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Article

Trade Creation and Trade Diversion Effects in ECOWAS

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Abstract

This study analyzed the trade creation and trade diversion impact on ECOWAS member trade flows and estimated the impact of income per capita differences in the economic area throughout the West African Economic and Monetary Union (WAEMU). To do so, we applied the gravity model by adding the square difference in per capita income and trade creation and diversion dummy variables. The results show there is a pure effect of trade creation within the ECOWAS region, and this effect is accompanied to some extent by export diversion. Furthermore, the squared difference in per capita income between the exporting and importing countries is associated with a 0.15% increase in trade. As the coefficient is positive, this suggests that the greater the income difference between the two countries (in both directions), the greater the trade.

Furthermore, the observed disparities in per capita income among ECOWAS members have been shown to encourage trade, thus indicating that policies should be oriented towards the harmonization of the economy in order to stimulate regional trade. It is imperative to acknowledge the considerable impact of income disparities, underscoring the necessity to address economic inequality to ensure the optimal realization of trade benefits within the ECOWAS region. However, relying too much on countries outside the WAEMU could lead to potential welfare losses and better integration is required.

Keywords

ECOWAS, WAEMU, Trade creation, Trade diversion, Gravity model

Introduction

Economic growth in Africa is expected to remain modest due to the current global economic slowdown. The global trade performance has had an impact on African growth due to subdued

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demand from key export markets and leveling off commodity prices. It is worth noting that the impact of the Africa Continental Free Trade Agreement (AfCFTA) is yet to materialize. Geopolitical instability will continue to adversely impact several sub-regions in Africa, notably the Sahel and West Africa. However, despite these challenges, the continent's economy is projected to grow by 4.2% in 2025 (United Nations, 2024).

The Economic Community of West African States, in short ECOWAS, was created by the Heads of State and Government of fifteen (15) West African countries with the signing of the ECOWAS Treaty in May 1975 in Abuja, Nigeria, with the stated aim to enhance trade and facilitate integration among West African states and people. According to the African Development Bank (AfDB) most ECOWAS countries have recorded high economic growth rates since the early 2000s, with the average five-year growth rate rising from 6.8% between 2001 and 2005 to 6.3% between 2006 and 2010, and to 5% between 2011 and 2015. It is estimated to have been 2.2% between 2016 and 2018. However, the COVID-19 pandemic led to a decline in real GDP of 1.7% in 2020 after real growth of 3.9% in 2019 (African Development Bank, 2021).

The share of agriculture in regional GDP rose from almost 25% in the 2000s to almost 35% in 2002 but fell to around 20% in 2018. Exports are gradually becoming one of the key economic growth driver in the ECOWAS region. However, this progress remains concentrated on a few agricultural commodities. The FERDI (Fondation pour les Études et Recherche sur le Développement International) concentration in 2018 was 79/100 for Nigeria, 42/100 for Ghana, 33/100 for Côte d' Ivoire, and 14/100 for Senegal. The index fell from 0.63 between 2006 and 2010 to 0.56 between 2011 and 2015 and to 0.44 between 2016 and 2018. The downward trend of this index since 2006 suggests a clear prospect for the diversification of exports of the ECOWAS region and a new integration process (ECOWAS, 2022).

A number of factors, including religion, official and local language spoken and traditional secular links, serve to interconnect the West African countries. This interconnectivity is reflected in the trade patterns observed between these countries, which demonstrate a greater propensity to trade with one another than with other regions. Nevertheless, despite this interconnectivity, the impact of this trade on the overall level of trade development and economic well-being in the countries concerned is limited. In light of the aforementioned factors, it is necessary to ascertain whether there is indeed a trade creation effect within ECOWAS countries and, if so, where the diversion of trade within this economic zone is directed.

This method is also used to estimate country-time effects and country-pair effects, solving by the same way, the bias of heterogeneity that can appear when dealing with panel data series as recommended by of this study is to analyze trade creation and trade diversion within the ECOWAS zone. According to Viner (1950), trade creation and trade diversion represent the direct consequences of free trade, which may occur within structures grouped together in a regional union or after several negotiations for trade agreements. Trade creation is characterized by the reduction or elimination of customs duties and/or tariff or non-tariff barriers. In contrast, trade diversion occurs when imports/exports from countries with low import/export costs are replaced by imports/exports from countries with high import/export costs. To do this, and inspired by the proposed literature of Anderson et al. (2003), the gravity model of trade with multilateral resistance terms (MRTs) will be applied. In practice, we will employ the log-linearized version of the basic gravity model to capture how bilateral trade between two countries depends not only on the direct trade barriers between them but also on the trade barriers between each country and all others trading partners. This method is also used to estimate country-time effects and country-pair effects, solving by the same way, the bias of heterogeneity that can appear when dealing with panel data series as recommended by Baier et al., (2007). The principal contribution of this article is to analyze the effects of trade creation and trade diversion resulting from the free trade

agreements in force within the zone and their impact on global trade volume and disaggregate trade within the ECOWAS.

This article will follow the next structure: Section II provides a brief summary of trade within ECOWAS and the recent empirical research dealing with the global trade barriers in the regional agreement context. Section III provides a brief literature review on the gravity model precursors and its recent development. Section IV presents the results of the various analyses and final section V will present the conclusions.

ECOWAS: A Regional Integration

ECOWAS Trade Background

West African States' trade is evolving. Until recently, old trade links were used to develop trade in the region, but now the emphasis is on the development dimension of trade. Trade across the West African region has averaged 208.1 billion USD (United States dollar) since the 2000s. Exports are estimated at around 137.3 billion USD, as shown in Graph 1, and imports at nearly 80.4 billion USD. The region's trade surplus is attributable to Nigeria (58.4 billion USD) and Côte d'Ivoire (3.4 billion USD); all other countries recorded a trade deficit.

