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Effect of Economic Integration on Agricultural Export Performance in Selected West African Countries

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Abstract: The paper investigates the effect of economic integration on agricultural export performance in West African economies using the gravity model of bilateral trade on the annual time series data straddling the period 1970 to 2016. The empirical evidence is based on the pooled OLS and fixed effects estimator. We find that economic integration, as measured by trade openness, is a remarkably strong predictor of export performance in the region. We also examine the effect of geographical distance measured by effective nominal exchange rates and we find it has a negative effect on agricultural export performance. The paper recommends the adoption of a common currency to help mitigate exchange rate negativity that serves as resistance to trade in the region. Likewise, proactive agricultural research, extension and market driven strategies are strongly advocated for driven competition and economic efficiency within the regional agricultural sector.

Keywords: economic integration; agricultural; export; West Africa

JEL Classification: F12; Q14; Q17

1. Introduction

Agriculture remains a huge aspect of any nation's economy given its impact on the performance of other associated economic variables. Importantly, it contributes to the integration of the economy. This paper examines the effect of economic integration on agricultural export performance in Africa. It probes the potential of economic integration to resolve the incidence of underperformance of agricultural export in West Africa and suggests policy strategies to improve the performance of the sector within the West African region. This theme is particularly important for West Africa because economic integration has the potential to reduce the poverty index of the region by enhancing the pool of agricultural resources in order to meet the growing demand of the population in the region.

At first, earlier literature had concluded that discriminatory policies would enhance trade protection and secure domestic infant agricultural firms' produce in the region (Bhagwati 1993; Bond et al. 2012; Matsuyama 2019; Tumwebaze and Ijjo 2015). However, academic debate and expansion in the frontier of knowledge has reshaped the dynamic nature of the subject. At the regional level, particularly in West Africa, the absence of commodity discrimination, which occurs where the same commodity is subjected to different duty rates across borders, might need to be reconsidered to lower transaction costs within the region. Similarly, the region needs to consider the sizeable population as potential to increase economies of scale with attention to effective and efficient utilization of resources in order to benefit from regional trade. Furthermore, the need to address the missing technical efficiency in the region, which has been lacking for decades, might be the aftermath effect of knowledge spill over in the agricultural sector.

Interestingly, varied reasons have been put forward for the non-performance of the agricultural sector in Africa despite its huge potential as a contributor to economic development. Poor regional

economic integration and non-existence of a coordinated integration policy within the region top the list of challenges that continue to limit the potential of the sector to yield expected results (Shobande et al. 2018a; Beyene 2014; Krueger 1997; Shobande 2018b). As it is, the relevance of regional integration remains a persistent issue in Africa, specifically in West Africa where there is high level of political conflict and economic backwardness. Without doubt, the West African countries are confronted with a long-established level of poverty, minimal share of world trade, slow pace of development in human capital and infrastructural deficit, as well as excessive external pressure on the need for regional cooperation (Olayiwola and Ola-David 2013; Shobande 2018a; Shobande et al. 2018b). In the final analysis, ensuring that regional economic integration in West Africa is successful remains crucial, not only because of its prospects and benefits but also because of its impact on globalisation.

In view of the challenges and opportunities facing economic integration and agricultural export performance in West Africa, the Nigerian Economic Society (NES), with support from the World Bank have requested a domesticated study that will highlight the main implication of economic integration on future agricultural export in West Africa. Thus, the purpose of this study is to: (a) contribute to a better understanding of the evolving context in which economic integration influences agricultural performance by examining more closely the drivers and trends in the sector; (b) analyze the specific countries' agricultural export peculiarity in West Africa and their ability to cope with regional policy in the face of dynamic macroeconomic uncertainty; (c) review the implication of a custom union with special interest in the static and dynamic benefits from regional integration as it influences the welfare of the partners.

The uniqueness of this study is reflected in the theory and model, which are anchored on the recent Krugman hypothesis and gravity model. Furthermore, the study differs from earlier research as it concentrated on the supply side and provides explanation on the need to improve agricultural diversification and drive competition as well as openness of trade within the region.

The study is organized as follows. Next it starts with segment two which focuses the literature review, followed by section four which provides the methodological approaches that describes the variables used, measures and sources of data. Results of the study are presented and discussed in part four while section five contains the conclusion and policy suggestions.

