THE IMPACT OF TRADE INTEGRATION ON POVERTY REDUCTION IN ECOWAS

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ABSTRACT

This paper examines the impact of trade integration on poverty reduction in the Economic Community of West African States (ECOWAS). To investigate the impact of trade integration on poverty reduction, data for all fifteen member countries of ECOWAS on the number of poor people, bilateral trade, trade openness, exchange rate, foreign direct investment, interest rate, inflation rate, and import tariff were collected from the World Bank, WTO, IMF and WDIs from 2010 to 2019. After various tests, heteroscedasticity was found to be present. Therefore, to address this problem, the Feasible Generalized Least Squares (FGLS) method was used to examine the aforementioned impacts. The results showed that trade openness, bilateral trade, exchange rate, and import duties significantly impact poverty. The results indicated that trade integration is significant in reducing poverty within ECOWAS. The study recommends measures to enhance the effectiveness of trade integration as it has an important impact on reducing poverty in the region. First, ECOWAS should implement policies to support smaller countries in improving their productive capacities to compete effectively within the region. Secondly, harmonization of exchange rates by creating a common currency would facilitate smoother trade flows and contribute to poverty reduction. Member countries should prioritize trade with other ECOWAS nations, implement policies to ensure that foreign investments benefit the local economies, and focus on exporting finished goods rather than raw materials to create employment opportunities and support poverty reduction efforts.

Keywords: *Trade Integration, Poverty Reduction, ECOWAS, Panel Data*
JEL: F15; F13; F55; I32; O19; C31

Introduction

Poverty is a major development issue and a concern for governments, international organizations, and policymakers worldwide. It was even made the first goal of the UN's Sustainable Development Goals (SDGs), which aim to reduce and eradicate poverty around the world. Poverty encompasses more than just the lack of money and productive resources.

It includes additional elements such as limited access to education and basic services, lack of food and nutrition, social prejudice and exclusion, and limited involvement in decision-making processes (UN, 2022). It is sometimes expressed as the proportion of the population that makes less than a given income standard, such as the international poverty line, which varies depending on the categorization of the nation and is set at $1.90, $3.20, or $5.50 per day (World Bank, 2023c).

Poverty reduction means reducing the incidence and severity of poverty to enable people to lead a better quality of life. This can be achieved through various means, including economic growth, job creation, improved access to education and healthcare, and targeted social safety net programs. Poverty reduction requires a multifaceted approach that addresses the immediate needs of poor households and the underlying structural and systemic factors contributing to poverty. By working towards more equitable and inclusive economic growth and supporting the development of strong institutions and governance, poverty reduction efforts can help to create a more sustainable and prosperous future for all. According to Aikins and McLachl (2022), the poverty rate in Western Africa is about 36.8%. The pandemic in 2020 was said to have wiped out the gains made in fighting food instability and malnutrition, causing extreme poverty to rise by 3% in the region (UN, 2022).

Regional integration is frequently proposed as a way to alleviate poverty through the facilitation of trade and investment, thereby creating employment opportunities for those living in poverty. As a result, many developing countries, particularly in Africa, have embraced regional integration and agreements. There is, however, little information available about the impact of regional trade integration on poverty and development in developing nations (Overseas Development Institute (ODI), 2005). Virtually all of Sub-Saharan Africa (SSA) has a long history of regional economic cooperation. Many leaders called for the integration of Africa soon after independence. However, it was not until the 1970s and 1980s that concrete steps were taken to revitalize or establish economic integration institutions in all sub-regions. The quest for African unity on the political front partly drove the initial wave of regional integration initiatives. However, it also created the necessary scale to support policies focused on import-substitution industrialization (Niekerk, 2005).

Because trade integration is a subset of regional integration, Nega et al. (2021) view regional integration as a means, not an end, of addressing the development challenges that African countries face, the most serious of which is how to achieve sustained growth and poverty reduction. Over the past few decades, regionalism has been essential in promoting peace and security in Africa. However, there are still obstacles to fully realizing its potential for economic development. This is demonstrated, for instance, by the fact that weak export and production structures are common in African countries, the number of impoverished people on the continent is rising, and the proportion of regional trade to total trade in Africa is relatively low (Nega et al., 2021).

It is essential to acknowledge that trade integration is a universal solution for alleviating poverty, and its effects might vary depending on a number of circumstances, including the particular trade agreement and the broader economic and institutional contexts of the country. There is evidence that trade integration can positively impact poverty reduction. For example, a study by Bartley et al. (2015) found that trade integration in the form of regional trade agreements can increase economic growth, which in turn can reduce poverty. Additionally, research has shown that small- and medium-sized enterprises (SMEs) can particularly benefit from trade integration, as they often lack the resources and capabilities to access foreign

markets independently. By removing trade barriers and creating a more level playing field, SMEs can be able to compete and grow, thereby increasing employment and income opportunities and reducing poverty. Trade integration can also have negative impacts, such as increased competition and job displacement in certain sectors. Therefore, it is important to approach trade integration from a holistic and well-rounded perspective and consider other policies and interventions supporting poverty reduction, such as social safety nets and investments in education and training.

While there is evidence that trade integration can positively impact poverty reduction, it is important to understand its impact in the West African region. This study analyzes the impact of trade integration on poverty reduction in ECOWAS countries.

Trade Integration in West Africa

Trade integration entails reducing trade barriers between states, including tariff and non-tariff measures, to facilitate a smoother movement of goods and services. This can be achieved through various mechanisms, such as regional trade agreements, customs unions, and free trade areas. The idea behind trade integration is that opening markets and increasing competition can lead to greater efficiency and productivity and, in turn, contribute to economic growth and poverty reduction (Ndukwe, 2004).