Trade within ECOWAS grew by an annual average of 18% between 2005 and 2014. Regional trade is dominated by mining products (oil resources, iron, bauxite, manganese, gold, etc.) and agriculture (coffee, cocoa, cotton, rubber, fruit and vegetables, and other products mainly marketed in the region, such as dried cereals, roots and tubers, livestock products, etc.). Nigeria, Côte d'Ivoire, Ghana, and Senegal share 87 percent of this trade, of which 79 percent relates to regional imports (55,520 million USD per year) and 94 percent to export and re-export activities (77,792 million USD per year) (Malick, 2020).

One of the key components of the Community's trade policy is the ECOWAS Trade Liberalization Scheme (ETLS). The objective is the gradual establishment of a customs union between the Member States of the Community over a period of fifteen (15) years, starting from January 1, 1990, the date of entry into force of the scheme. The establishment of a customs union will necessitate, amongst other provisions, the comprehensive abolition of all customs duties and taxes that bear an equivalent significance. It is designed to enable the Member States and

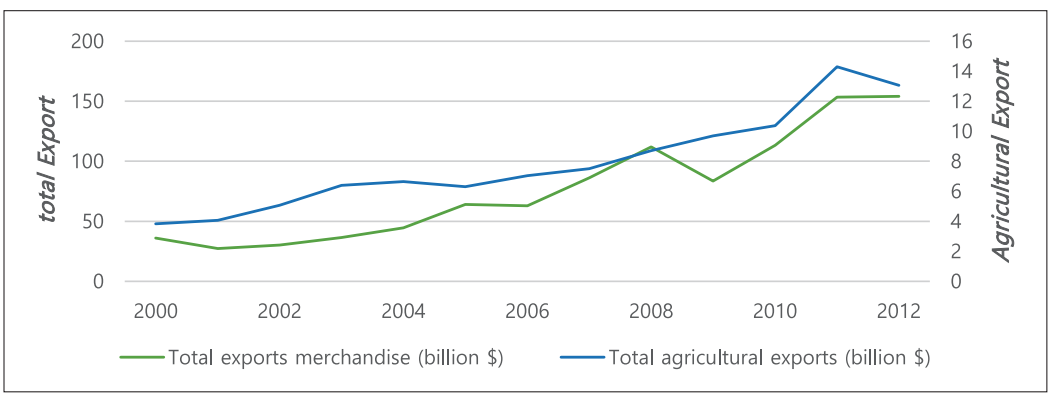

Figure 1. ECOWAS exports evolution
Source: ECOWAS (2013)

their citizens to derive numerous benefits from trade between them. For example, one of the advantages of importing unprocessed products from a Member State, as set out in Council of Ministers Decision C/DEC.8/11/79, is the total exemption from customs duties and taxes, the free movement of goods without quantitative restrictions, and the non-payment of compensation for loss of revenue resulting from importation.

One of the conditions laid down in this framework is that the unprocessed products must originate in the Member States of the Community and must appear on the list of products annexed to the Decision on the liberalization of trade in these products. Other conditions are laid down for categories relating to traditional crafts and industrial products. In practical terms, this also means that Member States are not required to introduce new taxes and charges having equivalent effect or to increase those already in force. The rates of these customs duties and taxes having equivalent effect, which serve as the starting point for the abolition of customs tariffs, are listed in the ECOWAS Customs Tariff for each member state. This is a binding rule for Member States, as they may not introduce new non-tariff barriers or increase those already in force.

All these actions have led to a situation where the ECOWAS Common External Tariff (CET), which came into effect in January 2015, has a real opportunity to stimulate the economies of West Africa while enabling the region's citizens to benefit effectively from the advantages of trade.

Empirical Literature Review on ECOWAS Trade

Recent political decisions taken by African governments have led to the creation of a number of economic and regional zones across the continent. One of the most dynamic of these, and one whose integration model has been followed for a long time, is ECOWAS. However, in order to further integrate the people of this zone, the West African Economic and Monetary Union (WAEMU) was created. Finally, all of these integration zones are not only created to stimulate the volume of trade between peoples, but also and above all, to create a trading bloc from which tariff and non-tariff barriers can be reduced. Exports from outside the region will thus become more competitive at both continental and extra-continental levels.

Various studies have looked at the main causes that can hinder or stimulate free trade and movement specifically within the African continent. Regarding the West African zone and in particular ECOWAS, the results of these various studies have shown diverse and varied outcomes.

As Afesorgbor et al. (2014) and other researchers found, multilateral trade resistance is also a source of trade barriers which can also affect the extent of trade among members within the ECOWAS zone. Osabuohien et al., (2019), by estimating the augmented gravity model, showed that WAEMU member countries tend to trade more among themselves than with other members of the ECOWAS zone, a phenomenon termed the "complementarity effect" on intra-ECOWAS trade. This result is confirmed by the findings of Ali et al. (2018), Afolabi et al. (2016), and Fajimolu et al. (2023). They found that the potential for trade within ECOWAS, once controlling for the quality of infrastructure and the production structure, is significantly revised downward and closer to its actual trade, especially for small economies in the community. This leads to trade diversion rather than trade creation. On the other hand, this diversion of trade improves the well-being of the population, albeit less than expected (Bakouan et al., 2021).

Very few manuscripts have dealt with trade creation and trade diversion within the ECOWAS zone and its impact on welfare. Coulibaly (2004) and Seid (2013) applied the gravity model to firstly measure the trade effect on various regional trade agreements (RTAs) and secondly to estimate the trade impact (welfare impact) on individual members of each RTAs. The results show that ECOWAS, as RTAs, presents intra-bloc trade creation. This means that within the economic area, countries with similar economic and social characteristics trade more among themselves

than with others, even though this diversion effect results in an improvement of welfare.