2. Review of Related Literature

This section presents a short synopsis of the theoretical and empirical review on economic integration–agricultural export nexus to provide a context for subsequent discussions.

2.1. Theoretical Framework

The theoretical framework for assessing the possibility of trade at regional level is rooted in the new trade theory built on increasing return to scale and economic geography credited to Paul Krugman in 1991. Krugman developed a simple framework that shows countries can endogenously become differentiated into an industrialised export production country in a well-defined global enterprise (Krugman 1991). The application of this theory has been confirmed by Coyle et al. (1998), Bajona and Kehoe (2010) and Mitze (2010) using the gravity model.

The latest refined theory of the Krugman hypothesis proposed by Chaney (2008), which finds its application in the gravity model earlier proposed by Melitz (2003), has recently been used by Arkolakis et al. (2012), Bergstrand et al. (2014) and Kabir et al. (2017). The volume of literature is increasing and reshaping our understanding of the dynamics of trade at the regional level. In 1980, Paul Krugman predicted that a higher elasticity of substitution between goods magnifies the impact of trade flow. As stated in Chaney (2008), the scholar argues and shows the application of this firm heterogeneity in a simple model of international trade. Krugman established this proposition by using the concepts of Pareto optimal distribution and predicted that the impact of trade flow is dampened by elasticity of substitution and not magnified (Bergstrand et al. 2013, 2014; Chaney 2008; Arkolakis et al. 2012; Melitz 2003). This position was adopted by Melitz (2003) who decided to develop

a framework to examine the aggregate bilateral trade of existing exporters on the basis of intensive and extensive use of alternative methods to account fully for time-varying observed heterogeneity in bilateral trading costs.

This newly introduced direction of margin allowed us to investigate the situation where transport costs vary. Thus, Chaney (2008) proposed a higher elasticity to make the intensive margin more sensitive to change in trade barriers while making the extensive margin less sensitive (Chaney 2008). The reason behind this argument is that trade barriers decrease a firm's ability to enter the export market. In addition, Bergstrand et al. (2014) examined the same subject and measured three important effects in international trade. He reported that the evidence from their study was biased using a properly specified gravity equation and concluded that general equilibrium comparative statistics exemplify a considerable difference in trade effects in their empirical observation.

2.2. Time Series Evidence

The effect of economic integration on agricultural export performance has been hotly debated in academia. The main concerns have been the drivers of regional integration, its static and dynamic consequences on the theory of custom unions (Che et al. 2015; Fuchs and Klann 2013; Qureshi 2013). A number of studies have investigated the effects of trade liberalisation on export growth in developing countries with inconclusive results. Some studies have identified positive effects of trade liberalisation on export performance (Bleaney and Wakelin 2002; Coyle et al. 1998; Hoque and Yusop 2012; Krueger 1997), while others confirmed an insignificant or even negative relationship (Greenaway et al. 1999; Jenkins 1997).

Furthermore, there are studies on economic integration that support the result that economic integration has the potential to guarantee economic growth and enhance welfare through the export channel. For instance, Coyle et al. (1998) used a modified version of the global trade analysis project (GTAP) model to analyse the role of different forces underlying the compositional changes in the world of agricultural and food markets in the last fifteen years. The study isolated the supply and demand factors as well as change in transport cost and policy changes. The authors reported that transport cost and related factors are important determinants in explaining the shift in global trade. Nin-pratt et al. (2009) estimated using a combining partial equilibrium analysis with bilateral trade data at the four-digit Standard International Trade Classification (SITC) level for 193 agricultural industries in 14 Southern African countries, to assess the potential impacts of a free trade agreement (FTA) on the agricultural sector of Southern African countries. Their results indicated that the overall welfare effects of an FTA would be positive but small in most countries, suggesting that the largest benefits would go to countries with a regional comparative advantage for agriculture, while still being inefficient producers of regionally traded commodities.

Similarly, Hoque and Yusop (2012) estimated an autoregressive distributed lag model (ARDL) bond testing approach for Bangladesh between 1972 and 2005. Their study assessed the impacts of trade liberalisation on export performance and reported that exports are mostly stimulated by GDP growth in Bangladesh.

In their work, Potelwa et al. (2017) assessed the factors influencing South Africa's agricultural export to its cardinal destination between 2001 and 2014. The authors employed a gravity model to investigate trade flow that has been validated as a suitable tool to determine export growth. Their results indicated that import on gross domestic product caused an increase in agricultural export. The authors further stressed that distance and political instability have no influence on the growth of agricultural export to its partners.