The ECOWAS membership is made up of diverse countries with notable differences among them. Nigeria's population and economy are significantly larger compared to the other member countries. The per capita GDP (PPP) of the region ranges from $1304 in Niger to $6717 in Cape Verde (World Bank, 2023a). According to the 2021 data from the World Bank (2023b), Benin, Cape Verde, Cote d'Ivoire, Ghana, and Nigeria are categorized as lower-middle-income economies, while the remaining countries are categorized as low-income. When looking at the economic structure, it is clear that most member countries depend on agriculture, services, and, occasionally, oil and minerals, while a few have developed substantial manufacturing enterprises. While every other member country has access to the sea, only Mali, Niger, and Burkina Faso are completely landlocked. Some of these nations also lack a well-developed port infrastructure (Uexkull, 2012).

Trade is an important aspect of regional integration. Therefore, ECOWAS takes the trade issue seriously and has many trade policies to promote trade among member countries in the region. Some of the existing policies include the ECOWAS Trade Liberalization Scheme (ETLS), West African Common Industrial Policy (WACIP), ECOWAS Regional Competition Policy Framework, ECOWAS Common External Tariff (CET), ECOWAS Common Investment Code and Policy, Services Policy Review, and ECOWAS Customs Code (ECOWAS, 2023a). All ECOWAS member countries have already signed the AfCFTA agreement and 12 out of the 15 countries already submitted documents for ratification of the continental initiative (Tralac, 2023). This is evidence that the region is ready to trade within itself and even with the rest of Africa.

In 2019, ECOWAS achieved a score of 0.438 on the Africa Regional Integration Index, which is a decrease from its 2016 score of 0.442. This indicates that trade in the region is declining and not performing up to standard. The region's best performing countries in trade integration are Côte d'Ivoire, Togo, Senegal, Burkina Faso, and Mali. The three countries with the highest levels of trade integration are Côte d'Ivoire, Togo, and Senegal, with scores of 0.772, 0.580, and 0.567, respectively. Côte d'Ivoire is the leader in intra-ECOWAS trade, although Togo has the highest proportion of exports relative to GDP within the region. Senegal has a good tariff policy and ranks third in terms of export share within the region. The worst

performers are Liberia, Cape Verde, and Sierra Leone, with scores of 0.198, 0.210, and 0.275, respectively. The underperformance of Liberia and Cape Verde in terms of their trade share in regional exports and imports positions them as the least successful countries, while Sierra Leone has the most unfavorable tariff system (ARII, 2019).
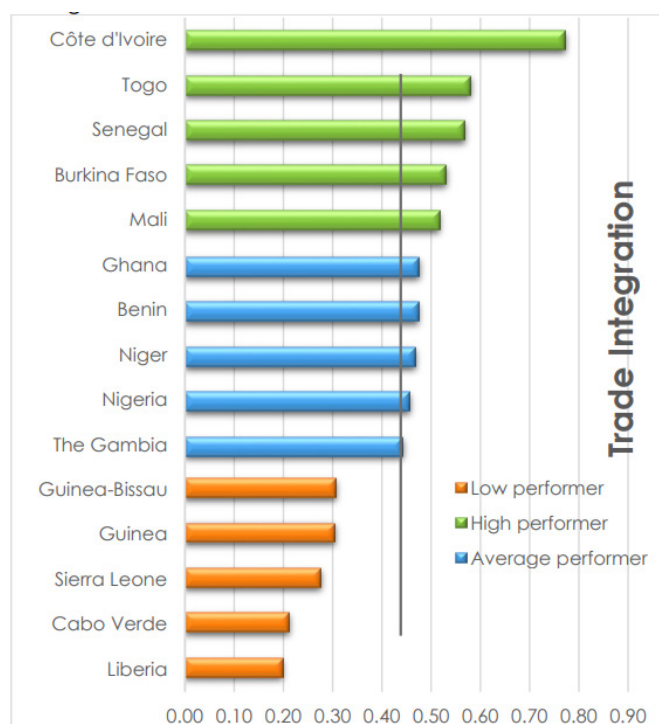

Figure 1: Trade integration index in ECOWAS
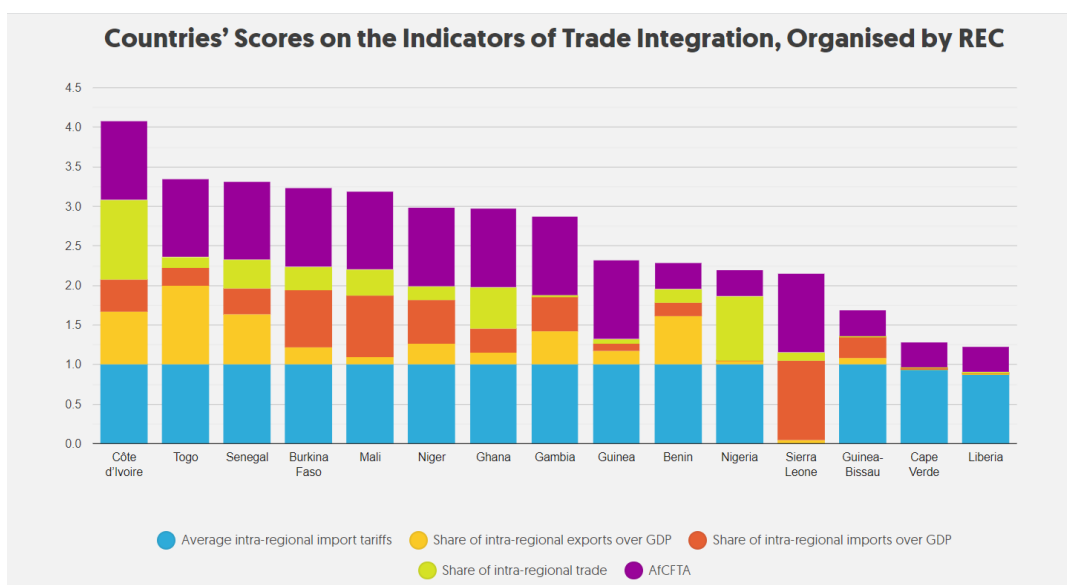Source: ARII (2019)

Figure 2: Trade integration index across all components of trade integration
Source: ARII (2019)

Overall, trade integration in the region is very low and below the average of 0.5. Cote d'Ivoire is the leading contributor to intra-ECOWAS trade, followed closely by Nigeria in the second position. Initially, between 2000 and 2009, Senegal held the third position, but was overtaken by Ghana after 2009. This indicates a decline in Senegal's contribution to intra-ECOWAS trade. At the same time, Ghana experienced an increase in its contribution, reflecting

the recovery of global trade after the impact of the global economic crisis (Onyekwena & Oloko, 2016).

