

# Analysis of the effects of the African Continental Free Trade Area (AfCFTA) on the labor market in the Central African Economic and Monetary Community (CEMAC)

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## Abstract

**Purpose** – The objective of this paper is to analyze the effects of the African Continental Free Trade Area (AfCFTA) Agreement on the labor market within the Central African Economic and Monetary Community (CEMAC).

**Design/methodology/approach** – The study is applied to 53 African countries and covers a period of 18 years from 2004 to 2021. To achieve this, we used the gravity model and performed two separate regressions. The first regression aimed to assess the effect of the AfCFTA on trade, while the second sought to analyze the relationship between trade and the unemployment rate within the CEMAC zone.

**Findings** – The results suggest that, despite the real trade potential, the AfCFTA Agreement has not yet had significant effects on trade between CEMAC countries and their African trading partners since its official launch in 2019. The results also show a negative relationship between trade and the unemployment rate in the CEMAC zone. Specifically, an increase of one unit in trade flows is associated with a decrease of 0.002% in the unemployment rate, holding other factors constant. Therefore, an increase in trade, particularly through the removal of tariff barriers among African countries under the AfCFTA Agreement, could potentially reduce unemployment in the CEMAC zone.

**JEL Classification** — F13, F15, F16, F19, C50, O24, O55

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The authors are indebted to the editor and reviewers for constructive comments.

*Conflict of interest:* The authors declare that they have no conflict of interest.

*Ethical approval:* This article does not contain any studies with human participants or animals performed by the authors.

*Data availability:* The data for this research are available upon request.

*Funding statement:* We did not receive any funding for this study.



**Originality/value** – This study complements the extant literature by assessing the effects of the AfCFTA on the labor market in the Central African Economic and Monetary Community (CEMAC).

**Keywords** AfCFTA, Labor market, CEMAC, Gravity model

**Paper type** Research paper

## 1. Introduction

For many decades, the African continent has been in a process of regional integration. Aware of the opportunities offered by successful economic integration, African leaders have, since independence, laid the foundations for continental economic integration. To this end, the Abuja Treaty was signed in 1991, and came into force in 1994. The Abuja Treaty, which gave birth to the African Economic Commission (AEC), marked a milestone in efforts to strengthen economic and monetary integration in Africa. With the AEC, African leaders set themselves the objective to: (1) create regional blocs in regions where they did not yet exist; (2) strengthen intra-RECs (Regional Economic Communities) integration and inter-RECs harmonization; create a free-trade zone and customs union in each regional bloc; (3) establish a continent-wide free-trade zone and (4) create a continent-wide customs union and common market, *inter alia* (Tchamyou *et al.*, 2023; Asongu, 2023). African countries have, managed to achieve some of these objectives. Moreover, the latest step to be taken is the creation of an African continental free-trade zone.

Indeed, in line with the objectives of the ECA and the African Union's (AU) Agenda 2063, the African Continental Free Trade Area (AfCFTA) was launched in 2019, following the ratification of the Agreement by 22 countries, and entered into force in January 2021. To date, the AfCFTA agreement has been signed by 54 of the continent's 55 member states, 46 of which have already ratified it (AfCFTA Secretariat, 2024; Tchamyou *et al.*, 2023). By signing this continental agreement, African states committed themselves to seven main objectives, including the elimination of 90% of tariffs across the continent. However, the six member states of the Central African Economic and Monetary Community (CEMAC) are among those committed to eliminating tariff and non-tariff barriers on a continental scale.

The CEMAC member states, aware of their low level of development and the enormous potential opportunities offered by a continent-wide free trade area, were among the first African states to sign and ratify the AfCFTA agreement. With a market estimated at 1.3 billion potential consumers and a combined GDP of over \$3,000 billion (AfCFTA Secretariat, 2024), the AfCFTA is seen as a great asset for all the countries of the continent in general and those of the CEMAC in particular.

The African Continental Free Trade Area (AfCFTA), with its objective of removing trade barriers and promoting economic integration across the continent, is likely to have significant impacts on the labor market across Africa in general and in the CEMAC region in particular. Indeed, according to the World Bank (WB), the AfCFTA could enable African countries to increase employment opportunities and income, thereby helping to lift 30 million people out of extreme poverty and boosting the income of 68 million people living on less than \$5.50 per day (including 12 million in West Africa and 9.3 million in Central Africa). The agreement is expected to create an additional 18 million jobs continent-wide and increase African exports by \$560 billion (World Bank, 2020). Similarly, the International Monetary Fund (IMF) states that the AfCFTA agreement could boost intra-African trade by 52.3% in the short term. This is expected to particularly benefit the manufacturing sector, which in turn will have a high demand for labor. It is therefore with the aim of leveraging these potential positive effects of the AfCFTA that the CEMAC countries have signed and ratified the AfCFTA agreement to address their significant economic challenges.

It should be noted that despite the numerous trade agreements signed (CEMAC, CEEAC and CEN-SAD) by the member countries of the community, trade between the country's signatory to these economic and trade agreements remains very low (2.24% in the CEMAC zone and 2.49% in the CEEAC zone, according to TRADE MAP data, 2024). This low volume

of intra-Community trade has therefore not boosted economic growth or solved the problem of unemployment, especially since the unemployment rate in 2022 was 10.14% in the CEMAC zone (average rates of the region calculated from World Bank data). In 2023, 1 in 4 young people in the CEMAC region were neither working nor enrolled in school or training (World Bank, 2024). Several factors may explain the low volume of trade in these RECs. These include the problem of very limited infrastructure, high administrative costs, very low product diversification, low productive complementarity and administrative slowness. In addition to these problems, which have a negative impact on intra-African trade, some studies have also deemed the AfCFTA inequitable (Berthelot, 2016). In other words, the potential effects of this agreement will not be the same for all signatory countries. Accordingly, some will benefit more from the AfCFTA, while others will not, hence the need to study the real impact of the AfCFTA on the CEMAC area, and more specifically on the labor market. To our knowledge, the gravity model has not yet been used in a similar study in the CEMAC zone, unlike the general equilibrium model, which has been widely applied (Chauvin *et al.*, 2016; Abrego *et al.*, 2019; Masiya, 2019; World Bank, 2020).

From all these findings, in line with the economic literature which is very mixed on the effects of trade integration on economies and job (Balassa, 1961; Anderson and Van Wincoop, 2003; Krugman, 1991), we aim to study in this paper, the implications of the AfCFTA on the labor market in the CEMAC zone. More specifically, formulating the hypothesis that the AfCFTA has contributed to reducing unemployment through trade since its official launch in 2019, we study, with the help of a gravity model, the effects of the AfCFTA Agreement on unemployment in CEMAC countries using panel data over the period 2004–2021.

To complete this work, the rest of this paper is structured as follows: the second section covers the literature review, the third the stylized facts, the fourth the methodology and discussion of the results, and the last section concludes with a general conclusion.