Hadjiyiannis et al. (2016) investigated the implications of preferential trade agreements (PTAs) for interstate conflict. Their study set up a two-stage game with three competing importers, where first, two of the countries decide on whether to initiate war against each other, and subsequently, all three countries select their import tariffs. The results showed that PTAs produce both a "peace-creation" effect and a "peace-diversion" effect, whereby they reduce the likelihood of conflict between member

countries (peace creation) but render the eruption of war between member and non-member countries more likely (peace diversion).

In North Africa, Bakari and Mabrouki (2018) searched for the influence of agricultural export on economic growth between 1982 and 2016, using the static gravity model. Their empirical results showed that agricultural policy has significant impact on agricultural investment and trade openness policies in the region. Equally, Uysal and Mohamoud (2018) analysed the impact on export performances of seven East African countries, using data from World Development Indicators between 1990 and 2014 and suggested the need to replace agricultural exports with industrial export, improve infrastructural facility, the quality of human capital and the need for policies to attract international investors.

Contrariwise, a group of studies challenged this view contending that there seems to be a negative relationship between economic integration potential and export performance. This group of studies claimed that negative effect on welfare and domestic policy as well as survival of domestic firms are observed empirically (Ahmed and Uddin 2009; Panagariya 2003; Baldwin 2006; Jenkins 1997; Greenaway et al. 1999; Bhagwati 1993). For instance, Panagariya (2003) spent over 20 years of his career focusing on the analysis of the static welfare effect of regionalism. The author drove most of his analysis from the Heckscher-Ohlin-Samuelson framework of comparative advantage and from the theory of custom unions contribution rooted in the theory of second best that goes back to Viner (1950) and Lipsey (1960). Panagariya (2003), debating on the extent to which optimal conditions are satisfied, argued that regional trade agreements (RTAs) are essential discriminatory policies. Panagariya (2003) results showed that the basis of negotiation on regional trade has its welfare effect on the objectives such arrangement seeks to achieve.

Baldwin (2006) presented the political economy logic of trade liberalisation using it to structure a narrative of world trade liberalisation since 1947. The logic is then used to project the world tariff map in 2010, arguing that the pattern will be marked by fractals–fuzzy, leaky trade blocs made up of fuzzy and leaky sub-blocs. Moving to global duty-free trade will require a multilateralization of regionalism.

Likewise, Jenkins (1997) discussed the theoretical arguments which underlined such a policy and the main neo-structuralist criticisms. He examined the effects of liberalisation on resource allocation, productivity growth and export performance and suggested that the results of trade liberalisation have been disappointing. This, according to him, has given rise to some scepticism concerning the advantages of a wholesale policy of trade liberalisation in a low-income country such as Bolivia.

In the same manner, Greenaway et al. (1999) estimated a dynamic model to exports growth by constructing a panel of 69 countries. The study explored the role of export composition in determining growth; it reported a strong positive relationship between exports and growth. Furthermore, the study asserted that the composition of those exports was important in determining the strength of growth.

There have been further attempts at finding the causality between economic integration and export performance with the aim of determining the potential of export to stimulate regional cooperation with reported mixed results. For instance, Beyene (2014) inspected the comparative advantage (RCA) of sub-Saharan Africa (SSA) and Latin America and the Caribbean (LAC) on the export of five merchandise subsectors (during 1995 to 2010) using the World Development Indicators database and reported that despite the improvements observed, SSA's and LAC's trade share and economic integration are low. In the same token, Ahmed and Uddin (2009) investigated the causal nexus between export, import, remittance and GDP growth for Bangladesh using annual data from 1976 to 2005 and reported limited support in favour of the export-led growth hypothesis for Bangladesh as exports, imports and remittance caused GDP growth only in the short run. The causal nexus was therefore unidirectional. In contrast, Francis et al. (2007) in their article used cointegration and error-correction models to analyse the causal relationship between agricultural export diversification and economic growth in eight selected Caribbean countries using annual data from 1961 to 2000. The empirical results show that in the short run, agricultural export diversification Granger causes economic growth in Barbados and Belize; non-causality exists for the other countries. In the long run, agricultural export diversification with Granger causes economic growth in the Dominican Republic. On the contrary, the author also

reported that agricultural export diversification was the outcome of economic growth process in Belize, Costa Rica, Haiti and Jamaica, in the long run; non-causality existed in Trinidad and Tobago. There was no evidence of bi-directional causality in any of the countries in either the short or long run.