Trade among West African countries is low despite the various trade policies adopted by ECOWAS (Gammadigbe, 2021). According to Gammadigbe (2021), this is due to the underdeveloped transport infrastructure among West African countries, non-application of community agreements, inconsistent or poorly managed trade policies, supply constraints, and poorly diversified economic structures in these countries.

This study seeks to understand the impact of trade among the ECOWAS member countries on poverty reduction in the region. The aim is to understand how trade openness, foreign direct investment, bilateral trade, and trading costs affect the number of poor people in the region. This study will help the ECOWAS organization understand the best policy measures it can undertake to reduce the number of poor people in its member countries. This study will also be useful for scientific knowledge as limited literature focuses on all ECOWAS member countries.

Literature Review

This literature review is divided into (i) theoretical literature and (ii) empirical literature on trade integration and poverty reduction.

Theoretical Literature

Several theories have been used to explain the relationship between trade integration and its impact on poverty reduction. The country similarity theory by Linder (1961) explains why countries at the same level of development trade with each other. Linder's perspective was that countries at similar stages of economic development and with common consumer preferences engage in the international trade of manufactured goods. This leads to the essence of the country similarity theory, which suggests that a significant portion of trade in manufactured goods should take place between countries with comparable per capita incomes. Additionally, intra-industry trade in manufactured goods is expected to predominate. ECOWAS member countries have similar economic realities, and these countries need to trade together as their tastes are in the same realities. In terms of culture, religion, and the level of economic development, ECOWAS member countries are similar. Therefore, these countries need to trade together to improve the level of development in this region and the standard of living.

The customs union theory explains an agreement in which two or more states have agreed to reduce or eliminate tariffs and other barriers to trade. It is also referred to as the market integration theory, which is associated with the work of Jacob Viner. Viner (1950) posits that customs union members typically implement a unified external tariff on imports originating from countries that are not part of the union. A customs union aims to promote trade among member countries and protect their domestic industries from foreign competition. ECOWAS is an example of a customs union with the adoption of the ECOWAS Common External Tariff (CET) in 2015 to promote trade activities in the region (ECOWAS, 2023b). Oslington (2013) provided an interpretation of Viner's notion of customs unions as part of various strategies to reduce tariff barriers among political entities while simultaneously maintaining restrictions on imports from external regions. Within the framework of a customs union, member countries effectively eliminate trade tariffs while simultaneously implementing a unified external tariff on imports originating from non-member countries. Viner's theory of customs unions

examines the impacts of various regional integration arrangements on trade diversion and trade creation. Viner argues that the impacts of customs unions may vary, either positively or negatively, depending on the unique conditions and objectives of each country.

Compared to the customs union, the common market theory goes one step further by allowing the free movement of the factors of production and the use of the customs union (Nshimbi, 2018). The common market goes beyond the common external tariffs, but also includes the free movement of factors of production among the countries involved in this agreement. This is a way to promote trade and productive activities among the citizens and businesses of the participating countries in a trade union.

Empirical Literature on Trade Integration and Poverty Reduction

According to the OECD (2009) and DFID (2008), economic growth is an effective way to reduce poverty. Trade is essential to achieving this growth that will help alleviate poverty. There are, however, many obstacles faced by developing countries in expanding and diversifying trade to achieve inclusive growth capable of reducing poverty. This is because many African countries face challenges that inhibit their ability to increase national production. These challenges include, but are not limited to, war, increasing insecurity, and low investment in industries.

Trade integration is a complex and multifaceted process that can lead to increased trade, improved competitiveness, and higher levels of economic growth (Bacrot & Valensisi, 2019). However, it is important to manage trade integration carefully and consider its potential impacts to ensure that its benefits are widely shared and its negative effects are minimized in the participating economies. If the regulatory framework supporting such regional integration is inadequate, it can increase inequality and poverty. The competition with foreign workers with higher levels of skills is now facing workers in these economies (Yameogo & Omojolaibi, 2022). Regional integration agreements are more likely to increase trade and welfare if the member countries initially account for considerable proportions of each other's imports (Baldwin & Venables, 2006). Theoretical studies by Krishna & Panagariya (2002) and Feenstra (2003) have provided evidence that both customs unions and free trade agreements can be beneficial to participating parties. However, Feenstra (2003) emphasizes the need to avoid assuming that regional integration agreements are inherently positive in practical terms.

Despite the benefits of trade integration, there are potential downsides, especially for certain vulnerable groups such as workers in fragile industries, small- and medium-sized enterprises, and rural communities. To counteract these negative effects, it is crucial to implement policies and programs that specifically target these groups, ensuring that the benefits of trade integration are distributed more equitably. The African Continental Free Trade Area (AfCFTA) is a transformative initiative that promises to increase intra-regional trade and foster inclusive economic growth. It also has the potential to facilitate industrialization and structural transformation, opening up new economic and developmental opportunities for Africa (Nega et al., 2021). By expanding intra-African trade flows and establishing new trade connections, the AfCFTA is expected to significantly promote economic progress and inclusivity.