## 2. Literature review

### 2.1 Theoretical review

In the theoretical literature, the implications of trade openness for economies in general and the labor market in particular have long been the subject of debate. Since the seminal work of Ricardo (1817), many theorists have addressed the issue (Heckscher, 1919; Ohlin, 1933; Stolper and Samuelson, 1941; Viner, 1950). Despite this abundance of literature, the subject of the effects of trade on the labor market remains unresolved (Abueg, 2018). Indeed, in the theoretical literature, the vast majority of authors defending the idea that trade has a positive impact on the labor market agree on one point: by removing barriers to trade, the demand for goods and services increases and, in turn, the demand for labor. As a result, unemployment falls in countries participating in international trade through free trade. However, even among those authors who stress that trade has positive effects on the labor market, some of them emphasize the temporal aspect of the contributions of international trade on unemployment. According to this theory, in the short term, when a country opens up to foreign competition through free trade, local firms may face increased competition from foreign firms, which can lead to a drop in demand for local products. This, in turn, leads to higher unemployment until local firms readjust to the new market (Cragg and Epelbaum, 1996).

For Viner (1950), free trade has two effects on economies: a trade creation effect and a detour effect. The detour effect arises from the shift from a more efficient partner to a less efficient one. Together, these two effects lead to a new dynamic in trade flows under a free-trade agreement.

### 2.2 Empirical review

From an empirical point of view, many studies have examined the relationship between free-trade zones, trade flows and labor markets, particularly in African countries. The empirical

literature is also mixed on this question. Some studies showed that trade openness can have a positive impact on unemployment (Matusz, 1996; Ali *et al.*, 2021; Anyanwu, 2014), while other studies show opposite results (Anjum and Perviz, 2016; Behanzin and Konté, 2022). According to Matusz (1996), when two countries enter into a trade agreement, the result is an increase in employment in both countries. In a study of all Organization of Islamic Cooperation (OIC) countries, Ali *et al.* (2021) found that trade openness has a significant and negative relationship with the unemployment rate across all OIC economies. Anyanwu (2014) also demonstrated that increased intra-African trade can reduce youth unemployment. Anjum and Perviz (2016), working on 75 countries, found that in labor-abundant countries, trade openness has a significant negative impact on long-term unemployment. But they also found that in capital-rich countries, trade openness has a significant positive impact on long-term unemployment. Moreover, Behanzin and Konté (2022) found a significant negative effect of trade openness on unemployment in UEMOA countries. For the authors, this result can be explained by the fact that “the level of production for external sales is not yet sufficient to significantly affect the unemployment rate” in UEMOA countries. Itskhoki and Helpman (2015) also showed in a study that lowering trade barriers can increase unemployment.

However, with regard to the potential effects of the AfCFTA on trade and job creation, Table 1 below summarizes some empirical studies along these lines.

### 3. Stylized facts

#### 3.1 Trade trends in CEMAC countries

As pointed out in the introduction, despite the many trade agreements signed by African countries in general and CEMAC countries in particular, trade between the continent’s countries is still low. Intra-African trade was estimated at 13.77% in 2021, and trade between CEMAC countries at 6.87% in the corresponding year (UNCTAD, 2022). As the graphs below show, intra-CEMAC trade has remained virtually stagnant over the period 2004–2021.

Although the volume of trade between CEMAC member countries has increased since 2004, Figure 1 shows that the share of trade between CEMAC member countries has hardly changed at all. Over the 18 years considered in this study, intra-CEMAC trade (i.e. trade between CEMAC member countries) has varied by only 1.37%, while trade with other African countries has increased by 2.07%. This clearly shows that, despite the signing of several trade agreements – described as a “spaghetti bowl” – inter-African trade remains below expectations, highlighting the need for more ambitious economic and trade policies to stimulate regional trade.

#### 3.2 The labor market in the CEMAC area

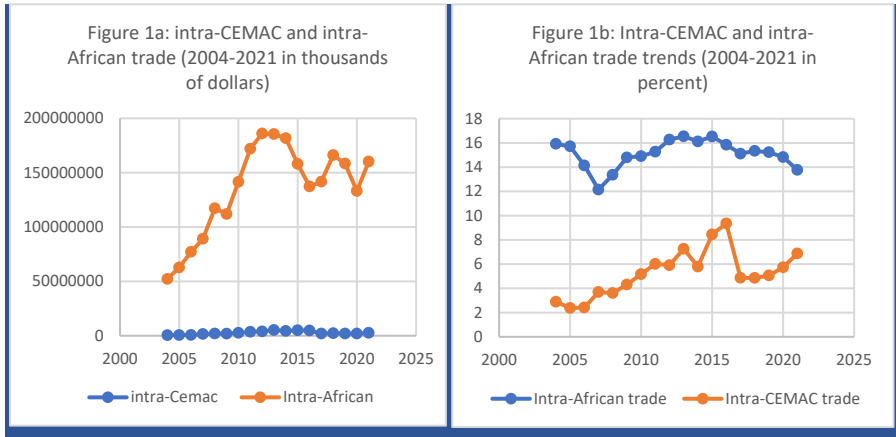
In the CEMAC zone, the labor market faces numerous challenges with specific characteristics. The average unemployment rate (as defined by the ILO) is relatively low, at 10.96% in 2021, while the rate of vulnerable employment is very high (73.13%) over the same period (average rates of the region calculated from World Bank data) in all countries in the zone.

This paradox can be explained by the method of collecting unemployment data using International Labor Organization (ILO) calculations. However, this data collection method is based on the ILO definition of work, which is often criticized in Africa and in developing countries in general. These criticisms stem from the fact that the boundary between activity and inactivity is not well defined in these countries (Mbaye and Gueye, 2018). Considering the World Bank data and noting a particularly low unemployment rate in CEMAC countries, which does not seem to correspond to reality, we felt it necessary to combine the unemployment rate with the vulnerable employment rate in order to obtain more representative data. This approach has been frequently adopted in the specialized literature (Golub and Hayat, 2014).

**Table 1.** Some empirical work on the AfCFTA

Authors	Methodology	Theme	Results
<a href="#">Abrego et al. (2019)</a>	MEGC	The African Continental Free Trade Agreement: Welfare gain estimates from a general equilibrium model	The findings of <a href="#">Abrego et al. (2019)</a> reveal significant potential gains in trade and welfare from trade liberalization in Africa
<a href="#">Geda and Yimer (2023)</a>	Trade indices and gravity model	The trade effects of the African Continental Free Trade Area (AfCFTA): an empirical analysis	Both authors found in their results with the index that the AfCFTA Agreement could have limited effects in terms of trade creation and a strong possibility of trade detour. On the other hand, the model results note a real trade potential for the AfCFTA. When the two methods are combined, the AfCFTA may boost intra-African trade (exports) by US\$72.7 billion on average annually between 2015 and 2017. However, given the results based on trade indices, this positive result should be taken with caution
<a href="#">Masunda (2020)</a>	Gravity model	The implications of the African Continental Free Trade Area for intra-COMESA trade	The author has found that the AfCFTA has potential for trade in the COMESA region. Above all, the study shows that it has great potential for the region's exports
<a href="#">Charles (2021)</a>	Gravity model	Continental African Free Trade Area: Does Côte d'Ivoire have commercial potential?	Charles's results reveal significant trade potential for Côte d'Ivoire in Africa, in at least 25 countries. These include 8 countries in the Economic Community of West African States (ECOWAS)
<a href="#">Bayale et al. (2022)</a>	WITS-SMART simulation model	Potential trade, welfare and income implications of the African Continental Free Trade Area (AfCFTA) for Ghana: an application of the partial equilibrium model	The authors conclude that while consumer welfare will improve, total trade effects in Ghana are expected to rise by US\$148.3 million. However, the nation may soon face revenue losses of \$8.604 million due to a decline in tariff revenues
<a href="#">Chauvin et al. (2016)</a>	CGE model	Impacts of the AfCFTA on trade, growth and well-being in Africa	According to the authors, trade patterns inside and between African nations as well as between different sectors would shift asymmetrically as a result of the AfCFTA. Additionally, they discover that while the long-term effects of the AfCFTA are largely favorable, the short-term effects are typically fairly minimal
<a href="#">World Bank (2020)</a>	CGE model	Distributional effects of the AfCFTA on poverty and employment	This World Bank report states that the AfCFTA's adoption would result in a net rise in the number of workers in the energy-intensive manufacturing sector, as well as an increase in job prospects and earnings for unskilled workers and a reduction in the gender wage gap