In West Africa, the surge to achieve successful RTAs has generated hot debate since the establishment of Economic Community of West African States (ECOWAS). For instance, Olayiwola and Ola-David (2013) examined the interaction between economic integration and trade facilitation in ECOWAS and how regional blocs had performed in promoting export. The objective of their study was achieved using descriptive statistics of annual data covering the period 1995 to 2009. Evidence from their study revealed that sustained growth can be achieved with export growth in the region.

One group of studies that have applied the gravity model seem to be consistent in their results. For instance, Sohn (2005) applied the gravity model to explain South Korea's bilateral trade flows and to extract practical trade policy applications. The scholar showed trade structure and an Asian-Pacific trade network using the gravity equation and reported that South Korea's trade followed a Heckscher–Ohlin model more than an increasing return or a product differentiation model. Thus, the study suggested that South Korea has a large, unrealised trade potential with Japan and China, which implies that they are desirable partners for an FTA. Invariably, North–South Korean trade will expand markedly if bilateral relations normalise and North Korea participates in Asia Pacific Economic Cooperation (APEC). Comparably, Bhattacharyya and Banerjee (2006) applied the gravity model to a panel consisting of India's yearly bilateral trade data with all its trading partners in the second half of the twentieth century. The study confirmed that the core gravity model can explain around 43% of the fluctuations in India's direction of trade in the second half of the twentieth century and that India's trade responds less than proportionally to size and more than proportionally to distance. Other studies with consistent results that have applied the gravity model include, but are not limited to, Nguyen (2010), Rahman and Dutta (2012) and Narayan and Nguyen (2016).

Limited information, methodological issues and contrasting results among some of the studies reviewed under this study further justify the need to assess the impact of economic integration on agricultural export performance in West Africa.

3. Methodology

3.1. Empirical Strategy

The present study adopts the Krugman hypothesis, the newly refined theory by Chaney (2008), and the gravity model version presented by Melitz (2003) and used recently by Bergstrand et al. (2014) in analysing the variable of interests. The gravity model has gained more popularity in explicating trade flows in international trade literature (Baier et al. 2014). Empirical studies inquiring into a trade-enhancing effect of countries' integration have often aimed to envisage the additional bilateral trade that might be expected if integration between two or more countries is fostered (Kabir et al. 2017). The "gravity equation" according to Narayan and Nguyen (2016) and Chakravarty and Chakrabarty (2014) has been employed in econometric estimation of the ex post partial (or direct) impacts of economic integration agreements, national borders, currency unions, language and other measures of trade costs on bilateral international trade flows.

In specifying the equation, two major variables explaining bilateral trade flow between trade partners are usually considered: economic strength of a country (variable GDP) and geographical proximity (variable distance).

Taking a reference point from Newton's universal law of gravitation, which proposes that the gravitational attraction between two objects is proportional to their masses and indirectly related to the square of their distance, the model is stated as follows:

$$L_{ij} = G \frac{F_i F_j}{D_{i,j}^2} \tag{1}$$

where:

L_{ij} is the gravitational attraction,

F_iF_j are the mass of two objects,

D_{ij}^2 is the distance,

G is the gravitational constant.

Following Krugman and Obstfeld (2003), who improved on Tinbergen (1962) application of the gravity model to analyse trade activities, our empirical model can be stated as thus:

$$A_{ij} = N\frac{Y_iY_j}{D_{i,j}^2} \tag{2}$$

where:

A_{ij} is the total trade flow from origin country i to destination country j,

Y_iY_j is the economic size of two countries i and j, which are usually expressed as gross domestic product (GDP) or gross national product (GNP),

D_{ij} is the distance between two countries i and j,

N is a constant.

The functional form of the gravity model is given in Equation (3).

$$A_{ij} = N.GDP_i^{\beta_1} \times GDP_j^{\beta_2} \times D_{ij}^{\beta_3} \tag{3}$$

Drawing from Melitz (2003), as used by Arkolakis et al. (2012) and refined and modified by Bergstrand et al. (2014), the baseline model for this present study is specified as

$$\log A_{ij} = \delta_{it} + \beta_1 logGDP_i expWA + \beta_2 \log GDP_j.impWA + \beta_3 \log D_{ij}. \tag{4}$$

From the modified gravity model above, β_1, β_2, β_3 parameters are interpreted as coefficients of elasticity of agricultural exports proxy by agricultural value added to GDP dependent variable in respect to changes in independent variables, GDP for the 16 selected West African countries, GDP for the world and distance. It should be noted that the change in dependent variable is not in absolute terms but relative in giving the log form on which the model is specified.