According to Rodriguez & Rodrik (2001), Winters et al. (2004), and Mealy (2005), regional integration offers several advantages, such as the ability to leverage economies of scale, enhance competitiveness, and attract investment, thereby contributing to poverty alleviation. Nevertheless, the degree of trade openness sometimes associated with regional

integration can have varying impacts on economic growth. Consequently, its influence on poverty reduction can be both beneficial and detrimental (Gasiorek & Martuscelli, 2017). The closure of local industries and the subsequent increase in unemployment is one of the unintended effects of regional integration (Balassa, 1961). Wages, employment, and production profits are three of the most direct avenues through which trade can affect poverty (Winters et al., 2004).

Using data from 2005 to 2014, Onakoya et al. (2019) examined the potential relationship between trade liberalization and poverty in 21 African countries. The panel unit root test, pooled OLS approach, cointegration test, descriptive statistics, correlation matrix, and variance inflator were all employed in the study. The results of the regression model were tested for robustness and validity by implementing the Ramsey RESET, cross-dependence, autocorrelation, and heteroscedasticity tests. The results indicate a positive correlation between foreign direct investment, inflation rates, and human development index. Conversely, there was a negative relationship between exchange rates and trade openness and poverty at 5% significance level. The study suggested immediate policy reforms aimed at restructuring poverty reduction initiatives. In order to expand their export markets, the study suggested that developing countries work with other developing countries to enhance South-South cooperation. This suggests that countries with similar demand patterns and levels of development should engage in bilateral trade. The idea of trade integration among developing countries to enhance economic growth and alleviate poverty in these countries was supported by Onakoya et al. (2019).

Bui et al. (2016) investigated how economic integration affects poverty and inequality among rural families in Vietnam. After adjusting for fixed effects and any possible biases, they discovered that economic integration has little and statistically insignificant impact on household welfare. The study suggested that to successfully reduce poverty, policy objectives should include a component that redistributes resources at the family and community levels and promotes macroeconomic growth. However, a study by Guerineau (2016) found that economic integration may significantly impact poverty reduction, even if the "growth channel" is weak.

Ilyas et al. (2023) investigated the impact of trade openness and foreign direct investment on Burundi's efforts to reduce poverty. The study aims to examine the relationship between poverty alleviation in Burundi and FDI, inflation, GDP, and trade openness using annual data from 1990 to 2021. The impact of the independent variables on the country was examined using autoregressive and lagged distributive models. It was found that FDI and GDP had a negative long-term effect on the poverty headcount ratio. According to the study, FDI did not significantly affect poverty levels in the short run. In the short run, poverty can be efficiently alleviated by GDP, trade openness, and inflation. FDI was shown to be crucial for developing nations to create jobs for the unemployed. The study also suggested that additional factors contribute to poverty.

A study by Adedokun et al. (2020) examined how financial integration has affected the macroeconomic performance and poverty reduction efforts of the West African Monetary Zone. The study emphasized the importance of borderless financial flows in improving macroeconomic outcomes and reducing poverty in the subregion. The study had two main objectives: first, to examine how international financial integration affects macroeconomic performance and poverty alleviation in the WAMZ sub-region; and second, to determine how these two factors interact to influence poverty in the WAMZ countries. This study used

time series data from 1980 to 2017. Using the SYS-GMM approach, the results showed that macroeconomic performance is strongly influenced by FDI and commodity terms of trade, which increase economic growth in the subregion. FDI, terms of trade, inflation, and institutional quality significantly reduce poverty levels in the region. Nevertheless, the combined influence of financial integration and macroeconomic performance adversely affects poverty levels. The study suggests that the governments of the WAMZ countries should actively pursue policies that promote rapid, unrestricted, and smooth financial integration. This would help reduce the prevalence of poverty among the population of the sub-region.

Ametoglo et al. (2018) examined the relationship between regional integration and inequality within ECOWAS from 2004 to 2013. They employed the least squares dummy variable corrected (LSDVC) regression method for their analysis. The results indicate that political integration has a moderating effect on income disparity, but economic integration increases income gap.

Park & Claveria (2018) developed a multidimensional regional integration index series to examine the impact of regional integration on inclusive growth. The study used the system generalized method of moments (GMM) and showed that even when trade and financial openness are regulated, regional integration significantly and positively impacts poverty reduction, income distribution, and economic growth.

Many studies have assessed the impact of trade integration on poverty reduction (e.g., Ilyas et al., 2023; Ozigbu, 2023; Yameogo & Omojolaibi, 2022; 2021; Umeh et al., 2021; Onakoya et al., 2019; Bui et al., 2016; Mealy, 2005; and Khatiwada, 2005). Each study came up with different relationships and significance of trade integration on poverty reduction. However, none was conducted on the impact of trade integration on all members of ECOWAS countries. Therefore, this study seeks to understand the impact and significance of trade integration on poverty reduction in all West African countries.

Methods

This study examines panel data for the 15 member countries of ECOWAS, namely Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. The panel data cover ten years, from 2010 to 2019.

Source and Scope of Data

This study used secondary data obtained online from the World Trade Organization (WTO), World Bank, IMF, and specific Bureau of Statistics of each country. The data collected covered ten years from 2010 to 2019.

Table 1 provides a clear description of the variables and sources of the data that were used.