**Source(s):** Authors



Source(s): Authors based on TRADEMAP (Trade Statistics for International Trade Development) data

Figure 1. Evolution of intra-CEMAC and intra-African trade between 2004 and 2021 in thousands of dollars and as a percentage

Cumulatively, we have an average unemployment rate of 83.28% over the 2004–2021 period. This clearly shows the scale of unemployment in the CEMAC zone. Figure 2 also shows that the labor market has not changed much in the CEMAC countries between 2004 and 2021. In 2004, the average unemployment rate in the CEMAC zone was 9.45%. By 2021, this had risen to 10.96%. Meanwhile, the average rate of vulnerable employment was 75.52% in 2004, but had fallen slightly to 73.13% in 2021. These statistics reveal a worrying stability in the labor market over the years, despite the multiple trade and political agreements adopted by CEMAC members.

Although all CEMAC member countries are classified as Least Developed Countries (LDCs), both unemployment and vulnerable employment rates vary from country to country, as shown in Figure 3.



Source(s): Authors based on World Bank data

Figure 2. Change in unemployment rate and vulnerable employment in the CEMAC between 2004 and 2021 (in %)



**Source(s):** Authors based on World Bank data

**Figure 3.** Unemployment rate and vulnerable employment

According to World Bank data for the year 2021, [Figure 3](#) shows that among CEMAC member countries, Congo has the highest unemployment rate, reaching 22.62%. In contrast, Chad has the lowest unemployment rate, at just 1.59%. In terms of vulnerable employment, the Central African Republic has the highest rate in the zone, peaking at 92.31% in 2021, while Gabon has the lowest, at 31.43%. So, although the labor market varies from country to country, it is clear that the vulnerable employment rate far exceeds the unemployment rate in all CEMAC countries. These findings reinforce criticisms of unemployment data collection in developing countries.

## 4. Gravity model and data

### 4.1 The gravity model

Following a strand of studies ([Geda and Yimer, 2023](#); [Charles, 2021](#)), it is possible to use the gravity model to study the effects of the AfCFTA. Since the middle of the 20th century, the gravity model has been used to explain trade flows. It is based on Isaac Newton's gravitational law (1687), which states that the force of gravity between two objects is directly proportional to the product of their masses and inversely proportional to the square of their distance. Following the work of [Tinbergen \(1962\)](#), who employed the gravity model to explain trade using variables such as the size of economies, geographical distance and contiguity (the land border), the gravity model has been used extensively in economic literature to explain the impact of trade flows on economies ([Geda and Seid, 2015](#)). The gravity model offers several advantages. Beyond providing a relatively simple and transparent structure, which facilitates the interpretation of results and the identification of causal relationships between variables, it generally requires less data. This is not the case for some models, such as the CGE model, which requires detailed social accounting matrices and other specific data for accurate calibration.

Moreover, in Africa, and particularly in the CEMAC countries, social accounting matrices are very outdated, which can pose a problem for the use of CGE models. For example, in Chad, the most recent social accounting matrix dates back to 2011.

The first equation or [Equation \(1\)](#) of the gravitational law taken from physics is provided below:

$$FC_{ij} = G \cdot \frac{(M_i \times M_j)}{D_{ij}^2} \quad (1)$$

$FC_{ij}$  is the force of attraction,  $G$  is a universal gravitational constant,  $M_i$  and  $M_j$  are the masses and  $D$  is the distance.

This first equation of the traditional law was extended for application to the social sciences in the 1960s, notably with the pioneering work of [Tinbergen \(1962\)](#), [Pöyhönen \(1963\)](#) cited by [Dihissou \(2017\)](#). Through these works, these authors apply a simple transposition of Newton's gravitational law applied to international trade. This gives an economic expression of the Cobb-Douglas type as follows in [Equation \(2\)](#):

$$FC_{ij} = A \frac{(GDP_i^\alpha \times GDP_j^\beta)}{D_{ij}^\lambda} \quad (2)$$

where  $FC_{ij}$  denotes the trade flows between country  $i$  and country  $j$ ;  $GDP_i$  and  $GDP_j$  are the GDPs of country  $i$  and  $j$  respectively;  $D_{ij}$  represents the geographical distance between the two countries;  $A$  is a constant (under the assumption of  $\alpha + \beta + \lambda = 0$ ). The gravity model applied to commerce supports the notion that trade between two countries is proportional to the product of their respective GDPs and inversely proportionate to their distance from one another, in line with Newtonian law of gravity. The disappearance of the square on distance is explained by the implicit assumption of perfect proportionality; (i.e. that elasticities must be unitary). By linearizing, the model becomes as follows in [Equation \(3\)](#):

$$\ln FC_{ijt} = \ln G + \ln GDP_{it} + \ln GDP_{jt} - \ln D_{ij} \quad (3)$$

To study the effects of the AfCFTA on unemployment in the CEMAC zone and based on the fact that the gravity model is simple and versatile due to the multiplicity of its applications ([Yotov et al., 2016](#)) and can be extended to add other variables, to overcome estimation problems such as omitted variable bias ([Jato et al., 2023](#)) we resort to an "augmented gravity equation" by adding other variables apart from size (GDP) and geographical distance ( $D$ ). These variables of interest that will be augmented in an augmented gravity equation can be qualitative and quantitative variables) ([Rose, 2000](#)).

By specifying the model to our study, it returns in the form in [Equation \(4\)](#):

$$\begin{aligned} \ln FC_{ij,t} = & \alpha_0 + \alpha_1 \ln GDP\_Cap_{i,t} + \alpha_2 \ln GDP\_Cap_{j,t} + \alpha_3 \ln Dist_{ij,t} + \alpha_4 AfCFTA_{ij,t} \\ & + \alpha_5 Cont_{ij} + \alpha_6 Lan_{ij,t} + \varepsilon_{ijt} \end{aligned} \quad (4)$$

with  $FC_{ij,t}$  the trade flows of countries  $i$  and countries  $j$  at time  $t$ ;  $GDP\_Cap_{i,t}$  the GDP per capita of CEMAC member countries at time  $t$ ;  $GDP\_Cap_{j,t}$  the GDP per capita of partner countries at time  $t$ ;  $Dist_{ij,t}$  the distance separating CEMAC countries from their African trading partners at time (here taking the distance between different capitals, it is assumed that this distance depends on time given that some countries have changed capitals over the period considered in this study);  $AfCFTA_{ij,t}$  a binary variable representing the AfCFTA Agreement that takes 1 if both partner countries have signed and ratified the Agreement at the time  $t$  considered, and 0 if not;  $Cont_{ij}$  (Contiguous) a binary variable that takes 1 if both partner countries share a common border and 0 if not;  $\ln Lan_{ij,t}$  is also a binary variable that takes 1 if country  $i$  and country  $j$  have a common official language at time  $t$  (a country's official language can also change over time) and 0 otherwise;  $\varepsilon_{ijt}$  is the error term.