The model in Equation (5) can be further enhanced by adding the variables of exchange rate to proxy distance, population and economic integration proxy by trade openness. Although, there are divergent opinions on the indicator that best measures economic integration, preponderance of the opinion anointed the key role of trade openness. This agrees with Arribas et al. (2009), who posit that, "the most commonly used integration measure based on quantities[1] is the degree of openness defined as exports plus imports divided by GDP (X + M/GDP)."

The modified gravity equation can also be stated in the subsequent form:

$$\ln A_{ij} = \delta_{it} + \beta_1 \ln GDP_i expWA + \beta_2 \ln GDP_j.impWA + \beta_3 \ln D_{i,j} + \beta_4 \ln POP_j + \\ \beta_5 \ln ECOINT_{i,j} + \mu_{i,j}. \tag{5}$$

The empirical signs in terms of gross domestic product to agricultural export performance is expected to be positive owing to the impact of higher income on imports of country. Hence, parameters $\beta_1 > 0$ and $\beta_2 > 0$ are expected to be positive. More so, the effect of geographical closeness on trade is negative and presupposes that distance affects trade in the opposite way $\frac{\psi A_{ij}}{\psi D_{ij}} < 0$ owing to the costs of transport. Thus, the expected sign of parameter β_3 is negative $\beta_3 < 0$.

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[1]   Another widely advocated measure is the law of price (LOP) which has however been faulted on the basis of the fact that econometric estimations on the ability to explain deviations from the LOP are manifold (Knetter and Slaughter 1999), yet they do not solve the key problem: the lack of a benchmark to measure integration that does not depend on perfect competition.

One key issue which arises in the gravity equation is in measuring distance. This can be resolved using auxiliary variables that can proxy change in prices that occur in the process of trade between countries *i* and *j*. One of the ways to attain this is to use either the real exchange rate or the price of oil. The former is chosen as a suitable representative interaction among the trading economies.

Population is employed to assess the size of market of each country, which is a prominent factor influencing international trade. The bigger the market the more it trades; hence, the market size is expected to exert a positive sign. As such, $\beta_4 > 0$.

The parameter δ_{it} accounts for the unobservable variables that are not explicitly explained through gravity equation and includes language, political, geographical, cultural and language differences among countries.

Economic integration as measured by trade openness is expected to exert a positive sign on agricultural sector export performance based on the fact that the more open an economy is, the more integrated it will be (Kabir et al. 2017; Bergstrand et al. 2014).

3.2. Data and Summary Statistics

This study investigates a panel of sixteen (16) selected West Africa countries with data from: (i) Trade and Development (UNCTAD) and (ii) World Development Indicators (WDI). for the period 1970 to 2016. All variables are well defined in Table 1. The periodicity is based on constraints in data availability and the motivation discussed in the introduction.

Table 1. Variables description.

Variables	Measurements	Symbol	Signs	Source
Agriculture sector Export performance	ln (agriculture value added to GDP)	ASEP	No sign	WDI
Gross domestic product	ln (GDP, current and constant (2010) prices, annual)	GDP	+	UNCTAD
Distance	ln (Nominal Effective Exchange Rate)	D	±	UNCTAD
Population	ln (Total and urban population)	POP	+	UNCTAD
Economic integration	ln (Trade Openness)	ECOINT	+	UNCTAD

Note: $\log ASEP$ = Natural ln of agriculture sector export performance, $\log \left(\frac{X}{gdp} \right)$ = Natura ln of exporter GDP, $\log \left(\frac{M}{gdp} \right)$ = Natura ln of importer GDP, $LogD$ = Natura ln of distance, $\log P_g$ = Natura ln of population, $\log E^{IT}$ = Natura ln of economic integration. Exporter and importer are synonymously used with West Africa and World in this study. Source: Investigator, 2019.