Deme et al. (2017), also by using the gravity regression, tried to show the welfare effect of RTAs among the lowest-income developing countries within ECOWAS. They found that economic integration of small and relatively low-income countries with a limited share of total trade between them is welfare-improving for the member countries collectively, for the majority of individual member countries, and for some third countries. Furthermore, low-income countries exhibit a particularly robust trade-creation effect. This tends to bring together countries belonging to the same monetary union, such as the WAEMU, which have a relatively similar purchasing power.

This result aligns with the research of Olufemi (2023). Using the gravity model, their results show that the participation of some ECOWAS members in the Global System of Trade Preferences among developing countries has resulted in trade diversion. In contrast, the participation of some ECOWAS members in the WAEMU has contributed to the level of trade creation in the ECOWAS region. Afolabi et al. (2017) agree with these findings, concluding that there is trade diversion between ECOWAS member countries based on the gravity model.

In the light of the various literatures exposed, the disparity in per capita income between low-income countries has the consequence of grouping these countries into intra-blocks for imports and exports with a view to facilitating trade among them. Therefore, assessing the extent to which differences in per capita income affect the global trade volume of ECOWAS members' trade volume taking into account the trade creation and diversion effects.

The gravity model has long been used to assess the important factors in the volume of trade between different countries within or outside the same economic zone. However, very few studies have extended this model to include variables such as the road infrastructure index, particularly within African economic zones. Martinez-Zarzoso et al. (2003) used the cross-section analysis to estimate the impact of road infrastructure variables in the gravity regression while Venables et al. (1999) used the cross-section over one year to do the same. Bergstrand (1985) and Arnon et al. (1996) used the difference in per capita income squared in a gravity regression to identify a possible Linder effect. Using the panel data methodology in the empirical application can cast a number of doubts on the interpretation of dummy variables when pooling time series or cross section analysis is applied. To avoid this problem, we use a two-step estimation process to estimate time-independent parameters and dummy coefficients using a fixed effects approach. Following these considerations, Brown et al. (2024) demonstrated how trust, security, and perceived disparities can significantly influence policy preferences and transnational behavior in Kenya, suggesting that intra-regional dynamics are also shaped by social and institutional perceptions. Similarly, Ahossey (2024) emphasized the manner in which historical legacies and asymmetric economic engagements, particularly with external powers such as China, influence the internal coherence of African regions, encompassing aspects such as trade policy effectiveness and democratic consolidation.

The Gravity Model

Gravity Model: The Theoretical Approach

In order to bring multilateral trade and trade and distance into the common toolbox of trade economists, Isard et al. (1954) empirically demonstrates the negative impact of distance for different modes of domestic and international trade by formulating a gravity equation using a metaphor from Newton's gravity theory. The basic gravity model is due to a group of Dutch economists led by Tinbergen, who were the first to actually publish a theoretical and empirical

application of the gravity model (Tinbergen, 1962) The basic form of the gravity equation is as follows:

$$T_{ij} = A \times \frac{Y_i Y_j}{D_{ij}} \tag{1}$$

where T_{ij} and is the bilateral trade flow between the country *i* and *j*. Y_i and Y_j represents respectively the economic size the two countries measured by the GDP, D_{ij} indicate the bilateral distance between the countries *i* and *j*. A is the constant term.

McCallum (1995) revealed that the border between the United States and Canada resulted in a substantial surge in trade between the two nations and Canadian provinces in 1988, amounting to a 2,200 percent increase compared to earlier years. This pronounced rise in trade volume was later highlighted by RogofF et al. (2000) as one of the key puzzles in international macroeconomics within the context of an open economy. To tackle the so-called "Border Puzzle," Anderson et al. (2003) proposed the following gravity model formulation:

$$ln\, T_{ij} = \beta_1 ln\,(Y_i) + \beta_2 ln\,(Y_j) + \beta_3 ln\,(D_{ij}) + \gamma RTA_{ij} + \epsilon_{ij} \tag{2}$$

where *ln* stands for the natural logarithm, RTA is a the preferential regional dummies. All the coefficients should be positive, except for β_3.

The Augmented Gravity Equation

To estimate our regressions, a cross-sectional panel database was created. The analysis of cross-sectional panel data has several advantages. Firstly, it allows you to see how variables change over time. Secondly, when we're using gravity models, it lets us think about the possible effects of individual countries that we haven't observed. This is important because, if these effects are connected to the things we're measuring, the usual OLS regression might be wrong.

The proposed gravity model framework below estimates the basic gravity model in equation (3.1) and adds the squared income per capita difference in equation (3.2). Note that the effects of trade creation and diversion are observed for all the equations through dummy variables.

$$\begin{aligned} ln\, T_{ijt} = {} & \alpha + \beta_1 ln\,(Y_{it}) + \beta_2 ln\,(Y_{jt}) + \beta_3 ln\,(P_{it}) + \beta_4 ln\,(P_{jt}) + \beta_5 ln\,(D_{ij}) + \\ & \gamma_1 TC_{ijt} + \gamma_2 ED_{ijt} + \gamma_3 ID_{ijt} + \epsilon_{ijt} \end{aligned} \tag{3.1}$$

$$\begin{aligned} ln\, T_{ijt} = {} & \alpha + \beta_1 ln\,(Y_{it}) + \beta_2 ln\,(Y_{jt}) + \beta_3 ln\,(P_{it}) + \beta_4 ln\,(P_{jt}) + \beta_5 ln\,(D_{ij}) + \\ & \gamma_1 TC_{ijt} + \gamma_2 ED_{ijt} + \gamma_3 ID_{ijt} + \delta(\Delta\ Y_{ijt})^2 + \epsilon_{ijt} \end{aligned} \tag{3.2}$$

Where $ln\, T_{ij}$ denotes variable in natural logarithm of bilateral trade between countries *i* and *j* at the time *t*. $ln(Y_{it})$ and $ln(Y_{jt})$ represent the logarithms of GDP for the exporting and importing countries. $ln(P_{it})$ and $ln(P_{jt})$ represents the logarithms of the population for the exporting and importing countries. $ln(D_{ij})$ is the logarithm of distance between trading-pair countries. TC_{ijt} is a dummy variable representing the trade creation effects. It takes the value of 1 when both countries are members of WAEMU and 0 otherwise. ID_{ijt} is a dummy variable representing the import diversion effects. It takes the value of 1 when the importing country is a member of WAEMU while the exporting country is not and ED_{ijt} is the export diversion dummy effect. It

takes the value of 1 when the exporting country is a member of WAEMU while the importing country is not. δ is the coefficient of the squared income different between exporters and importers, $(\Delta\ Y_{ijt})^2$. ϵ_{ijt} is the error term.

