631	20.438*
	(3.592)	(1.959)	(10.38)
Exchange Rate		0.023***	0.063**
		(0.007)	(0.029)
Financial Development		-0.09	-0.009
		(0.063)	(0.142)
inflation			-0.281

[8] See https://www.ecowas.int/ecowas-sectors/trade/

[9] See https://www.brookings.edu/wp-content/uploads/2016/07/01_nigeria_trade.pdf

			(0.1904)
Fertility			19.469
			(13.380)
M2/GDP			-0.0288
			(0.017)
Constant	-29.948	-23.819*	409.97
	(24.859)	(13.08)	(234.53)
Number of Countries (Periods)	10(8)	10(8)	10(8)
J-Statistics	24.322	19.443	6.948
Sargan(p)	0.11	0.19	0.86
Instrument rank	17	15	12

Source: *Generated by the author from the study's data.*
Notes: *The dependent variable is the annual growth rate of GDP for each country in our sample; robust standard errors are reported in parentheses, and *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.*

From all the regression estimates presented in Tables 4, 5, and 6, evidence suggests that within the ECOWAS region, market size effects and knowledge transfer effects exist. Our estimates also point to a positive relationship between trade integration and economic growth while rejecting the hypothesis of conditional convergence among ECOWAS countries captured in our sample. The estimated results are reported with their robust standard errors, and the justification of over–identifying the instruments used is based on the reported Sargan(*p*) values. In this light, the ECOWAS trade integration policy encourages smaller countries in its regional economic community to benefit more through market size and knowledge transfers.

6.0 Conclusions and Policy Implications

With increasing economic and financial integration among regional economic entities in Africa, this paper traced the effort of trade integration in ECOWAS by specifically investigating the presence of market size effects and knowledge transfers transfer effects. The study estimated the degree of the trade integration–economic growth relationship among selected ECOWAS countries using the panel GMM estimation technique. The findings have important policy implications.

The estimates indicated that within the ECOWAS community, scale effects do exist, as smaller member countries benefit from increased trade integration relative to larger countries. The findings of scale effects point more to a potentially significant impact of trade integration if bigger countries like Nigeria could increase their share of manufacturing in trade flows to the region. The preference for an increased share in manufacturing trade flows over mineral fuels and oil, which already dominates trade flows within the community, is premised on the supply chain gains – inclusivity, pro-growth inducing, and reducing inequality – the manufacturing sector provides. In addition, our a priori expectation was some form of conditional convergence among ECOWAS member countries, given already existing trade agreements. However, the heterogeneous institutional structure within the region (the Anglophone and Francophone institutional structures) and the existence of a monetary union for the Francophone countries while Anglophone countries maintained independence over their respective currencies are among the key reasons that constrain any form of convergence. These constraints on convergence highlight the importance of

harmonizing and consolidating institutional structures within the region as a prerequisite for experiencing the benefits of increased trade integration.

Another implication of the findings borders on the expansionary impact of exchange rate depreciations. This finding suggests that exchange rate depreciation induces import substitutions and opens the economy to trade. This highlights the protectionist role of ECOWAS trade agreements in ensuring that members take advantage of currency depreciations to increase their export quality. Lastly, the study found evidence of knowledge transfers. A possible channel for such knowledge transfers exists through Nigeria's capacity to transfer knowledge, as we have assumed it is the technologically advanced economy with the largest market size in the community. Such capacity to transfer knowledge may largely emanate from the extractive industry in Nigeria. The reason for this assertion is mainly due to the dominance of Nigeria's trade flows in mineral fuels and oil. Off-shore petroleum companies and operators within Nigeria expand their scope of business to other ECOWAS member countries, thereby transferring knowledge to these countries. However, this transfer of knowledge is limited to the extractive industry. There exists a potential to induce both horizontal and vertical innovation if the structure of trade flows changes. ECOWAS member countries can actively pursue the objective of increasing the share of manufacturing trade flows. On the basis of the findings, the study, therefore, recommends that for the ECOWAS sub-region to maximize the benefits that accrue from increased market access, experience knowledge transfers as well as record the desired economic growth, the policies of its member states should be such that promote increasing returns to scale, in both aggregate factor inputs and country's production process. In line with the empirical findings, increased returns could be achieved by maintaining a low inflation targeting, enhanced income for citizens, stable exchange rate, inclusive and sound financial development, and a stable and enabling macroeconomic environment, among others.