Drawing on the literature which states that the removal of trade barriers encourages trade flows between partner countries, we therefore assume that the AfCFTA has a positive impact

on trade flows between African countries, and hence we consider that  $\alpha_4$  will be greater than 0, if there is no trade detour of course. Based on this assumption and inspired by Equation (4), we can capture the impact of the AfCFTA on unemployment in the CEMAC zone with the following model in Equation (5):

$$\ln Unemployment_{ij,t} = \alpha_0 + \ln FC_{ij,t} + \ln GDP\_Cap_{i,t} + \ln AfCFTA_{ij,t} + \ln FC_{ij,t} \# \ln AfCFTA_{ij,t} + \varepsilon_{ijt} \quad (5)$$

Here the dependent variable  $Unemployment_{ij,t}$  is the unemployment rate in the CEMAC zone;  $FC_{ij,t}$  represents the trade flows between country i and country j at time t;  $\ln FC_{ij,t} \# \ln AfCFTA_{ij,t}$  is the interaction term between the AfCFTA Agreement and the trade flows of CEMAC and partner countries at time t and  $GDP\_Cap_{i,t}$  the GDP per capita of CEMAC member countries at time t.

#### 4.2 Data sources

We have a panel data structure with a time dimension equal to 18 years (2004–2021), and a country dimension equal to 6 (the six CEMAC countries). A total of 108 observations are therefore apparent. With interactions in line with the gravity model and our study of the AfCFTA, we added 47 African countries in addition to the CEMAC countries (so we took a total of 53 African countries out of the 54 on the continent. The only African country not included in our database is Seychelles which is removed due to data unavailability. We therefore have a total of 5,724 bilateral observations ( $18 \times 6 \times 53 = 5,724$ ).

Our data on GDP, education and unemployment (unemployment rate and vulnerable employment) come from the World Bank’s (WDI) data. Trade data come from the Trade Market Access Portal (Trade MAP) database. Data on other variables (distance, contiguity and language) come from the “Center d’études prospectives et d’informations internationales” (CEPII). The corresponding variables are provided in Table 2.

The selection of these explanatory variables is based on established economic theories and empirical studies. GDP per capita is included as a proxy for the economic size of countries, as a larger economy is likely to generate increased demand and, consequently, create more jobs. The AfCFTA is used in Equation (4) to capture the effect of a country’s participation in the agreement. According to the literature, the smaller the geographical distance between two countries, the lower the transaction costs associated with transportation. This is why control variables such as distance and contiguity have been chosen. Finally, the choice of the official language variable is justified by its role in facilitating trade and economic interactions between countries.

**Table 2.** The expected signs of Equations (4) and (5)

Explanatory variables for Equation (4)	Expected signs	Explanatory variables for Equation (5)	Expected signs
<i>GDP_Capi</i>	+	<i>FCij</i>	–
<i>GDP_Capj</i>	+	<i>GDP_Capi</i>	–
<i>AfCFTAij</i>	+	<i>AfCFTAij</i>	–
<i>Cont ij</i>	+	<i>ln FC<sub>ij,t</sub> # ln AfCFTA<sub>ij,t</sub></i>	–
<i>Langij</i>	+		
<i>Dist_ij</i>	–		

**Source(s):** Authors

The selection of the variables in Equation (5) is also motivated by theoretical and empirical considerations. The variable  $FC_{ij}$ , representing trade flows, was chosen because trade could have a positive impact on the labor market, as previously highlighted by the Heckscher-Ohlin model. The variable  $GDP\_Hab\_i$ , representing the GDP of CEMAC countries, was included because economic literature consistently shows that GDP per capita is an indicator of a country's wealth and level of economic development. A higher GDP per capita is generally associated with a better standard of living, increased demand for goods and services, and therefore more employment opportunities.

As mentioned earlier, the AfCFTA aims to remove trade barriers between African countries, and the inclusion of this variable allows for an analysis of the evolution of unemployment in the context of a trade agreement like the AfCFTA. Lastly, the interaction variable is introduced to capture the joint effects of the AfCFTA and trade flows on unemployment. Theoretically, the impact of a trade agreement on unemployment could depend on the intensity of trade between member countries.

### 5. Estimation results and discussion

As outlined above, in our study we have considered CEMAC member countries as reporting countries and other African countries as trading partners (47 in total).

The gravity model generally uses four estimators, namely ordinary least squares (OLS), fixed effects, random effects and Poisson pseudo-maximum likelihood (PPML) estimators. In this study, we opted for the PPML approach for Equation (4) and the Tobit estimator for Equation (5).

Our choice of the PPML estimator in Equation (4) was guided by two main reasons. Given that the dependent variable in this equation is trade flows ( $FC_{ij}$ ) between African countries and CEMAC countries, the first reason is that the PPML estimator accounts for the bias associated with heteroscedasticity. Secondly, given that bilateral trade data between African countries is zero between several partners, this estimator is able to deal with this problem and produce fairly robust results (Geda and Yimer, 2023).

For Equation (5), our choice of the Tobit estimator is due to the fact that in this equation, the dependent variable is no longer trade but rather the unemployment rate. The Tobit estimator is known for its ability to handle censored data to provide consistent and unbiased results. Given that our dependent variable is the unemployment rate with data ranging between 0 and 1, the most suitable estimator for obtaining unbiased results is the Tobit estimator.

Table 3 shows that trade flows are positively and significantly correlated with all variables except distance (0.293, 0.116, 0.008,  $-0.340$ , 0.131, 0.362). The AfCFTA variable is not significant.