National income generally has a positive effect on the level of trade between countries, so the signs of the coefficients β_1 and β_2 are assumed to be positive. The estimated coefficient of the population is expected to be positive or negative. The sign depends on whether a country exports less when it is large or whether a large country exports more than a small country. Since individual time effects μ_t are now included in the regressions, we need to decide whether they should be treated as fixed or as random. To do this, the Hausman test is used to check whether the random effects model (REM) is more efficient than the fixed effects model (FEM). The second case will be the one favored when we assumed there is no link between μ_t the error stochastic term and the regressors. The gravity frameworks proposed in equation (4.1) and (4.2) respectively correspond to the basic gravity model and the augmented gravity model taking into account the potential time fixed effects:

$$\begin{aligned} ln\,T_{ijt} = {} & \beta_1 ln(Y_{it}) + \beta_2 ln(Y_{jt}) + \beta_3 ln(P_{it}) + \beta_4 ln(P_{jt}) + \beta_5 ln(D_{ij}) + \\ & \gamma_1 TC_{ijt} + \gamma_2 ED_{ijt} + \gamma_3 ID_{ijt} + \mu_t + \epsilon_{ijt} \end{aligned} \tag{4.1}$$

$$\begin{aligned} ln\,T_{ijt} = {} & \beta_1 ln(Y_{it}) + \beta_2 ln(Y_{jt}) + \beta_3 ln(P_{it}) + \beta_4 ln(P_{jt}) + \beta_5 ln(D_{ij}) + \\ & \gamma_1 TC_{ijt} + \gamma_2 ED_{ijt} + \gamma_3 ID_{ijt} + \delta(\Delta\ Y_{ijt})^2 + \mu_t + \epsilon_{ijt} \end{aligned} \tag{4.2}$$

Since the income difference variable $(\Delta\ Y_{ijt})^2$ is included in the model, there is a concern of multicollinearity. We need to test for the existence of a potential Linder effect. To avoid any presence of a multicollinearity effect between the income variables, the model will be estimated without the exporter and importer income variables:

$$\begin{aligned} ln\,T_{ijt} = {} & \beta_1 ln(P_{it}) + \beta_2 ln(P_{jt}) + \beta_3 ln(D_{ij}) + \gamma_1 TC_{ijt} + \gamma_2 ED_{ijt} + \gamma_3 ID_{ijt} + \\ & \delta(\Delta\ Y_{ijt})^2 + \mu_t + \epsilon_{ijt} \end{aligned} \tag{5}$$

Data

Data from 1999 to 2020 were used to carry out the regressions for each economic activity and the total volume of trade in each of the 15 ECOWAS member countries. The bilateral trade value is the sum of the total import and export for both trading pairs, country *i* and country *j*, for each period *t*, expressed in USD. The variable D_{ij} represents the distance between trading pairs of countries, expressed in kilometers. Variables Y_{it} and Y_{jt} represents the national income of the exporting and importing countries, measured by their respective Gross Domestic Product (GDP). Regarding the variable $(\Delta\ Y_{ijt})^2$, it represents the square of the difference in per capita income between the exporter and importer, as recommended by Arnon et al. (1996).

Finally, our variables representing the trade creation and import and export diversion effects are estimated through the following dummy variables TC_{ijt}, ID_{ijt}, and ED_{ijt}. We used the 8 WAEMU member states and their current bilateral trade agreements among them to build our trade effect dummy variables. The main descriptive statistics of our model variables are shown in Table 1.

Based on the values presented in Table 1, the average distance between ECOWAS member countries is around 1,294 km, with a wide disparity in terms of income between countries. The

Table 1. Descriptive statistics for all the industries

Variables	Unit	Description	Mean	Min	Max	Stand. dev	Obs.	Source
Distance	km	Distance from *i* to *j*	1294	109	3085	722	4619	CEPII
Exporter GDP	$ Billion	GDP of Exporter country	26.7	0.22	568.5	81.4	4619	World Bank
Importer GDP	$ Billion	GDP of Exporter country	26.4	0.41	568.5	81.5	4619	World Bank
Agricultural Raw Material Trade	$ Million	Bilateral Trade in Agricultural Raw Material	0.84	0	170	6.1	4619	Wits
Livestock Trade	$ Million	Bilateral trade in livestock	1.8	0	170	0.9	4619	Wits
Consumer Goods Trade	$ Million	Bilateral trade in consumer goods	25.8	0	750	10.3	4619	Wits
Textile and Clothing Trade	$ Million	Bilateral trade in textiles and clothing	17.9	0	750	1.5	4619	Wits
Processed Food Trade	$ Million	Bilateral trade in processed food products	4.5	0	140	24.3	4619	Wits
Service volume of Trade	$ Million	Bilateral trade in services	11.8	0	3,200	57.5	4619	Wits
Manufactured Goods Trade	$ Million	Bilateral trade in manufactured goods	17.2	0	3,800	79	4619	Wits
Total Trade Volume	$ Million	Total trade volume between ECOWAS countries	63.3	0	4,730	236	4619	Wits
Exporter Population	Capita Million	Population of exporter country	20.2	0.43	206.1	38.5	4619	World Bank
Importer Population	Capita Million	Population of importer country	19.8	0.43	206.1	37.5	4619	World Bank