Table 1: Definitions and sources

S/N	Variable Name	Symbol	Definition	Unit	Data Source
1	Poverty Headcount Rate	POVR	The proportion of the population residing below the poverty threshold	%	World Bank Data, Worldpoverty.io, Ghana Statistical Service
2	Poverty Headcount	POV	The population residing below the poverty threshold	Unit	POVR*Population

S/N	Variable Name	Symbol	Definition	Unit	Data Source
3	Bilateral Trade within ECOWAS	BTWE	Import and export within ECOWAS in dollars	$	World Trade Organization
4	Trade Openness (ECOWAS)	T	The percentage of trade within ECOWAS to GDP	%	BTWE/GDP * 100
5	Import Duty	IMT	The charge on goods imported into an ECOWAS country	%	World Trade Organization
6	Interest Rate	IR	Price paid on borrowing	%	International Monetary Fund Database, Central Bank of Liberia Data, BCEAO
7	Foreign Direct Investment	FDI	Foreigners' investment in an ECOWAS country	$	World Bank Data
8	Exchange Rate	ExR	The value of a country to the dollar	Local currency	World Bank Data

Model Specification

This study employed a model derived from the Solow growth model, adapted from the work of Yameogo & Omojolaibi (2021). The variables listed below were among the criteria considered in the application of trade integration in accordance with the theoretical frameworks. The equation representing the initial regression model is provided.

$$POV = f(Trade\ Integration) \tag{1}$$

$$Trade = f(TO,\ BT,\ FDI,\ IR,\ EXR,\ IFR,\ IMT) \tag{2}$$

$$LPOV_{it} = \beta_0 + \beta_1 TO_{it} + \beta_2 LBT_{it} + \beta_3 LFDI_{it} + \beta_4 IR_{it} + \beta_5 LEXR_{it} + \beta_6 IFR_{it} + \beta_7 IMT_{it} + \beta_{it} + v_{it} \tag{3}$$

Where,

$LPOV_{it}$ = log of poverty headcount to measure poverty
TO_{it} = trade openness to measure trade integration
LBT_{it} = log of bilateral trade
$LFDI_{it}$ = log of foreign direct investment
IR_{it} = interest rate
$LEXR_{it}$ = log of exchange rate
IFR_{it} = inflation rate
IMT_{it} = import duty
$\beta_1 - \beta_7$ = coefficient of the variables
μ_{it} & v_{it} = error term

Estimation and Validation of Result

The research used a unidirectional error component model. The models described (μ_{it}, v_{it}) include an individual effect component that accounts for all unobserved time-invariant variables that influence TO_{it}, LBT_{it}, $LFDI_{it}$, IR_{it}, $_L EXR_{it}$, IFR_{it}, IMT_{it}. The error components μ_{it} and v_{it} are responsible for accounting for country-specific characteristics that remain constant over time. Both fixed effect and random effects were used to estimate the model. The fixed and random effect models assume that the variables μ_{it}, v_{it} are non-zero. In the fixed effect model, the parameters (μ_{it}, v_{it}) are considered as fixed and are estimated, whereas in the random effect model, the values of μ_{it} and v_{it} are considered random and are estimated.

When estimating the model using OLS, it is assumed that μ_{it} and v_{it} are zero. However, this assumption is incorrect because each nation is different from the others. Therefore, OLS is not an appropriate estimator for this model. This study used the Hausman test to determine the appropriate estimator, either random effect or fixed effect, to be used for the investigation.

Hausman Test

The Hausman test was developed by Hausman in 1978. It is a formal test that helps to choose between fixed effects and random effects (Gujarati, 2004). Because of the inefficiencies of the ordinary least squares, the choice of which method to use between fixed and random effects becomes important to solve this problem. Typically, the Hausman test is employed for this objective.

The null hypothesis of random effects can be tested against the alternative hypothesis of fixed effects. The statistic shows a quadratic relationship for the difference between fixed and random effects estimators. The statistic is as follows:

$$H = (\hat{\beta}_{fe} - \hat{\beta}_{re})' \widehat{var}(\hat{\beta}_{fe} - \hat{\beta}_{re})^{-1}(\hat{\beta}_{fe} - \hat{\beta}_{re}) \qquad (4)$$

$$H = (\hat{\beta}_{fe} - \hat{\beta}_{re})(\hat{V}_{fe} - \hat{V}_{re})(\hat{\beta}_{fe} - \hat{\beta}_{re}) \qquad (5)$$

where both $\hat{V}_{fe}$ and $\hat{V}_{re}$ take the classical (non-robust) forms.

Additionally, the Hausman test can be use to identify endogeneity in a model. A rejection of the test indicates that the individual effect u_i is correlated with the regressors. Therefore, the random effects model is inappropriate. Conversely, if the test does not produce a rejection, this evidence refutes the possibility of rejecting the random effects hypothesis. One might consider employing the random effects estimator in the event that the Hausman test does not reject the random effects hypothesis, and the fixed effects estimator in the event that the Hausman test does reject the random effects hypothesis (Hansen, 2019).

Table 2: Properties of the random and fixed effects models estimators

Model / Correct Hypothesis	Random Effect Model	Fixed Effect Model
H_0: $Cov(\alpha_i, x_{it}) = 0$ Exogeneity	Consistent Efficient	Consistent Inefficient
H_1: $Cov(\alpha_i, x_{it}) \neq 0$ Endogeneity	Inconsistent	Consistent Possibly Efficient

Source: Adapted from Sheytanova (2015)

Test for Multicollinearity

The Variance Inflation Factor (VIF) was used to examine the potential existence of correlation between the independent variables. VIF is used as a multicollinearity indicator. A variable is considered more "problematic" or collinear as the value of the VIF increases. A variable is considered highly correlated if the value of VIF is greater than 10 (Gujarati, 2004).

Autocorrelation Test

The Wooldridge test for autocorrelation was used to test for the presence of serial correlation.

H_0 = no serial correlation
H_1 = there is a serial correlation

Accepting the null hypothesis means that there is no serial correlation, while rejecting the null hypothesis indicates the presence of serial correlation.

Test for Heteroscedasticity

In testing for the presence of heteroscedasticity, the modified Walt test was used. If the null hypothesis is rejected, there is heteroscedasticity, while there is no heteroscedasticity if the null hypothesis is not rejected.