3.3. Motivation and Choice of Variables

3.3.1. Agricultural Export Performance

Agricultural export performance is the value of all agricultural goods provided to the rest of the world. It is defined by the ability of a nation to produce and distribute agricultural goods that can compete in the international market. It has the potential to achieve income growth and improve the welfare of the nation. Data on agricultural trade export performance were obtained from WDI (Braha et al. 2017; Kumar 2010; Barma 2017; Sun and Li 2018; Campi and Duenas 2016; Arribas et al. 2009).

3.3.2. Economic Integration

The idea in this study is that regional trade helps countries overcome divisions that impede the flow of goods, services, capital, people and ideas. These divisions are constraints to economic growth, especially in developing countries. We follow (Vicard 2011; Hur and Park 2012; Saucier and Tariq 2017; Baier et al. 2019; Campi and Duenas 2016; Bergstrand et al. 2013, 2014) on their recent contributions on trade flow. In this study, trade openness is used to capture economic integration. This choice is based on the argument that trade openness brings many economic benefits, including increased technology transfer, skill transfer, increased labour and total factor productivity and agricultural growth in the region.

3.3.3. Distance

Real effective exchange rate or nominal effective exchange rate is a well-known proxy for distance in literature of trade (Eregha 2019; Bergstrand et al. 2013, 2014; Arribas et al. 2009; Bond et al. 2012; Hadjiyiannis et al. 2016; Campi and Duenas 2016; Baier et al. 2019). The nominal effective exchange rate measure as an unadjusted weighted average rate at which one country currency's exchange for a basket of multiple currencies (World Bank, and World Development Indicators WDI; Oke et al. 2017; Shobande 2018a).

3.3.4. Population Growth

The justification for the inclusion of population growth in our model is based on the derived motivation from the growth theory (Kastner et al. 2014; Tumwebaze and Ijjo 2015). The new growth theory points out the importance of growth of labour supply (population growth) and growth of labour productivity as factors of economic growth. Thus, the quest for agricultural export and economic integration will lead to food productivity and greater economic of scale. According to the dynamic trade theory, the static gains from trade—due to specialization and reallocation of existing resources—are small compared to the dynamic gains due to an increase in the growth rate and the volume of additional resources made available to, or employed by, the trading country (Tumwebaze and Ijjo 2015).

3.4. Estimation Techniques

The estimation techniques used in this present study combine the pooled ordinary least squares (POLS) and the alternative fixed effect (FE) estimations. Customarily, the gravity model is usually linearized and measured using the ordinary least squares (OLS) method based on the assumption that error is constant across observation. However, recent development on the subject advocates log-linear modeling estimators (Bergstrand et al. 2014; Chaney 2008; Arkolakis et al. 2012; Matsuyama 2019). Thus, this study follows the work of Bergstrand et al. (2014) and Arkolakis et al. (2012) and used pooled-OLS and fixed effect.

4. Results

In this section, we present the results and discuss the findings under various estimation techniques used.

4.1. Preliminary Statistical Results

Prior to the discussion of the empirical finding, the descriptive statistics and correlation matrix of the variables are presented in Tables 2–4.

Table 2. Cross-country summary statistics.

Variable	Mean	Std. Dev.
	17.94	7.60
$\log\left(\frac{X}{gdp}\right)$	21.69	18.28
$\log\left(\frac{M}{gdp}\right)$	30.70	22.98
$\log D$	37.07	43.75
$\log P_g$	20.51	72.84
$\log E^{IT}$	42.21	46.21

Note: $\log ASEP$ = Natura ln of agriculture sector export performance, $\log\left(\frac{X}{gdp}\right)$ = Natura ln of exporter GDP, $\log\left(\frac{M}{gdp}\right)$ = Natura ln of importer GDP, $\log D$ = Natura ln of distance, $\log P_g$ = Natura ln of population, $\log E^{IT}$ = Natura ln of economic integration. Exporter and importer are synonymously used with West Africa and World in this study. Source: Investigator, 2019.

In Table 2, we present the descriptive statistic of the variable, which comprises the mean value and their associated standard deviation. The average value of agricultural export (ASEP) and economic integration were 17.5 (SD = 7.6) and 42.2 (SD = 46.21).

4.2. Correlation Matrix

This section presents the correlation matrix which shows the nature and pattern of relationships that exist among the variables used.

In Table 3, the results show the majority of the variables have positive relations with the exception of export performance, economic integration variable and exchange, which show negative relations.