Source: author's own computations.

minimum and maximum incomes for exporting countries are estimated to be around US$0.22 billion and US$568.5 billion, respectively, with an average value of US$26.7 billion, while those for importing countries are estimated to be 0.41 billion USD and 568.5 billion USD, respectively, for an average of 26.4 billion USD. Furthermore, trade in agricultural raw materials over the period 1999-2020 shows an average amount of 0.84 million USD, while trade in livestock products is estimated at an average of 1.8 million USD. However, the table shows that the volume of trade is much greater for processed products. In fact, consumer goods have the highest value in terms of trade volume within ECOWAS member countries, with an average estimated value of 25.8 million USD, followed by textiles, manufactured products, and services, with average values of 17.9 million USD, 17.2 million USD, and 11.8 million USD, respectively, over the same period. Among the manufactured products traded within the ECOWAS zone, processed foodstuffs have the lowest value, with an average value estimated at 4.5 million USD. Finally, according to the sampling carried out, an average amount of 63.3 million USD was exchanged between ECOWAS member countries between 1999 and 2020, with amounts reaching up to 4.7 billion USD.

Results

Pooled Ordinary Least Square and Between Regressions

We estimated the basic and the augmented gravity equations (3.1 and 3.2) following diverse methodologies, mainly for comparison purposes. The first method is the pooled Ordinary Least Squares (pooled OLS) method under the assumption that individual effects are not present. The results are presented in Table 2. The coefficient of the export diversion variable, when taken in absolute value, is greater than the coefficient of the trade creation variable, while the latter is greater than the coefficient of the import diversion dummy variable. The latter means that we are witnessing a pure trade creation effect and import-export diversion in all sectors of trade within the ECOWAS region and among WAEMU countries. However, in models where individual-specific effects are ignored, the constant (or intercept) may vary across observations. This variation can indicate that the model has not accounted for key factors that differ between individuals (or cases) and are correlated with the predictors. This unobserved heterogeneity can cause spurious correlation between the dependent and independent variables, leading to biased coefficient estimates (Wooldridge, 2010). Even though the results show the expected signs for each variable, and they are globally and highly significant, we should not accept the hypothesis of equality of individual effects. In order to verify the poolability of the data, researchers usually use the ordinary least squares between regression which is basically the difference in means. This regression is also an alternative to estimate long-run coefficients (Martinez-Zarzoso et al., 2003).

The between regression (difference between individuals) although having a stronger correlation coefficient, presents coefficients whose magnitudes are very close to those obtained with pooled regression. However, since the regression took into account the differences between individuals,

Table 2. Pooled and between results for augmented generalized gravity equations

	POOLED OLS dependent variable: TOTAL TRADE (eq.3.2)	BETWEEN REGRESSION dependent variable: TOTAL TRADE (eq.3.2)
Intercept	-5.51***	-9.51***
Exporter GDP	-0.20*	0.71*
Importer GDP	1.54***	2.49***
Population Exporter	-0.64***	-1.62***
Population Importer	1.11***	0.21
Distance	-1.02***	-1.15***
Difference in per capita income	0.03	-0.13
Trade Creation	1.50***	1.42***
Export Diversion	0.65***	0.60**
Import Diversion	-2.12***	-1.90***
R square	0.45905	0.64704
F-test	349.724	38.4968
Observations	3719	3719

Note: ***, **, * represents the level of significance at 1%, 5% and 10% levels respectively.

it can demonstrate the presence of individual effects within the variables. These results, therefore, confirm that the pooled regression is indeed spurious. It would be appropriate to take into account the suspected individual effects in the estimation of the different models.

On the other hand, dummy (or indicator) variables are frequently subject to multicollinearity, particularly when all categories are included without the exclusion of a reference category. In a regression model, the inclusion of all categories within a dummy variable may result in the occurrence of perfect collinearity, which hinders the estimation of coefficients for certain variables. To resolve the multicollinearity present within our dummy variables while also accounting for the individual effects inherent in each explanatory variable, it would appear that a fixed-effects regression over time is the optimal method.

Time Fixed Effects Regressions

The regression results for the time-fixed effects models are presented in Table 3. A Hausman test was conducted in order to test the null hypothesis that there is no correlation between the explanatory variables and individual effects. In light of the outcomes of the Hausman test, it appears that the fixed-effects model is the most suitable for the analysis of the various models under consideration. The chi-square value for the Hausman test confirms the high consistency of the fixed effects model, thereby indicating the inconsistency of the random effects model.

The R-squared results show that our selected explanatory variables significantly explain the level of trade between ECOWAS members. Trade in Textile Clothing and Food products are the most significant with respectively 52.25% and 51.30%. Which means that our selected variables explained respectively 52.25% and 51.30% of the level of trade in term of textiles clothing and food products, followed by manufactured products (48.83%), services (48.27%), consumer goods (49.77%), livestock (32.19%), and finally raw agricultural products (27.87%). In addition, the different Fisher test values obtained for each regression provide information about the very high significance of the different models. However, by examining the estimated coefficients, we see that they are all highly significant, except for our control variable indicating the difference in per capita income for importing and exporting countries.

The lack of relevance of the control variable “the difference in per capita income” is likely due to the presence of multicollinearity between the values of income from importing and exporting countries and our new variable. Nevertheless, the estimated models indicate that the trade dummy variables are all highly statistically significant and also, the trade creation effect coefficients are all greater than those of import diversion effects, which suggests a pure trade creation effect across all sectors within the ECOWAS zone. Furthermore, the trade creation effect coefficients are higher than the export and import diversion effect coefficients, which is characteristic of a trade creation effect. Furthermore, the import diversion effect showed a coefficient inferior to the export diversion effect, which means that there is a clear export diversion effect within the economic area.