Table 4 shows a negative but significant correlation between the unemployment rate and trade flows ( $-0.115^*$ ). It is also observed that there is a negative but significant correlation

**Table 3.** Results of correlation matrix analysis between variables in Equation (4)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) $\ln\_FC_{ij}$	1.000						
(2) $\ln\_GDP\_Cap\_j$	0.293*	1.000					
(3) $\ln\_GDP\_Cap\_i$	0.116*	0.017	1.000				
(4) AfCFTA <sub>ij</sub>	0.008	0.113*	0.007	1.000			
(5) $\ln\_Dist$	$-0.340^*$	$-0.040^*$	$-0.070^*$	$-0.036^*$	1.000		
(6) Lang <sub>ij</sub>	0.131*	$-0.035^*$	$-0.081^*$	0.012	$-0.122^*$	1.000	
(7) contig	0.362*	0.099*	$-0.087^*$	0.004	$-0.502^*$	0.222*	1.000

**Note(s):** Significance is at 5%

**Source(s):** Estimates made by the authors using Stata software

**Table 4.** Results of correlation matrix analysis between variables in Equation (5)

Variables	(1)	(2)	(3)	(4)	(5)
(1) Unemployment_ij	1.000				
(2) ln_GDP_Cap_i	-0.636*	1.000			
(3) ln_FC_ij	-0.115*	0.100*	1.000		
(4) AfCFTA_ij	-0.001	0.007	0.028	1.000	
(5) ln_AfCFTA_ijf # FC_ij	-0.006	0.012	0.173*	0.886*	1.000

**Note(s):** Significance is at 5%

**Source(s):** Estimates made by the authors using Stata software

between the unemployment rate and the GDP of CEMAC countries ( $-0.636^*$ ). This means that if the unemployment rate decreases in the CEMAC zone, their GDP per capita could increase. The correlation between the AfCFTA\_ij variable ( $-0.0006$ ) and the unemployment rate is almost zero, indicating that the Free Trade Agreement (AfCFTA) does not have a direct effect on the unemployment rate. Additionally, there is a negative and non-significant correlation between the interaction variable (the AfCFTA and trade flows between countries i and j) and the unemployment rate in the CEMAC zone.

The results of the AfCFTA Agreement on trade flows provided in Table 5 show that most variables have a positive coefficient. GDP per capita of CEMAC countries has a positive and significant coefficient at 5% ( $0.0558^{**}$ ) on trade flows. This indicates that a 1% increase in CEMAC member countries' GDP per capita is associated with a 5.6% increase in trade flows between CEMAC countries and their African partners, all else being equal. The GDP per capita of partner countries also explains positively and significantly ( $0.124^{***}$ ) trade between the pairs. In relative terms, this means that, all other things being equal, a 1% increase in the GDP per capita of African trading partners is associated with a 12.4% increase in trade flows.

**Table 5.** Regression results for Equation (4)

	(1) ln_FC_ij
ln_GDP_Cap_i	0.0558** (3.17)
ln_GDP_Cap_j	0.124*** (7.13)
AfCFTA_ij	0.00178 (0.09)
ln_Dist	-0.181*** (-4.15)
Contig	0.215* (2.02)
Lang_ij	0.152** (2.81)
_cons	2.995*** (8.63)
Lalpha	-1.690*** (-18.95)
N	4,394

**Note(s):** Significance at 1% (\*\*\*), 5% (\*\*) and 10% (\*)

The results table presents the estimated coefficients for each variable, accompanied by their respective t-statistics in parentheses

**Source(s):** Estimates made by the authors using Stata software

For the variable  $AfCFTA_{ij}$ , which represents the AfCFTA Agreement, the results show a positive but insignificant coefficient (0.00178). This indicates that the signing and ratification of the AfCFTA has not yet had a significant effect on trade flows between CEMAC countries and their African partners. In other words, from its official launch in July 2019 until 2021, the AfCFTA Agreement has had no effect on trade between CEMAC countries and their trading partners. This result is in line with the work of [Chauvin et al. \(2016\)](#), who found that the AfCFTA Agreement has no significant effects on trade in the short term. The positive coefficient of our result indicates that the Agreement has trade potential between the pairs in line with the work of [Charles \(2021\)](#), [Geda and Yimer \(2023\)](#), [Geda and Seid \(2015\)](#) and the [World Bank \(2020\)](#).

The other variables in the gravity model, notably language ( $Lang_{ij}$ ) and contiguity (shared border between country  $i$  and country  $j$ ), have positive and significant coefficients at 5% and 10%, respectively ([Table 6](#)). This suggests that language and sharing a common border have an impact on trade between pairs. The distance variable ( $Dist$ ) has a significant negative coefficient as expected (0.152\*\*). In relative terms, this means that, all other things being equal, a 1% increase in geographical distance is associated with a 15.2% decrease in trade flows between CEMAC countries and their African partners. This negative relationship between distance and trade has been found by [Carrère \(2016\)](#), [Geda and Yimer \(2023\)](#) and [Charles \(2021\)](#).

The results of this second regression using the Tobit estimator reveal that GDP per capita in the CEMAC zone has a highly significant impact on unemployment at the 1% level. With a negative and significant coefficient, this result suggests that economic development, as reflected by GDP per capita, is associated with a decrease in unemployment. This is consistent with our initial hypothesis. The variable  $\ln\_FC_{ij}$ , which represents the logarithm of trade flows between CEMAC countries and other African countries, also shows a negative and highly significant coefficient. This outcome, as expected, indicates that increased intra-African trade contributes to reducing unemployment.

The results further show that the mere existence of an agreement between the continent's countries does not help reduce unemployment in the CEMAC region. With a positive and insignificant coefficient (0.00219), the AfCFTA seems to have no direct positive impact on unemployment in the CEMAC zone on its own. This result was anticipated, especially since the literature does not point to a direct relationship between unemployment and trade agreements such as the AfCFTA. The link is rather indirect and often operates through an increase in trade volumes between partner countries. This justifies the inclusion of the interaction variable between trade flows and the AfCFTA, which shows a negative and significant coefficient, as expected.

Thus, even though the AfCFTA itself does not have a direct impact on unemployment, the negative interaction indicates that the combined effect of increased trade flows and participation in the AfCFTA tends to reduce unemployment. In other words, when trade flows increase within the framework of the AfCFTA, this mitigates the potentially negative effect of the AfCFTA alone on unemployment. This could suggest that trade liberalization under the AfCFTA, by further stimulating trade, may have a beneficial effect on the labor market in the medium to long term, as expected. This result, indicating that trade positively influences the unemployment rate within the framework of a free trade agreement, is consistent with the findings of several previous studies ([Matusz, 1996](#); [Ali et al., 2021](#); [Anyanwu, 2014](#)). However, it contrasts with results obtained by others ([Anjum and Perviz, 2016](#)), who found that the removal of tariff barriers increases the unemployment rate.

## 6. Robustness checks

This [Section 6](#) of the article is dedicated to robustness tests. To this end, we conducted several robustness analyses. First, to verify whether the results are sensitive to the model specification, we performed estimations using the Ordinary Least Squares (OLS) method, as carried out in several studies, following the example of [Leamer \(1983\)](#). Upon comparison, the coefficients, signs, and significance of the variables remained unchanged. Next, we excluded the major

**Table 6.** Analysis of Equation (5) results

Variables	(1) Unemployment_ij	(2) /	(3) Unemployment_ij	(4) /	(5) Unemployment_ij	(6) /
ln_GDP_Cap_i	-0.0802*** (0.00129)		-0.0861*** (0.00155)		-0.0860*** (0.00155)	
AfCFTA_ij	0.00219 (0.00566)				0.0332** (0.0135)	
var(e.Unemployment_ij)		0.0148*** (0.000277)		0.0156*** (0.000330)		0.0156*** (0.000330)
ln_FC_ij			-0.00251*** (0.000562)		-0.00221*** (0.000593)	
c.ln_FC_ij#c.AfCFTA_ij					-0.00326* (0.00185)	
Constant	0.893*** (0.00195)		0.903*** (0.00409)		0.899*** (0.00429)	
Observations	5,724	5,724	4,459	4,459	4,459	4,459

**Note(s):** Significance at 1% (\*\*\*), 5% (\*\*) and 10% (\*)  
The results table presents the estimated coefficients for each variable, accompanied by their respective t-statistics in parentheses  
**Source(s):** Estimates made by the authors using Stata software

economies from the sample to examine the impact on the results. In the first scenario, we excluded Cameroon, the largest economy in CEMAC (Table 7). In the second scenario, we excluded both Cameroon and Gabon (Table 8). In both cases, the results remained stable. We also excluded years prior to the implementation of the AfCFTA Agreement to observe any changes (Table 9). Once again, no significant changes were found. Finally, we added additional control variables, including a variable representing diplomatic disagreements between countries (Table 10). After performing all these tests, we conclude that the results of our analysis are robust.