Table 3. Correlation matrix.

Variable	log *ASEPP*	log $(\frac{X}{gdp})$	log $(\frac{M}{gdp})$	log *D*	log P_g	log E^{IT}
	1					
log $\left(\frac{X}{gdp}\right)$	−0.32	1				
log $\left(\frac{M}{gdp}\right)$	−0.02	0.8	1			
log *D*	−0.07	0.67	0.77	1		
log P_g	0.05	0.80	0.99	0.72	1	
log E^{IT}	−0.17	0.93	0.96	0.85	0.90	1

Source: Investigator, 2019.

4.3. Main Results

The estimation results obtained from Equation (5) are presented in Table 4.

Table 4. Results.

Dependent Variable: log *ASEP*		
	OLS	**Fixed Effect (FE)**
log $\left(\frac{X}{gdp}\right)$	0.43 *	0.13 ***
	(2.10)	(0.023)
log $\left(\frac{M}{gdp}\right)$	0.73 *	0.31 *
	(5.47)	(0.09)
log *D*	−0.11 *	−0.42 *
	(6.38)	(0.012)
log P_g	0.22 *	0.091 *
	(0.00)	(0.033)
log E^{IT}	0.03 *	0.076 *
	(0.00)	(0.015)
_cons	0.23 *	1.26 ***
	(11.89)	(1.065)
Hausman	-	0.172
R^2	0.79	0.233
F	5.285 *	57.6 **

Note: * $P < 0.1$; ** $P < 0.05$; *** $P < 0.001$. log *ASEP* = Natural ln of agriculture sector export performance, log $\left(\frac{X}{gdp}\right)$ = Natura ln of exporter GDP, log $\left(\frac{M}{gdp}\right)$ = Natura ln of importer GDP, log *D* = Natura ln of distance, log P_g = Natura ln of population, log E^{IT} = Natura ln of economic integration. Exporter and importer are synonymously used with West Africa and World in this study. Linear model with country and year FE. Robust standard error in parentheses are clustered at the country level. Source: Investigator, 2019.

Table 4 shows the analysis of both OLS and the alternative FE estimations. The fixed effect estimator is under the assumption that all the explanatory variables are independent of u_i for all

countries and times (endogeneity assumption). The choice of FE follows from the results of the Hausman test which indicate the null hypotheses for all the estimated model at different (1% and 5%) levels of significance are rejected as suggested by the calculated Chi-square values. According to Baltagi (2008), the fixed effect estimator is appropriate if the study centers on a particular set of *N* countries. The FE is equally adopted to estimate the panel regression model by accounting for the non-randomness of a cross-section of West African countries.

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Results show that the growth in GDP of West Africa is perceived intuitively as instrumental in enhancing effective and efficient performance of the region's agricultural sector. The estimated coefficients of both the region are positive and statistically significant, which conform to our a priori earlier stated in the model. All things being equal, a 1% increase in West Africa's GDP (world) will boost agricultural sector performance and trade approximately by 43%.

This further affirms the role of international trade in influencing economic growth and increasing the volume of export base of trading partners. The GDP of importer is positive but insignificant in explaining the variation in agricultural sector export performance of West African countries. This reflects the reality of what is in vogue in the region's economies.

The reality of most West African economies' GDP stems from the fact that the larger contribution to GDP which comes from agriculture is faced with a number of challenges. First, the sector which contributes the larger percentage of the region's GDP is basically involved in primary export. As a primary product, the volume of trade in such a sector is very meagre when compared to the manufacturing sector. Hence, primary product has little to add in terms of impacting on the volume of GDP from export. Second, the agricultural sector in most West African regions—like other African counterparts—is less attractive and suffers from export competitiveness when compared to regions like the Asia, which also exports primary agricultural products. Third, the cumbersome nature of both import and export procedures in the African region also holds plausible explanations for the region's underperformance in the global market. Thus, importers' GDPs reflect the state of the situation in the region.

Another important insight from the empirical results is the fact that the population parameter estimate conforms with the a priori expectation of a positive sign, and in addition, its statistical significance suggests that a 1% increase in population will lead to a 22% increase in an agricultural sector's export performance in West Africa.

Geographical distance as measured by exchange rate is found to be statistically significant and estimated to deter the agricultural sector's export performance in West Africa. This equally fulfils our stated anticipated sign of negativity. Thus, with an increase of distance by 1%, agricultural export performance is expected to decrease by 11% on average. Furthermore, the efficiency of the gravity model in explaining trade pattern is vindicated by the high value of adjusted R-squared 82%.