H_0 = variances across entities are equal to zero
H_1 = variance varies across entities and is not equal to zero

Feasible Generalized Least Squares

The FGLS estimators were used because they are more efficient and have related test statistics with the standard t and F distributions (Wooldridge, 2012; Gujarati, 2004). In this study, the model showed evidence of heteroscedasticity and to correct this, FGLS was employed. As recommended by Gujarati (2004), in the presence of heteroscedasticity, the FGLS should be used.

Standard Error

Abadie et al. (2022) found that the clustered variance estimator of the least squares estimator is asymptotically correct regardless of whether the treatment assignment is clustered or not if the data are on the country and the sample is a small fraction of the population. The case for using clustered standard errors was made by Bertrand et al. (2004). It has been observed that the use of non-clustered variance estimators results in standard errors that are too small. Consequently, researchers may incorrectly conclude that the randomly generated "variable" has a significant effect in a regression analysis. The elimination of erroneous rejections can be achieved through the use of clustered standard errors (Hansen, 2019).

This study, however, did not use the clustered standard error because FGLS was used. The standard error of FGLS is neither robust nor clustered, but reliable.

Results and Discussion

Descriptive and Correlation Test

Tables 3 and 4 present the results of descriptive statistics and correlation matrix, respectively.

Table 3: Descriptive statistics

Variable	POV	TO	BT	FDI	IR	EXR	IFR	IMT
Mean	8.6m	6.85%	846m	829m	11%	848.6	4.88%	9.84%
Maximum	79.6m	24.72%	3,420m	8,840m	29%	9400.82	23.56%	39.90%
Minimum	130,303	0.23%	11m	(181m)	5.04%	1.45	(3.23%)	1.30%
Stand. Dev	15.9m	4.84%	758m	1,410m	7.01%	1929.93	5.57%	8.82%

The above table summarizes the statistics of the variables. The average poverty headcount in the region was 8.6 million. The average trade openness within the ECOWAS region was 6.8%, while the maximum trade openness within the region was 24.7%. This indicates a very low trade activity among the ECOWAS countries. The average value of bilateral trade in the ECOWAS region was $846m. The average value of FDI inflows into the region was $829m.

The average interest rate in the ECOWAS region was 11%, and the highest was 29%, indicating that interest rate on the region is double-digit and high. The exchange rate value in

the region was 848.5 to one dollar, with the weakest currency going as high as 9,400 to one dollar. The average inflation rate among ECOWAS countries was 4.88%, and the lowest inflation rate was -3.2%, while the highest was 23.56%. The average import tariff among the ECOWAS countries was 9.8%, with the highest being 39.9%. This shows that despite the different trade policies in the region, the cost of importation is still very high.

Correlation Matrix

Table 4: Correlation matrix

	POV	TO	BT	FDI	IR	EXR	IFR	IMT
POV	1.0000							
TO	-0.3273	1.0000						
BT	0.4019	0.1280	1.0000					
FDI	0.6449	-0.3349	0.3488	1.0000				
IR	0.1406	-0.1101	-0.1826	0.2908	1.0000			
EXR	-0.0876	-0.1698	-0.1444	-0.1145	0.0269	1.0000		
IFR	0.2936	-0.0310	-0.0233	0.4214	0.6303	0.2348	1.0000	
IMT	-0.1308	-0.1592	0.2344	-0.0963	-0.1653	-0.1313	-0.2641	1.0000

The table above shows the correlation coefficient of the data. Trade openness, exchange rate, and import tariff have a negative relationship with poverty, while poverty has a positive relationship with bilateral trade, foreign direct investment, interest rate, and inflation rate. There is a strong correlation between poverty and foreign direct investment. Trade openness has a positive relation with bilateral trade and a negative relationship with foreign direct investment, interest rate, exchange rate, inflation rate, and import tariff.

Multicollinearity Test

Table 5: Variance Inflation Factor (VIF) Tests

Variable	VIF	1/VIF
IR	2.58	0.387
LBT	2.40	0.416
LFDI	2.33	0.428
LEXR	2.00	0.499
IFR	1.93	0.518
TO	1.43	0.700
IMT	1.24	0.804

From Table 5 above, it can be seen that the VIF values of all the variables are less than 10. Therefore, it can be concluded that the model does not have multicollinearity problems.

Unit Root Test

Table 6: Summary of Levin-Lin-Chu Unit Root Tests

Variable	t Statistics	P-Value	Order of Integration	Inference
LPOV	-4.6365	0.0226**	I(0)	Stationary
TO	-7.4931	0.0002***	I(0)	Stationary
LBT	-8.3416	0.0000***	I(0)	Stationary

Variable	t Statistics	P-Value	Order of Integration	Inference
FDI	-5.4836	0.0378**	I(0)	Stationary
IR	-6.6510	0.0001***	I(0)	Stationary
LEXR	-3.3429	0.0485**	I(0)	Stationary
IFR	-7.9668	0.0000***	I(0)	Stationary
IMT	-5.9043	0.0018***	I(0)	Stationary

*Note: ***, **, and * denote significance at the 1%, 5%, and 10%.*

The results of the unit root test of the variables are presented in Table 6. The results indicate that all of the variables exhibit stationarity at a significance level of 5%. This suggests that there is no evidence of cointegration among the variables, hence allowing for the estimation of the model.

Estimation of the Model

Fixed Effect

Table 7: Fixed effect

Fixed Effect (Within Regression)
Dependent Variable: LPOV

Variable	Coefficient	t-statistics	P-Value
TO	-3.725284	-3.74	0.000***
LBT	0.2608337	3.49	0.001***
LFDI	-0.0088979	-0.63	0.527
IR	0.02094173	0.28	0.779
LEXR	-0.0073381	-0.08	0.935
IFR	1.303512	2.31	0.023**
IMT	1.349401	3.35	0.001***
Constant	6.759734	15.66	0.000***

R-square: 43.97
F(7, 124) = 121.55
Prob>F = 0.0001
F test that all u_i = 0: F(14,124) = 121.55   Prob > F = 0.0000

Note: ***, **, and * denote significance at 1%, 5%, and 10%.