Beyond these analyses, we conducted several additional tests, including the heteroscedasticity test, the normality test, the correct specification test, the multicollinearity test, the endogeneity test, and an interaction robustness test. These tests are included in the [appendix](#) of the document.

### 7. Concluding implications and future research directions

The aim of this article was to analyze the effects of the African Continental Free Trade Area Agreement (AfCFTA) on the labor market within the Economic and Monetary Community of Central Africa (CEMAC). This study covers an 18-year period, from 2004 to 2021, with a panel of 53 countries. To do this, we used the gravity model and carried out two separate regressions. The first regression aimed to assess the effect of the AfCFTA on trade, while the second was designed to analyze the relationship between trade and the unemployment rate within the CEMAC zone.

The results of these regressions show that, on the one hand, the signing and ratification of the AfCFTA Agreement has not yet had a significant effect on trade flows between CEMAC countries and their African partners. However, this contradicts our initial hypothesis that the Agreement has helped to increase trade between African countries between 2019 and 2021. But this result has trade potential. In other words, although trade potential exists with the

**Table 7.** Analysis of the results of [Equations \(4\) and \(5\)](#) without Cameroon

Equation (4)	(1)	Equation (5)	(1)	(2)
Variables	ln_FC_ij	Variables	CHOMAGE_i	/
ln_GDP_Cap_j	0.137*** (0.0199)	ln_GDP_Cap_i	-0.0941*** (0.00172)	
ln_GDP_Cap_i	0.0647*** (0.0185)	ln_FC_ij	-0.000396 (0.000716)	
AfCFTA_ij	-0.00134 (0.0222)	AfCFTA_ij	0.0290* (0.0152)	
ln_Dist	-0.173*** (0.0490)	c.ln_FC_ij#c. AfCFTA_ij	-0.00347 (0.00212)	
Lang_ij	0.144** (0.0600)	var(e. Unemployment_ij)		0.0176*** (0.000418)
contig	0.218* (0.121)	Constant	0.914*** (0.00499)	
Constant ln_FC_ij	2.886*** (0.390)	Observations	3,569	3,569
/lnalpha	-1.678*** (0.0988)		(1)	(2)
Observations	3,519			
Number of identifiant	235			

**Note(s):** Standard errors in parentheses

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

**Source(s):** Estimates made by the authors using Stata software

**Table 8.** Analysis of the results of Equations (4) and (5) without Cameroon and Gabon

Equation (4)	(1)	Equation (5)	(1)	(2)
Variables	ln_FC_ij	Variables	CHOMAGE_i	/
ln_GDP_Cap_j	0.138*** (0.0240)	ln_GDP_Cap_i	-0.0383*** (0.000490)	
ln_GDP_Cap_i	0.0630*** (0.0219)	ln_FC_ij	0.00192*** (0.000203)	
AfCFTA_ij	-0.00418 (0.0260)	AfCFTA_ij	0.00827* (0.00422)	
ln_Dist	-0.167*** (0.0595)	c.ln_FC_ij#c. AfCFTA_ij	-0.000187 (0.000618)	
Lang_ij	0.143** (0.0710)	var(e. Unemployment_ij)		0.00108*** (2.94e-05)
contig	0.249* (0.138)	Constant	0.932*** (0.00136)	
Constant ln_FC_ij	2.823*** (0.473)	Observations	2,709	2,709
/lnalpha	-1.580*** (0.112)			
Observations	2,674			
Number of identifiant	183			

**Note(s):** Standard errors in parentheses  
\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$   
**Source(s):** Estimates made by the authors using Stata software

**Table 9.** Analysis of the results of Equations (4) and (5) excluding the years prior to the implementation of the AfCFTA

Equation (4)	(1)	Equation (5)	(1)	(2)
Variables	ln_FC_ij	Variables	CHOMAGE_i	/
ln_PIB_Hab_j	0.152*** (0.0327)	ln_PIB_Hab_i	-0.0991*** (0.00399)	
ln_PIB_Hab_i	0.0468* (0.0276)	ln_FC_ij	-0.00426** (0.00203)	
ZLECAf_ij	0.0414 (0.0389)	ZLECAf_ij	0.0264 (0.0181)	
ln_Dist	-0.151*** (0.0467)	c.ln_FC_ij#c.ZLECAf_ij	-0.000753 (0.00266)	
Lang_ij	0.153*** (0.0580)	var(e.CHOMAGE_i)		0.0151*** (0.000729)
contig	0.294*** (0.112)	Constant	0.914*** (0.0131)	
Constant ln_FC_ij	2.723*** (0.373)	Observations	861	861
/lnalpha	-1.808*** (0.118)			
Observations	849			
Number of identifiant	283			

**Note(s):** Standard errors in parentheses  
\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$   
**Source(s):** Estimates made by the authors using Stata software

**Table 10.** Analysis of the results of Equations (4) and (5) with the inclusion of the diplomatic disagreement variable

Equation (4) Variables	ln_FC_ij	Equation (5) Variables	CHOMAGE_i	/
ln_PIB_Hab_j	0.129*** (0.0180)	ln_pibo	-0.0941*** (0.00280)	
ln_PIB_Hab_i	0.0506*** (0.0182)	ln_FC_ij	-0.000619 (0.000704)	
ZLECAf_ij	0.0140 (0.0257)	ZLECAf_ij	0.0427*** (0.0208)	
ln_Dist	-0.204*** (0.0496)	c.ln_FC_ij#c.ZLECAf_ij	-0.00354 (0.00279)	
Lang_ij	0.139** (0.0551)	diplo_disagreement	0.0367*** (0.00696)	
contig	0.181 (0.111)	var(e.CHOMAGE_i)		0.0206*** (0.000454)
diplo_disagreement	-0.00633 (0.0299)	Constant	2.328*** (0.0443)	
Constant ln_FC_ij	3.190*** (0.397)	Observations	4,118	4,118
/lnalpha	-1.681*** (0.0904)			
Observations	4,057			
Number of identifiant	283			

**Note(s):** Standard errors in parentheses  
\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$   
**Source(s):** Estimates made by the authors using Stata software

AfCFTA Agreement, it has not yet influenced trade between CEMAC countries and their partners since its official entry into force in July 2019. On the other hand, the results of the second regression show a negative relationship between trade and the unemployment rate in the CEMAC zone. Therefore, we can conclude that an increase in trade, particularly through the removal of tariff barriers among African countries under the AfCFTA Agreement, could lead to a decrease in unemployment in the CEMAC zone. However, the results of the second regression indicate that the mere existence of a free trade agreement does not have a direct effect on unemployment in the CEMAC zone. Instead, the results show that the AfCFTA Agreement affects unemployment through its impact on trade.