Despite the relative appropriateness of these findings, more remains to be done. The findings are based on a simple theoretical abstract from the Schumpeterian growth model that does not emphasize the role of endogenous research and development costs and benefits, as well as economic frictions existing among countries that trade. In addition, the sample size was restricted our sample size to selected ECOWAS member countries due to the paucity of data. With increasing data availability, one would be encouraged to increase the scope of the sample to have a more representative regression estimate.

References

Acemoglu, D., Robinson, J. A., and Johnson. S. (2002). Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution. *Quarterly Journal of Economics*, 117, 1231–1294.

AfDB. (2019). *West Africa Economic Outlook 2019: Macroeconomic Performance and Prospects*. African Development Bank Group: Abidjan.

African Regional Integration Index. (2019). *African Regional Integration Index Report 2019*. African Union Commission, the African Development Bank, Economic Commission for Africa. Retrieved from https://www.integrate-

africa.org/fileadmin/uploads/afdb/Documents/ARII-Report2019-FIN-R39-21may20.pdf

Aghion, P., and Howit, P.W. (2009). *The Economics of Growth*. MIT Press, Cambridge, Massachusetts.

Aghion, P., Carlin, W., and Schaffer, M. E. (2002). Competition, innovation and growth in transition: Exploring the interactions between policies.

Aghion, P., Ljungqvist, L., Howitt, P., Howitt, P. W., Brant-Collett, M., and García-Peñalosa, C. (1998). *Endogenous growth theory*. MIT Press.

Alesina, A., and Spolaore, E. (1997). On the number and size of nations. *The Quarterly Journal of Economics*, *112*(4), 1027-1056.

Alesina, A., and Spolaore, E. (2005). *The size of nations*. MIT Press.

Alesina, A., Spolaore, E., and Wacziarg, R. (2000). Economic integration and political disintegration. *American Economic Review*, *90*(5), 1276-1296.

Alesina, A., Spolaore, E., and Wacziarg, R. (2005). Trade, growth, and the size of countries. In *Handbook of economic growth* (Vol. 1, pp. 1499-1542). Elsevier.

Amalia, S. K., Santoso, D. B., and Sasongko, S. (2018). Convergence Analysis of Economic Growth in East Java. *JEJAK: Jurnal Ekonomi dan Kebijakan*, *11*(1), 151-161.

Arellano, M., and Bover, O. (1995). Another look at the Instrumental Variable Estimation of Error Components Models. *Journal of Econometrics*, 68(1), 29-51.

Backus, D. K., Kehoe, P. J., and Kehoe, T. J. (1992). In search of scale effects in trade and growth. *Journal of Economic Theory*, *58*(2), 377-409.

Baldwin, R. E., Wyplosz, C., and Wyplosz, C. (2006). *The Economics of European Integration* (Vol. 2). Berkshire: McGraw-Hill Education.

Blundell, R., and Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics*, 87(1), 115-143.

Broda, C., Limao, N., and Weinstein, D. E. (2008). Optimal tariffs and market power: the evidence. *American Economic Review*, *98*(5), 2032-65.

Busse, M., and Königer, J. (2012). Trade and Economic Growth: A Re-examination of the Empirical Evidence.

Cerver-Romero, E., Ferreira, J. J., and Fernandes, C. (2018). A scientometric analysis of knowledge transfer research. *The Journal of Technology Transfer*, 1-26.

Chakalabbi, B. F., Matur, S., and Neregal, S. (2018). Efficient GMM Estimation of Autoregressive Panel Data Model. *International Journal of Statistics & Economics*, *19*(2), 38-47.

Chaney, T. (2008). Distorted gravity: the intensive and extensive margins of international trade. *American Economic Review*, *98*(4), 1707-21.

Cheewatrakoolpong, K., and Potipiti, T. (2014). *Does exporting increase the productivity of Thai firms via linkage spillovers?* (No. 141). ARTNeT Working Paper Series.

Coe, D. T., Helpman, E., and Hoffmaister, A. W. (2009). International R&D spillovers and institutions. *European Economic Review, 53*(7), 723-741.

Coste, A., and von Uexkull, E. (2015). Benefits of the ECOWAS CET and EPA will Outweigh Costs in Nigeria, but Competitiveness is the Real Issue. *World Bank Africa Trade Policy Notes (93642)*.

Damoah, K. A. (2017). Inward Foreign Direct Investments to Morocco: Competitiveness and Dynamics. *IEMed: Mediterranean yearbook*, (2017), 255-260.

Di Giovanni, J., and Levchenko, A. A. (2012). Country size, international trade, and aggregate fluctuations in granular economies. *Journal of Political Economy, 120*(6), 1083-1132.