In summary, the regression with fixed time effects, despite exhibiting a discrepancy at the level of the variables indicating the influence of income disparities between importing and exporting countries, nevertheless demonstrates there exists a pure trade creation effect as well as export diversion effects. It would be enlightening to examine the actual effect of income disparities within the ECOWAS zone using a statistical technique known as Linder regression taking into account the time fixed effect within our variables.

Table 3. Time Fixed effects models results

	dependent variable: TOTAL TRADE (eq.4.2)	dependent variable: AGRO. RAW MATERIALS (eq.4.2)	dependent variable: LIVESTOCK (eq.4.2)	dependent variable: CONSUMER GOODS (eq.4.2)	dependent variable: TEXTILE AND CLOTHING (eq.4.2)	dependent variable: FOOD PRODUCT (eq.4.2)	dependent variable: SERVICE (eq.4.2)	dependent variable: MANUFACTURE PRODUCTS (eq.4.2)
Exporter GDP	0.42***	0.75***	0.42***	0.28**	0.61***	0.44***	-0.60***	0.22*
Importer GDP	2.42***	1.08***	0.86***	2.04***	1.03***	1.70***	1.88***	1.83***
Population Exporter	-1.54***	-0.86***	-0.46	-1.34***	-0.57***	-1.03***	-1.19***	-1.00***
Population Importer	0.54***	-0.23**	0.11	0.68***	0.12	0.48***	0.38***	0.71***
Distance	-1.02***	-1.01***	-0.84***	-1.23***	-1.41***	-1.32***	-1.44***	-1.27***
Difference in per capita income	-0.06*	-0.03	-0.01	0.04	-0.02	0.06**	-0.02	-0.02
Trade Creation	1.47***	0.73***	1.11***	1.54***	1.23***	1.35***	1.34***	1.36***
Export Diversion	0.67***	0.24***	0.24***	0.64***	0.31***	0.17**	0.16*	0.46***
Import Diversion	-2.07***	-1.06***	-1.64***	-2.09***	-1.66***	-1.88***	-2.03***	-2.05***
R square	0.49374	0.3003	0.3244	0.50165	0.52245	0.51302	0.48828	0.51327
F test	399.636	175.874	196.763	412.49	448.304	434.154	393.236	432.114
Observations	3719	3719	3719	3719	3719	3719	3719	3719

Note: ***, **, * represents the level of significance at 1%, 5% and 10% levels respectively.

Table 4. Time Fixed effects models with Linder effect results

	dependent variable: TOTAL TRADE (eq.5)	dependent variable: AGRI. RAW MATERIALS (eq.5)	dependent variable: LIVESTOCK (eq.5)	dependent variable: CONSUMER GOODS (eq.5)	dependent variable: TEXTILE AND CLOTHING (eq.5)	dependent variable: FOOD PRODUCT (eq.5)	dependent variable: SERVICE (eq.5)	dependent variable: MANUFACTURE PRODUCTS (eq.5)
Exporter GDP	-	-	-	-	-	-	-	-
Importer GDP	-	-	-	-	-	-	-	-
Population Exporter	1.21***	0.35***	0.51***	0.98***	0.58***	0.90***	0.95***	1.08***
Population Importer	0.94***	0.53***	0.54***	0.94***	0.74***	0.90***	0.96***	0.90***
Distance	-1.03***	-1.00***	-0.84***	-1.24***	-1.41***	-1.32***	-1.44***	-1.28***
Difference in per capita income	0.15***	0.13***	0.09***	0.21***	0.12***	0.22***	0.18***	0.13***
Trade creation	1.51***	0.74***	1.13***	1.57***	1.24***	1.37***	1.36***	1.39***
Export Diversion	0.65***	0.22***	0.22***	0.63***	0.30***	0.16*	0.14*	0.45***
Import Diversion	-2.16***	-1.11***	-1.68***	-2.18***	-1.70***	-1.95***	-2.11***	-2.12***
R square	0.41837	0.25739	0.3068	0.44312	0.44732	0.47317	0.45935	0.46147
F test	379.178	182.704	233.303	419.457	426.643	473.454	447.879	451.717
Observations	3719	3719	3719	3719	3719	3719	3719	3719

Note: ***, **, * represents the level of significance at 1%, 5% and 10% levels respectively.

Time Fixed Effect Regressions with Linder Effect

The results showed in Table 4 highlights the pure trade creation effect accompanied by the export diversion effect within the ECOWAS is maintained. In addition, although the level of population can play a catalytic role in significantly boosting trade, there is a clear disparity in incomes within countries, which has a fairly strong impact on the volume of overall trade. However, the low significance of the variable describing the effects of export diversion in terms of services and food products trade tells us that this effect is almost negligible for these sectors.

From the perspective of the coefficients of our independent variables, we note that all of them are highly significant, which denotes a clear importance of these variables in our regressed model. Moreover, an increase of 1% in the population of the exporting country will have an impact on an increase in the total volume of trade of 1.21%, all other factors being equal. However, this increase turns out to be less (i.e., 1.08%, 0.35% and 0.51%) in the case of the volume of manufactured products, the volume of trade in raw agricultural products and livestock respectively. An increase of 1% in the population of the importing country will result in a 0.94% increase in the total volume of trade, all things being equal. The 1% increase in the population of the importing country will respectively result in a 0.96% increase in the volume of trade in services, 0.90% in the volume of trade in manufactured goods, 0.54% in trade in livestock, and 0.53% in the volume of trade in agricultural raw materials. Regarding the distance variable, a 1% increase in the distance between importing and exporting countries will reduce the total volume of trade within ECOWAS by approximately 1.03%, in accordance with gravity theory. Whether in one sector of the economic activity or another, this reduction has a varying impact on the volume of trade. This is particularly the case for the volume of trade in services, which is set to fall by around 1.44%, while there will be a reduction of 1.41% in manufactured goods, 1% in agricultural raw materials, and 0.84% in the volume of trade in livestock.