In terms of implications, based on the results obtained in the paper, it can be said that although the AfCFTA agreement does not yet have a significant impact on trade flows within CEMAC, it remains essential for policymakers on the continent to accelerate efforts aimed at strengthening regional economic integration. This could include implementing policies to facilitate trade between CEMAC member countries and their African partners. The results indicate that trade has the potential to reduce unemployment in the CEMAC zone. Therefore, policymakers should consider addressing the technical challenges related to trade between African countries, particularly by improving infrastructure and simplifying customs procedures. Additionally, the results show that education contributes to reducing the unemployment rate in the CEMAC zone. Thus, it is crucial for CEMAC governments to invest in the development of their workforce's skills. This could involve vocational and technical training programs, as well as initiatives to improve access to quality education. Furthermore, although the Agreement has been signed by the vast majority of African countries, it is important to note that some countries have not yet ratified this Agreement. Therefore, to have a real impact at the continental level, policymakers must encourage these countries to proceed with ratification. The low diversification of African economies and the high endowment of

natural resources do not encourage trade between African countries. It is therefore necessary to diversify economies and transform these resources to take advantage of the opportunities offered by the AfCFTA. Moreover, the labor market in the CEMAC zone is characterized by informal employment, with a significant agricultural workforce. This limits access to many opportunities, such as access to credit, labor rights, and social protection. Therefore, CEMAC authorities must consider promoting policies aimed at formalizing and diversifying the economy.

Despite the results, this work is not without its limitations. The first limitation of this work is the evaluation period of the AfCFTA. Although it was launched in July 2019, the AfCFTA did not really come into force until January 2021. Consequently, the 2019–2021 period covered by this study is not long enough to see any real effects of this Agreement. The second limitation of this work is inherent in the non-existence of data on bilateral trade between African countries. Data between African countries do not exist for the two previous years (at least to our knowledge). This is what forced us to assess the AfCFTA only for the period 2019–2021, whereas the study should extend to 2023 to have meaningful results. Given that the study highlights the significant potential of the AfCFTA Agreement for intra-African trade as well as its positive impact on unemployment in the CEMAC region, an analysis using more recent data could provide more conclusive results. Furthermore, future research could focus on the effects of the AfCFTA on specific sectors (agriculture, industry, services) to better understand its implications for trade and employment in these areas. Additionally, an analysis based on dynamic simulation models or other approaches, such as computable general equilibrium (CGE) models, could help better capture the long-term effects of the Agreement.

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### Appendix

**Table A1.** The different variables in Equation (4)

Variables	Definitions	Sources
<i>Dependante variable</i>		
FC <sub>ij</sub>	Total trade (imports/exports) of CEMAC countries and partners	Trade MAP
<i>Independantes variables</i>		
GDP_Capi	Gross Domestic Product per capita of CEMAC countries in millions of dollars	WDI
GDP_Capj	Gross Domestic Product per capita of the partner country in millions of dollars	WDI
AfCFTA <sub>ij</sub>	Is a dummy variable which takes the value 1 if both countries are signatories and 0 otherwise	
Contiguous <sub>ij</sub>	Dummy variable, which takes the value of 1, when the two trading partners are adjacent, and 0 otherwise	CEPII
Langue <sub>ij</sub>	Dummy variable takes the value of 1, when the two partners have the same official language, and 0 otherwise	CEPII
Distance	Variable measuring the distance between trading partners	CEPII
<b>Source(s):</b> Authors' compilation		

**Table A2.** The different variables in Equation (5)

Variables	Definitions	Sources
<i>Dependante variable</i>		
Unemployment <sub>i</sub>	The sum of the unemployment rate (% of total active population) (ILO model estimate) and vulnerable employment in CEMAC countries	WDI
<i>Independantes variables</i>		
FC <sub>ij</sub>	Total trade (imports/exports) between CEMAC countries and partners	Trade MAP
GDP <sub>Capi</sub>	Gross domestic product of CEMAC countries in millions of dollars	WDI
AfCFTA <sub>ij</sub> #FC <sub>ij</sub>	Binary variable of the AfCFTA and trade flows	Authors
<b>Source(s):</b> Authors' compilation		

**Table A3.** Descriptive statistics for Equation (4)

Variable	Obs	Mean	Std. Dev.	Min	Max
ln FC <sub>ij</sub>	3,665	6.82	3.334	0	15.029
ln GDP Cap <sub>j</sub>	5,460	0.198	1.058	-2.104	3.155
ln GDP Cap <sub>i</sub>	5,724	0.765	1.25	-1.121	3.155
AfCFTA <sub>ij</sub>	5,724	0.088	0.284	0	1
ln Dist	5,640	7.717	0.755	2.079	8.677
Lang <sub>ij</sub>	5,640	0.518	0.5	0	1
contig	5,640	0.086	0.28	0	1
<b>Source(s):</b> Authors' compilation					

**Table A4.** Descriptive statistics for Equation (5)

Variable	Obs	Mean	Std. Dev.	Min	Max
Ln_Unemployment <sub>i</sub>	5,724	4.4	0.219	3.914	4.595
ln FC <sub>ij</sub>	4,459	6.314	3.344	0	15.029
ln_GDP <sub>i</sub>	5,724	0.765	1.25	-1.121	3.155
AfCFTA <sub>ij</sub>	5,724	0.088	0.284	0	1
AfCFTA <sub>ij</sub> #FC <sub>ij</sub>	4,459	0.708	2.303	0	13.416
<b>Source(s):</b> Authors' compilation					

**Table A5.** Multicollinearity test for Equation (4)

	VIF	1/VIF
contig	1.521	0.657
ln Dist	1.452	0.689
Lang ij	1.074	0.931
Ln_GDP_Cap_i	1.036	0.965
Ln_GDP_Cap_j	1.035	0.966
AfCFTA_ij	1.012	0.988
Mean VIF	1.188	

**Source(s):** Authors' compilation**Table A6.** Multicollinearity test for Equation (5)

	VIF	1/VIF
Ln_GDP_Cap_i	1.01	0.99
ln FC ij	1.125	0.889
AfCFTA_ij	5.023	0.199
c.ln FC ij#c.AfCFTA_ij	5.174	0.193
Mean VIF	3.083	

**Source(s):** Authors' compilation**Table A7.** Heteroscedasticity test for Equation (4).

Random-effects Poisson regression							
ln_FC_ij	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ln_GDP_Cap_j	0.124	0.023	5.50	0	0.08	0.168	***
ln_GDP_Cap_i	0.056	0.018	3.04	0.002	0.02	0.092	***
AfCFTA_ij	0.002	0.017	0.10	0.917	-0.031	0.035	
ln_Dist	-0.181	0.04	-4.52	0	-0.26	-0.103	***
Lang_ij	0.152	0.052	2.93	0.003	0.05	0.254	***
contig	0.215	0.079	2.71	0.007	0.06	0.37	***
Constant	2.995	0.312	9.60	0	2.383	3.607	***
lnalpha	-1.69	1.291	.b	.b	-4.22	0.84	
Mean dependent var		6.341			SD dependent var		3.343
Number of obs		4,394			Chi-square		6213.636
Prob > $\chi^2$		0.000			Akaike crit. (AIC)		18837.912