Random Effect

Table 8: Random effect

Random Effect (Between Regression)
Dependent Variable: LPOV

Variable	Coefficient	Z	P-Value
TO	-5.433763	-5.55	0.000***
LBT	0.4208093	6.59	0.000***
LFDI	-0.0043044	-0.27	0.791
IR	-0.5205812	-0.63	0.530
LEXR	-0.0154072	-0.25	0.800
IFR	1.835561	3.22	0.001***

Random Effect (Between Regression)
Dependent Variable: LPOV

Variable	Coefficient	Z	P-Value
IMT	1.088713	2.52	0.012**
Constant	5.996034	13.60	0.000***

R-square: 57.06
Wald Chi^2(7) = 56.61
Prob> Chi^2 = 0.0000

*Note: ***, **, and * denote significance at 1%, 5%, and 10%.*

Hausman Test

Table 9: Hausman test

Hausman Test	
Chi^2(4)	161.25
Prob> Chi^2	0.0000

H_0 = difference in coefficient, not systematic
H_1 = difference in coefficient, systematic

A fixed effect is the best method if the significance level is less than the probability value.

The data was analyzed using both fixed effect and random effect. The Hausman test was then used to determine which method best suited the model. Since the probability value of 0.000 is less than the significance level, the Hausman test indicated that fixed effect was the best model analysis method.

Test for Serial Correlation

Table 10: Test for serial correlation

Wooldridge Test	
F(1, 14)	1.686
Prob> F	0.2151

The Wooldridge test for autocorrelation was performed to test for serial correlation in the panel. The results showed that the probability value is greater than the significance level at 0.05. Therefore, the null hypothesis was accepted and it was concluded that there is no serial correlation in the panel.

Heterogeneity/Heteroscedasticity Test

Table 11: Test for heteroscedasticity

Modified Wald Test	
Chibar^2(15)	875.40
Prob > Chibar^2	0.0000

The modified Wald test for groupwise heteroskedasticity in the fixed effect regression model was performed to test for the presence of heteroskedasticity in the panel. Since the p-value is less than 0.05, the null hypothesis was rejected, indicating heterogeneity. The result of the test showed that the panel has the problem of heterogeneity.

Since the panel is free of serial correlation, however, there is the problem of heteroscedasticity. It would be inappropriate to use a fixed effect as it would produce a biased and unreliable result.

To address the problem of heterogeneity, the panel general least square (GLS) was performed. The choice of FGLS was necessary since it considers the presence of heteroscedasticity, thereby allowing for an efficient estimation of the model parameters. The GLS also corrects for bias by adjusting the standard error to provide more accurate hypothesis testing and confidence intervals.

The GLS is also robust and can handle various forms of heteroscedasticity.

Feasible Generalized Least Squares (FGLS)

The analysis revealed no serial correlation in the panel. However, heteroscedasticity was discovered. Hence, using the regular fixed effect in analyzing the panel becomes problematic. It is, therefore, necessary to analyze the data using FGLS, which addresses the problem of heteroscedasticity.

Table 12: Generalized least squares

Generalized Least Squares Dependent Variable: LPOV			
Variable	Coefficient	z-statistics	p-value
TO	-8.957218	-8.31	0.000***
LBT	0.8603651	17.57	0.000***
LFDI	0.0128185	0.31	0.755
IR	0.3854436	0.39	0.698
LEXR	-0.0714273	2.21	0.027**
IFR	0.7676158	0.70	0.482
IMT	-5.355393	-9.80	0.000***
Constant	3.570886	9.61	0.000***

Log-likelihood = -113.4469

Wald Chi^2(7) = 771.91

Prob> Chi^2 = 0.0000

*Note: ***, **, and * denote significance at 1%, 5%, and 10%.*

The generalized least square (GLS) was used to test the model. The result indicated that the model is now free from autocorrelation and is also homoscedastic. The results showed a negative relationship between poverty and trade openness. A percentage increase in trade openness in ECOWAS reduces poverty by about 8.95%. This is an indication that trade openness is significant in reducing the level of poverty in ECOWAS member countries. Bilateral trade in the region has a positive correlation with poverty. The results showed that a percentage increase in bilateral trade increases poverty by 0.86%.

The inflows of foreign direct investment also had a direct relationship with poverty. The results indicated that a percentage increase in the dollar amount of foreign direct investment in the region increases poverty by 0.01%.

Interest rate also had a positive relationship with poverty. The results showed that a percentage increase in interest rate increases poverty by about 0.38%. This indicates that the higher the interest rate, the higher the poverty in the region.

A 1% increase in the exchange rate reduces poverty by 0.07% in the West African region. This implies that the higher the exchange rate, the lower the poverty.

The inflation rate had a positive impact on poverty. The higher the inflation rate, the higher the poverty level in the region.

Import tariff negatively impacted poverty in ECOWAS member countries. A 1% increase in import duty reduces poverty by 5.35%.

In terms of significance, trade openness, bilateral trade, exchange rate, and import tariff are all significant in reducing poverty in the region. However, foreign direct investment, interest rate, and inflation rate are insignificant in reducing the poverty in ECOWAS member countries.

Discussion

The findings revealed a negative significant relationship between trade openness and poverty in ECOWAS. This implies that trade openness in ECOWAS is significant in reducing the poverty level in the region. The implication is that trade activities among ECOWAS countries help them to increase the level of production, which can significantly create employment opportunities leading to reduced poverty. This claim was supported by the findings of Yameogo & Omojolaibi (2022) that increased economic integration reduces poverty in the WAEMU zone. However, this claim contrasts with the findings by Yameogo & Omojolaibi (2021) that trade has a negative effect on poverty reduction in sub-Saharan Africa. This is also possible because although trade openness reduces that the level of poverty, trade openness within Africa is still significantly low and might not be significant for reducing poverty. The issues around border control could also pose significant costs on the prices of goods, which might also pose significant hindrances to the ability of trade openness to reduce poverty in the region.