Our control variable shows that a one-unit increase in the squared difference in per capita income between the exporting and importing countries is associated with a 0.15% increase in trade, all other things being equal. As the coefficient is positive, this suggests that the greater the income difference between the two countries (in both directions), the greater the trade. The latter finding reinforces our hypothesis of export diversion within the ECOWAS zone.

According to the trade effects dummy variables, it is evident that they are also highly statistically significant, with coefficients that are largely comparable across the regression models for total trade volume and the disaggregate models. This suggests that the conclusions regarding the creation or diversion of trade may be consistent when considering the global or disaggregate trade volume. Therefore, and looking at the different coefficients, we find the same conclusion as in the pooled models (i.e. there is indeed a pure effect of trade creation within the ECOWAS region and that this effect is accompanied to some extent by export diversion effects).

Conclusion and Policy Implications

The principal aim of the present study was to see the effects of trade creation and trade diversion within the ECOWAS zone through the West African Economic and Monetary Union. To achieve this, we applied the gravity model by incorporating the difference in squared per capita income as a control variable and also with trade creation and trade diversion dummy variables. Trade creation occurs when a trade agreement, such as a customs union, leads to increased trade between member countries due to the reduction or removal of tariffs or barriers. It allows countries to import goods more cheaply from their partners rather than producing

them domestically. However, the trade diversion effect happens when countries within a trade agreement area begin to import goods from less efficient member countries instead of those from more efficient non-members, due to tariff preferences, which can result in a welfare loss.

We examined the effects of trade creation and trade diversion in explaining bilateral trade for all the 15 ECOWAS countries, considering the WAEMU member countries, and also evaluated the impact of differences in per capita income on trade. We did this using both aggregate and disaggregated models, covering firstly the whole ECOWAS countries bilateral trade and then each sector of economic activity. A panel data framework was employed to facilitate these regressions, allowing us to better identify all the heterogeneity that could arise between the variables used for each trading partner.

The estimated regressions demonstrated highly significant results for our different estimated models, confirming the importance of the chosen variables, as they all proved to be statistically significant. Our results showed that there is a pure effect of trade creation within the ECOWAS region, accompanied by export diversion effects taking the level of trade as a whole or after disaggregating each economic activity sector's level of trade. The results showed a pure trade creation effect in ECOWAS, suggesting that the trade agreement has effectively increased trade between member states, which is a positive outcome for regional economic integration. However, the presence of export diversion effects implies that some trade is being diverted from more efficient global markets to less efficient regional markets, which could lead to a welfare loss; And also indicates the need for ECOWAS to balance regional trade growth with strategies that minimize inefficiencies caused by trade diversion, and particularly toward non-member countries. Furthermore, the correlation between the exporter and importer populations and the promotion of trade is indicative of a positive relationship between population size and trade flows.

The observed outcomes can be attributed to the existence of larger domestic markets, which offer greater demand and supply capacity, thereby encouraging more significant economic exchanges. It is suggested that, as populations within the ECOWAS region continue to grow, trade volumes are likely to increase, thereby further supporting regional integration. Also, it is recommended that policymakers should redirect their efforts towards the provision of support for population-driven economic activities, with a view to ensuring the sustained and enhanced growth of trade in all sectors. In the context of rising customs duties, precipitated by soaring inflation, and the subsequent decline in the purchasing power of the population, certain member states have called into question the continued relevance of this economic community.

The article's implications can be therefore distilled into three key areas: trade policy, regional integration and economic inequality. With regard to the first point, the disparity in per capita income between ECOWAS member countries provides a stimulus for trade, thereby indicating that policies could be devised with the objective of promoting economic harmonization in order to maximize intra-regional trade. Concerning the regional integration issue, the trade creation effect within ECOWAS points to a strengthening of regional trade. However, the export diversion effect could result in a loss of welfare, necessitating the formulation of a strategy to enhance the integration of non-WAEMU countries. Ultimately, income divergence exerts a considerable influence, underscoring the necessity to consider economic disparities between countries in order to optimize trade benefits within ECOWAS.

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References

Afesorgbor S. K. and Van Bergeijk P. A. G. (2014). Measuring multi-membership in economic integration and its trade impact: a comparative study of ECOWAS and SADC. *South African Journal of Economics,* 82, p. 518–530.

Afolabi L. O., Aznin A. B. N. and Izraf A. A. M. (2017). ECOWAS Regional Integration and Trade Effect: A Dynamic Panel Cointegration Method Using the Gravity Model. *International Journal of Economic Perspectives,* 11.

Afolabi L. O., Bakar N. A. A. and Aziz A. (2016). The Gravity model approach: An Application on the ECOWAS Trading Block. *The South East European Journal of Economics and Business,* 11.

African Development Bank. (2003). Review of the Implementation Status of the Trans-African Highway and the Missing Links, African Development Bank and United Nations Economic Commission for, Africa, Tunis.

Ahossey, K. (2024). *Do colonial legacy and engagement with China impact the effectiveness of the European aid in promoting democracy in African states?* International Area Studies Review, 27(4), 341–352. https://doi.org/10.69473/iasr.2024.27.1.57

Ali A. A. and Berahab, R. ((2018). Trade Integration in the Economic Community of West African States: Assessing Constraints and Opportunities Using an Augmented Gravity Model. *OCP Policy Center*.

Anderson J. E. and Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American economic review,* 93, p. 170–192.

Arnon A. and Spivak, A. (1996). Monetary integration between the Israeli, Jordanian and Palestinian economies. *Weltwirtschaftliches Archiv,* 132, p. 259–277.