Dollar, D., and Kraay, A. (2001). *Trade, growth, and poverty*. World Bank, Development Research Group, Macroeconomics, and Growth.

Dornbusch, R. and Werner, A. (1994). Mexico: Stabilization, Reform, and No Growth. *Brookings Papers on Economic Activity*, 1: 253-315.

Eaton, J, and Kortum, S. (2002). Technology, Geography, and Trade. *Econometrica* 70:5, pp. 1741–79.

Eaton, J., and Kortum, S. (1996). Trade in ideas Patenting and productivity in the OECD. *Journal of International Economics, 40*(3-4), 251-278.

Eaton, J., Kortum, S., and Kramarz, F. (2011). Anatomy of international trade: Evidence from French firms. *Econometrica, 79*(5), 1453-1498.

Ekpo, A., and Chuku, C. (2017). Regional Financial Integration and Economic Activity in Africa. *Journal of African Economies, 26*(suppl_2), ii40-ii75.

Evenson, R. E., and Westphal, L. E. (1995). Technological change and technology strategy. *Handbook of development economics, 3*, 2209-2299.

Fleisher, B., Li, H., and Zhao, M. Q. (2010). Human capital, economic growth, and regional inequality in China. *Journal of development economics, 92*(2), 215-231.

Fracasso, A., and Marzetti, G. V. (2015). International trade and R&D spillovers. *Journal of International Economics, 96*(1), 138-149.

Frankel, J. A., and Rose, A. K. (1998). The endogeneity of the optimum currency area criteria. *The Economic Journal, 108*(449), 1009-1025.

Frankel, J. A., and Romer, D. H. (1999). Does Trade Cause Growth? *American economic review, 89*(3), 379-399.

Gallup, J. L., Sachs, J. D., and Mellinger, A. D. (1999). Geography and economic development. *International, regional science review, 22*(2), 179-232.

Galor and Mountford (2008). Trading population for productivity: theory and evidence. Review of Economic Studies. 75 (4), 1143–1179.

Gouveia, S., and Correia, L. (2013). Trade Integration and Business Cycle Synchronization in the Euro Area: The Case of Southern European Countries. *Journal of Economic Integration*, 85-107.

Gries, T., and Grundmann, R. (2014). Trade and fertility in the developing world: the impact of trade and trade structure. *Journal of Population Economics*, *27*(4), 1165-1186.

Grossman, G. M., and Helpman, E. (1991). Trade, knowledge spillovers, and growth. *European economic review*, *35*(2-3), 517-526.

Haddad, M., Lim, J. J., Pancaro, C., and Saborowski, C. (2013). Trade openness reduces growth volatility when countries are well diversified. *Canadian Journal of Economics/Revue canadienne d'économique*, *46*(2), 765-790.

Hammouda, H. B., Karingi, S. N., Njuguna, A. E., and Jallab, M. S. (2009). Why doesn't regional integration improve income convergence in Africa? *African Development Review*, *21*(2), 291-330.

Hausmann, R., Hidalgo, C., Bustos, S., Coscia, M., Simoes, A., and M. Yildirim (2013). The Atlas of Economic Complexity: Mapping Paths to Prosperity. Cambridge, MA: MIT Press.

Helpman, E., Melitz, M., and Rubinstein, Y. (2008). Estimating trade flows: Trading partners and trading volumes. *The quarterly journal of economics*, *123*(2), 441-487.

Iyoha, M., and Okim, A. (2017). The Impact of Trade on Economic Growth in ECOWAS Countries: Evidence from Panel Data. CBN Journal of Applied Statistics Vol. 8(1), 23 – 49.

Kamin, S. B., and Rogers, J. H. (2000). Output and the Real Exchange Rate in Developing Countries: An Application to Mexico. *Journal of development economics*, *61*(1), 85-109.

Kang, S. J. (2002). Relative backwardness and technology are catching up with scale effects. *Journal of Evolutionary Economics*, *12*(4), 425-441.

Keller, W. (2004). International technology diffusion. *Journal of economic literature*, *42*(3), 752-782.

Khandelwal, A. (2010). The Long and Short (of) Quality Ladders. *Review of Economic Studies*, 77, 1450–1476.

Krugman, P. (1980). Scale economies, product differentiation, and the pattern of trade. *The American Economic Review*, *70*(5), 950-959.

Lake, D. A. (2018). *Power, Protection, and Free trade: International sources of US commercial strategy, 1887–1939*. Cornell University Press.