Bilateral trade had a significant positive correlation with poverty, indicating that the level of bilateral trade within the ECOWAS region increases poverty. This is possible because certain countries have an advantage over others in terms of their economic strength in production, and there is no regional effort to support the smaller economies to compete in this regard. This contrasts with Schislyaeva & Saychenko (2022), who studied the evaluation of post COVID-19 energy poverty and global trading impact on energy affordability. The study found that bilateral trade reduces energy poverty. The reason for the positive relationship between bilateral trade and poverty in ECOWAS might be due to the level of trade openness in ECOWAS which was 6.8% according to the descriptive statistics. This is very low compared to the level of trade of ECOWAS countries with countries outside of the West African region, indicating that bilateral trade among ECOWAS countries is inadequate to reduce poverty in the region.

The inflows of foreign direct investment showed a positive yet insignificant relationship with poverty. FDI was also insignificant in a study by Bisiriyu et al. (2021) who found that FDI had a negative relationship with economic growth. The result of this study indicated that the inflows of foreign direct investment did not reduce poverty, but increase poverty in the region. The higher the amount of foreign direct investment in the region, the higher the poverty. This finding is consistent with the study of Ilyas et al. (2023), which found that FDI tends to increase the poverty headcount ratio by 0.176% in sub–Saharan Africa. This is possible if all

FDI within the region comes from other regions of the world and the investors repatriate their profit back home, which affects the economy of the country that receives the investment and, hence, does not affect the poverty level in the region. As Ilyas et al. (2023) pointed out, FDI may not directly reduce poverty, but the government policies regarding FDI may help to reduce poverty. This suggests that the policies of respective countries in ECOWAS can help translate foreign investment into reducing poverty in the region.

Interest rate has a positive impact on poverty, indicating that as interest rate increases, poverty level also increases which is in line with expectation. However, the effect of interest rate is not significant. This finding is in line with the study of Bakari et al. (2019) which found that interest rate increases poverty. As interest rate increases, the cost of borrowing for businesses increases and as such it limits business borrowings which affects production leading to reduced employment opportunities and as a result contributes to poverty.

The exchange rate significantly impacted poverty reduction in the ECOWAS region. A lower exchange rate can help countries that export more by making export cheaper. This can encourage production for export, which can have a ripple effect in reducing the region's poverty level. This is consistent with the study of Umeh et al. (2021) on the impact of international trade on poverty reduction in Nigeria, which found that the exchange rate has a negative relationship with poverty and is significant in reducing poverty.

Import tariff negatively and significantly impacted poverty in ECOWAS member countries. The higher the import tariff, the lower the poverty. This is because the level of importation within ECOWAS is very low compared to that outside the region. Hence, reducing the import tariff in the region does not positively impact poverty reduction. The low import within the ECOWAS region is a problem for ECOWAS as much of the importation is from countries outside the region. This finding is consistent with the study by Sukoco et al. (2020) which showed that reducing import tariff increases poverty at the rural and national levels.

Conclusion and Recommendations

This study examines the impact of trade integration on poverty reduction in ECOWAS using data from 2010 to 2019. A panel data analysis was conducted using a linear regression model. The Hausman test was conducted to select whether to use the fixed or random effect model. The fixed effect was selected. However, after conducting the test for autocorrelation and heteroscedasticity, the model indicated the presence of heteroscedasticity. The panel data were finally analyzed using the generalized least square (GLS) corrected for heteroscedasticity.

This study found that trade openness, exchange rate, and import tariff significantly reduce poverty, while bilateral trade within ECOWAS significantly increase poverty. It was concluded that trade integration is significant in reducing the level of poverty in ECOWAS. However, the following recommendations must be followed in order for trade integration to achieve its potential to reduce poverty in ECOWAS:

1. ECOWAS needs to implement measures to help smaller countries in the region improve their productive activities so that they can compete with the stronger countries for trade to reduce poverty in ECOWAS effectively.
2. There is a need to harmonize exchange rates in the region to ensure the free flow of goods and services, as the exchange rate has shown to be significant in reducing poverty in the region.
3. Each ECOWAS member country must implement policies to ensure that trade with other ECOWAS countries is prioritized over trade outside the region. The elimination

of import tariff will not have any major impact on reducing poverty in the region if the level of trade is low. Hence, the trade among ECOWAS countries needs to be improved significantly, and this can be done through the policies of the respective countries. As indicated by the results, bilateral trade does not reduce poverty, and this is because the level of bilateral trade in the region is very low. The average trade openness in the region is only 6.85%, which is extremely low.

4. ECOWAS countries need to establish policies that control the activities of foreign investors so that these investments translate into the welfare of the people to help reduce poverty.

5. Each ECOWAS country should ensure that it exports more finished goods than raw materials. The transformation of raw materials involves many value-added services that help to create employment opportunities, which can then translate into the welfare of the people, leading to a reduction in poverty.

Declaration

Conflict of Interest

There are no relevant financial or non-financial competing interests.

Availability of Data and Materials

Data and materials used for this research will be make available on request.

Authors' Contribution

The authors confirm contribution to the paper as follows:

1. Introduction: Akinyemi Christopher Afolabi
2. Literature Review: Akinyemi Christopher Afolabi
3. Data collection: Akinyemi Christopher Afolabi
4. Analysis and interpretation of results: Akinyemi Christopher Afolabi.
5. Draft manuscript preparation: Akinyemi Christopher Afolabi and Ndamsa Dickson Thomas
6. Review of the Whole Work: Ndamsa Dickson Thomas.
7. Both authors reviewed the results and approved the final version of the manuscript.

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