Another key result which emanates from the empirical model is the positive and statistically significant level of economic integration, which concerns the study to a large extent. As explicated in Table 3, a 1% increase in economic integration proxy by trade openness will lead to a 30% increase in the agricultural sector's export performance in West Africa. Although the variation of 30% seems small, it is however indicative of the fact that the degree of openness is still low in most West African economies when considered in terms of both tariff and quotas.

In terms of the alternative results anchored on fixed effect, import, export, population growth and trade openness are found to be positively, statistically and significantly linked to agricultural export performance. Contrariwise, geographical distance measured by nominal exchange rates was negative and statistically predicts the behaviour of agricultural export performance, as evident in Table 4 above.

By and large, the estimated model portrays the set of outcomes which have relevant and fundamental implications for the agricultural sector's performance in West African region, the prominence of which are examined in the succeeding section.

As evident from the table, export performance, import, population and economic integration exert a positive impact on agricultural performance with the exception of distance (exchange rate). However, contrary to the pooled OLS results, the fixed effect estimators show that all variables were found to be statistically significant in predicting agricultural export performance.

Empirical results obtained from the model in this study conform with preceding studies in the literature. For instance, the significant and positive estimate of market size measured by GDP conforms with a number of studies (Sohn 2005; Bhattacharyya and Banerjee 2006; Rahman and Dutta 2012; Narayan and Nguyen 2016; Kabir et al. 2017; Chakravarty and Chakrabarty 2014), while the studies of Kabir et al. (2017) and Nguyen (2010) both confirm the negative impact of exchange rate estimated in this study.

5. Concluding Remarks

The study examines the relationship between economic integration and agricultural export performance by examining more closely the drivers and trends in the sector and giving credence to the regional peculiarity of West Africa using the gravity model of bilateral trade on annual time series data straddling 1970–2016. The panel econometric method based on the pooled OLS and fixed effect (FE) were used to obtain these results. We find that economic integration as measured by trade openness, is a remarkably strong predictor of agricultural export performance in the West Africa region. We also examine the effect of geographical distance measured by effective nominal exchange rates. Surprisingly, we find a negative effect on agricultural export performance. Thus, we recommend that proactive agricultural research, extension and market driven strategies are used to help drive competition and enhance economic efficiency in the regional agricultural value chain

Therefore, the study showed that the most robust agricultural export performance determinants in the West Africa region were export to GDP ratio, import to GDP ratio, population growth, geographical distance and the level of openness to international trade. These variables had positive and significant impacts on the agricultural export performance in West Africa with exception of the negative-like observation in the geographical distance proxy with effective nominal exchange rates.

This study by implication supports the potential of economic integration to resolve the incidence of underperformance of agricultural export in West Africa and suggests that the region has all it takes to survive its present challenges and equally compete favourably at local and international fora. Thus, it is therefore recommended that effort towards a common currency can help reduce the observed negative threats of exchange rate and foster trade in the region.

Contrary to earlier findings, the empirical analysis produces three important pieces of evidence. First, the estimates for the effect of economic integration on agricultural export performance obtained from a well specified gravity model provided a robust explanation on the predictors of agricultural sector in the region. Second, the fixed effects provide fresh evidence as it is robust to the specification of gravity equation. Third, that an increase in openness has a positive and statistical impact among the countries in the West Africa region

Furthermore, the study has contributed to the existing literature by addressing the fundamental market hindrances that affect export performance in selected African countries. The study has refuted earlier findings by Tumwebaze and Ijjo (2015), who found no evidence for regional economic integration in Common Market for and Eastern and Southern Africa (COMESA), member countries, but supports evidence from a number of studies (Bergstrand et al. 2013, 2014; Arribas et al. 2009; Bakari and

Mabrouki 2018; Kabir et al. 2017) that provide evidence for regional integration in their respective environment of study. In addition, the study sets the stage for future work by providing evidence that could be applied to other ambitious economic integration prospect areas such as the Eastern African Community (EAC), COMESA and other African countries.

Future studies may focus efforts on assessing whether there is linkage between innovation technology spillover in the agricultural sector that can further trigger technical efficiency in the region. Such cross-country level studies are essential for more targeted policy suggestions.

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