Le Goff, M., and Singh, R. J. (2014). Does Trade Reduce Poverty? A View from Africa. *Journal of African Trade*, *1*(1), 5-14.

Lucas, R. E. (2009). Trade and the Diffusion of the Industrial Revolution. *American Economic Journal: Macroeconomics*, *1*(1), 1-25.

Matsuyama, K. (1992). The market size, entrepreneurship, and the big push. *Journal of the Japanese and International Economies*, *6*(4), 347-364.

Mayer, T., Melitz, M. J., and Ottaviano, G. I. (2014). Market size, competition, and the product mix of exporters. *American Economic Review*, *104*(2), 495-536.

Menyah, K., Nazlioglu, S., and Wolde-Rufael, Y. (2014). Financial Development, Trade Openness and Economic Growth in African Countries: New Insights from a Panel Causality Approach. *Economic Modelling*, *37*, 386-394.

Morales, E., Sheu, G., and Zahler, A. (2014). *Gravity and extended gravity: Using moment inequalities to estimate a model of export entry* (No. w19916). National Bureau of Economic Research.

Nelson, R. R., and Nelson, R. R. (2005). *Technology, institutions, and economic growth*. Harvard University Press.

Olakojo, S. A. (2017). Foreign trade and international financial flows: Implications for economic stability in ECOWAS countries, Working Paper Series N° 251, African Development Bank, Abidjan, Côte d'Ivoire.

Poole, J. P. (2013). Knowledge transfers from multinational to domestic firms: Evidence from worker mobility. *Review of Economics and Statistics*, *95*(2), 393-406.

Pan, X., and Li, S. (2016). Dynamic optimal control of the process–product innovation with learning by doing. *European Journal of Operational Research*, *248*(1), 136-145.

Parente, S. L. (1994). Technology adoption, learning-by-doing, and economic growth. *Journal of economic theory*, *63*(2), 346-369.

Rivera-Batiz, L., and Romer, P. M. (1994). Economic integration and endogenous growth: an addendum. *The Quarterly Journal of Economics*, *109*(1), 307-308.

Rodriguez, F., and Rodrik, D. (2000). Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence. *NBER macroeconomics annual*, *15*, 261-325.

Rodrik, D. (2001). *The Global Governance of Trade: As if Development Really Mattered*. Harvard University.

Romer, P. M. (1987). Growth is based on increasing returns due to specialization. *The American Economic Review*, *77*(2), 56-62.

Romero, J. P., and Britto, G. (2017). Increasing returns to scale, technological catch-up and research intensity: endogenising the Verdoorn coefficient. *Cambridge Journal of Economics*, *41*(2), 391-412.

Salomon, R., and Jin, B. (2008). Does knowledge spill to leaders or laggards? Exploring industry heterogeneity in learning by exporting. *Journal of International Business Studies*, *39*(1), 132-150.

Schwab, K. (2019). The Global Competitiveness Report 2019. World Economic Forum: Geneva. Retrieved from: http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

SGreenaway, D. (1998). Does Trade Liberalization Promote Economic Development? *Scottish Journal of Political Economy, 45*(5), 491-511.

Shin, K., and Wang, Y. (2005). The Impact of Trade Integration on Business Cycle Co-Movements in Europe. *Review of World Economics, 141*(1), 104-123.

Spolaore, E., and Wacziarg, R. (2005). Borders and Growth. *Journal of Economic Growth*, *10*(4), 331-386.

Tinta, A. A., Sarpong, D. B., Ouedraogo, I. M., Al Hassan, R., Mensah-Bonsu, A., and Ebo Onumah, E. (2018). The Effect of Integration, Global Value Chains and International Trade on Economic Growth and Food Security in ECOWAS. *Cogent Food and Agriculture*, *4*(1), 1465327.

Venables, A. J. (2005). Spatial disparities in developing countries: cities, regions, and international trade. *Journal of Economic Geography*, *5*(1), 3-21.

Wong, P. K., Ho, Y. P., and Autio, E. (2005). Entrepreneurship, innovation and economic growth: Evidence from GEM data. *Small business economics*, *24*(3), 335-350.

Yanikkaya, H. (2003). Trade Openness and Economic Growth: a Cross-Country Empirical Investigation. *Journal of Development Economics*, *72*(1), 57-89.

Young, A. (1998). Growth without scale effects. *Journal of political economy*, *106*(1), 41-63.

Zulfiqar, K., Chaudhary, M. A., and Aslam, A. (2017). Convergence Hypothesis: A cross country Analysis. *Pakistan Economic and Social Review*, *55*(1), 201-222.