Bakouan M., Boccanfuso D. and others. (2021). General Equilibrium Effects of Trade Liberalization in ECOWAS Countries: Structural Gravity Approach. *Modern Economy,* 12, p. 274.

Baier, S. L., & Bergstrand, J. H. (2007). Do free trade agreements actually increase members' international trade?. *Journal of international Economics*, *71*(1), 72-95.

Bergstrand, J. H. (1985). The gravity equation in international trade: some microeconomic foundations and empirical evidence. *The review of economics and statistics*, 474-481.

Brown, A. D., Shin, W.-J., Bae, J. H., & Byeon, J. (2024). *Trust, sense of security, and immigration policy preferences of the Kenyan public.* International Area Studies Review, 27(4), 401–415. https://doi.org/10.69473/iasr.2024.27.1.57

Carrère, C. (2006). Revisiting the effects of regional trade agreements on trade flows with proper specification of the gravity model. *European Economic Review*, 50(2), 223–247.

Coulibaly S. (2004) On the assessment of trade creation and trade diversion effects of developing RTAs. *Lausanne: University Lausanne Working paper No45*.

Deme M. and Ndrianasy E. R. (2017). Trade-creation and trade-diversion effects of regional trade arrangements: Low-income countries. *Applied Economics,* 49, p. 2188–2202.

ECOWAS. (2022). *ECOWAS 2050 Vision: A regional strategy for inclusive growth and sustainable*

development. Commission de la CEDEAO. https://ecowap.ecowas.int/media/ecowap/file_document/2021_ECOWAS_2050_Vision_EN.pdf

Fajimolu O., Olayemi O. and others. (2023). Analyzing Trade Creation and Trade Diversion effects in ECOWAS Regional Trade Agreement. *Business and Entrepreneurial Review,* 23, p. 143–156.

Isard W. and Peck M. J. (1954). Location theory and international and interregional trade theory. *The Quarterly Journal of Economics,* 68, p. 97–114.

Krugman P. and others, The move toward free trade zones. (1991) *Economic Review,* 76 No 6 *Federal Reserve Bank of Kansas* City, p. 5

Malick, S. (2020). Effects of the Common External Tariff on intra-regional trade: The case of the West African Economic and Monetary Union and the Economic Community of West African States. *Studies of Applied Economics*, *38*(3).

Martinez-Zarzoso et al., (2003). Augmented gravity model: An empirical application to Mercosur-European Union trade flows. *Journal of applied economics,* 6, p. 291–316.

Martínez-Zarzoso, I., Nowak-Lehmann, D. F., & Horsewood, N. (2009). Are regional trading agreements beneficial? Static and dynamic panel gravity models. *North American Journal of Economics and Finance*, 20(1), 46–65.

McCallum J. (1995). National borders matter: Canada-US regional trade patterns. *The American economic review,* 85, p. 615–623.

Olufemi Olabode, O. (2023). Analysing Trade Creation and Trade Diversion Effects in ECOWAS Regional Trade Agreement.

Osabuohien E. S. (2019). Bilateral trade performance in West Africa: A gravity model estimation. *African Development Review,* 31, p. 1–14.

Rogoff, K., & Obstfeld, M. (2000). The six major puzzles in international macroeconomics: is there a common cause?. *NBER macroeconomics annual*, *15*, 339-390.

Seid E. H. (2013). Regional integration and trade in Africa: Augmented gravity model approach. *Horn Economic and Social Policy Institute* (HESPI).

Tinbergen J. (1962). Shaping the world economy. *The International Executive,* 5, p. 27–30.

Venables A. and Limao, N. (1999). Infrastructure, Geographical Disadvantage, and Transport Costs.

Viner, J. (1950). Customs union theory. *NY: Carnegie Endowment for International Peace.*

Wooldridge, J. M. (2010). Econometric analysis of cross section and panel data*, MIT press.*

Appendix

Trade Creation and Trade Diversion Effect

By following the Carrère (2006) and Martinez-Zarzoso et al. (2009) reflections, a solitary observation of intra-bloc trade I_{ijt} is inadequate for substantiating the occurrence of net trade creation in a free trade area (FTA) To illustrate, an augmentation in intra-bloc exports (X_{ijt}) may be concomitant with a diminution in imports from extra-bloc countries (M_{ijt}). The trade creation and diversion effects may be mutually offset. Therefore, in addition to the coefficient of free trade agreement (FTA_{ij}), it is imperative to analyse the magnitudes and directions of trade among member and non-member countries (T_{ijt}).

According our models developed, let assume that $\gamma_1 X_{ijt}$ denotes the change in intra-bloc exports and $\gamma_2 M_{ijt}$ denotes the change in extra-bloc imports, where:

- $\gamma_1 X_{ijt} > 0$ indicates an increase in intra-bloc exports.
- $\gamma_2 M_{ijt} > 0$ indicates an increase in extra-bloc imports.

The presence of both $\gamma_1 X_{ijt} > 0$ and $\gamma_2 M_{ijt} > 0$ indicates the occurrence of a trade creation effect, concomitant with an increase in exports from intra-bloc countries to extra-bloc countries. We should conclude a pure trade creation among WAEMU countries. However, if it is accompanied by $\gamma_2 M_{ijt} < 0$, it will then denote that there are a trade creation effects and export diversion effects combination. Here, if we can conclude that despite trade creation effects being offset to a certain extent by export diversion effects, trade creation still prevails (Krugman et al., 1991).

Conversely, if $\gamma_1 X_{ijt} < 0$ and $\gamma_2 M_{ijt} < 0$, a dominant export diversion effect will be demonstrated, representing a welfare loss for member countries. The potential trade effects of an FTA have been specifically delineated by Martinez-Zarzoso et al. (2009).