**Note(s):** \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ **Source(s):** Authors' compilation

**Table A8.** Correct Specification test: RESET test for Equation (4)

Robust						
ln_FC_ij	Coef.	Std.Err.	z	p > z	[95% Conf	Interval]
ln_GDP_Cap_j	0.122	0.007	17.820	0.000	0.108	0.135
ln_GDP_Cap_i	0.044	0.006	7.600	0.000	0.032	0.055
AfcFTA_ij	0.000	0.021	0.010	0.992	-0.041	0.042
ln_Dist	-0.144	0.010	-13.760	0.000	-0.164	-0.123
Lang_ij	0.137	0.015	8.880	0.000	0.107	0.167
contig	0.219	0.024	9.330	0.000	0.173	0.265
_cons	2.760	0.083	33.260	0.000	2.598	2.923

**Source(s):** Authors' compilation

**Table A9.** Hausman test for Equation (4).

Conditional fixed-effects Poisson regression							
ln_FC_ij	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ln_GDP_Cap_j	0.105	0.023	4.63	0	0.061	0.15	***
ln_GDP_Cap_i	0.077	0.027	2.84	0.005	0.024	0.13	***
AfcFTA_ij	0.009	0.021	0.43	0.665	-0.031	0.049	
ln_Dist	-0.257	0.189	-1.36	0.173	-0.627	0.112	
Mean dependent var		6.343		SD dependent var		3.342	
Number of obs		4,393		Chi-square		42.973	
Prob > $\chi^2$		0.000		Akaike crit. (AIC)		15955.734	
Random-effects Poisson regression							
ln_FC_ij	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ln_GDP_Cap_j	0.124	0.017	7.13	0	0.09	0.158	***
ln_GDP_Cap_i	0.056	0.018	3.17	0.002	0.021	0.09	***
AfcFTA_ij	0.002	0.02	0.09	0.929	-0.037	0.041	
ln_Dist	-0.181	0.044	-4.15	0	-0.267	-0.096	***
Lang_ij	0.152	0.054	2.81	0.005	0.046	0.258	***
contig	0.215	0.106	2.02	0.044	0.006	0.423	**
Constant	2.995	0.347	8.63	0	2.315	3.675	***
lnalpha	-1.69	0.089	.b	.b	-1.865	-1.516	
Mean dependent var		6.341		SD dependent var		3.343	
Number of obs		4,394		Chi-square		125.573	
Prob > $\chi^2$		0.000		Akaike crit. (AIC)		18837.912	
Hausman specification test							
							Coef.
Chi-square test value							2.338
p-value							0.674

**Note(s):** \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1  
**Source(s):** Authors' compilation

**Table A10.** Heteroscedasticity test for Equation (5)

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity

Ho: constant variance  
 Variables: fitted values of CHOMAGE<sub>i</sub>  
 $\chi^2(1) = 1482.66$   
 Prob >  $\chi^2 = 0.0000$

**Source(s):** Authors' compilation**Table A11.** With heteroscedasticity-robust standard errors for Equation (5)

Variables	(1) Unemployment <sub>ij</sub>	(2) /	(3) Unemployment <sub>ij</sub>	(4) /	(5) Unemployment <sub>ij</sub>
ln_GDP_Cap <sub>i</sub>	-0.0802*** (0.00129)		-0.0860*** (0.00155)		-0.0442*** (0.00202)
ln_FC <sub>ij</sub>			-0.00221*** (0.000593)		-0.000253 (0.000196)
AfCFTA <sub>ij</sub>	0.00219 (0.00566)		0.0332** (0.0135)		0.00656*** (0.00219)
c.ln_FC <sub>ij</sub> #c. AfCFTA <sub>ij</sub>			-0.00326* (0.00185)		-0.000798*** (0.000291)
var(e. Unemployment <sub>ij</sub> )		0.0148*** (0.000277)		0.0156*** (0.000330)	
Constant	0.893*** (0.00195)		0.899*** (0.00429)		0.855*** (0.00206)
Observations	5,724	5,724	4,459	4,459	4,459
R-squared					0.396
Number of identifiant					288

**Source(s):** Authors' compilation**Table A12.** Residual normality test for Equation (5)

Shapiro-Wilk W test for normal data					
Variable	Obs	W	V	z	Prob > z
resid	4,459	0.833	409.500	15.726	0.000

**Note(s):** The normal approximation to the sampling distribution of  $W'$  is valid for  $4 \leq n \leq 2000$ **Source(s):** Authors' compilation

**Table A13.** Interaction robustness test for Equation (5)

(1)  $[Unemployment_{ij}]c.ln\_FC_{ij} \# c. AfCFTA_{ij} = 0$

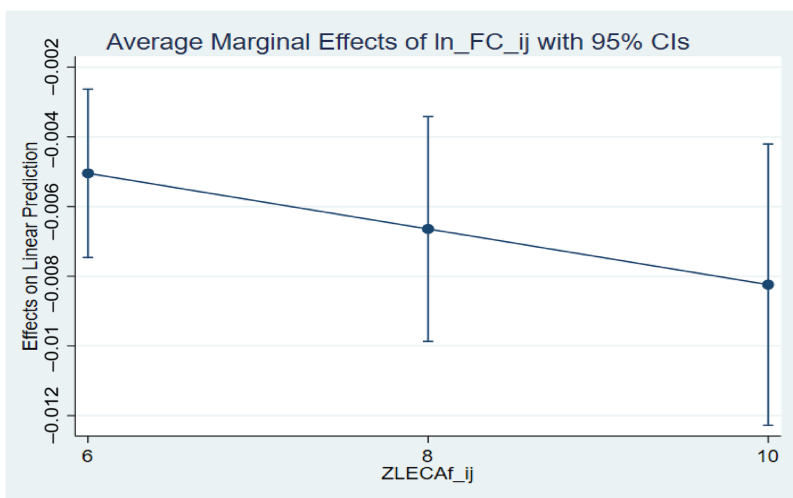
$\chi^2(1) = 14.85$

Prob >  $\chi^2 = 0.0001$

Delta-method

	dy/dx	Std.Err.	z	p > z	[95% Conf	Interval]
ln_FC_ij						
_at						
1	-0.005	0.001	-4.090	0.000	-0.007	-0.003
2	-0.007	0.002	-4.030	0.000	-0.010	-0.003
3	-0.008	0.002	-4.000	0.000	-0.012	-0.004

Source(s): Authors' compilation



Source(s): Authors' compilation

**Figure A1.** Marginsplot for Equation (5)

**Table A15.** Robustness to functional specification for Equation (5)

Variables	(1) Unemployment_ij	(2) /	(3) Unemployment_ij	(4) /	(5) Unemployment_ij	(6) Unemployment_ij	(7) Unemployment_ij	(8) /
ln_GDP_Cap_i	-0.0802*** (0.00129)		-0.0860*** (0.00155)		-0.0442*** (0.00202)	-0.0442*** (0.000872)	-0.0419*** (0.00134)	
ln_FC_ij			-0.00221*** (0.000593)		-0.000253 (0.000196)	-0.000253* (0.000133)	-0.000258* (0.000133)	
AfCFTA_ij	0.00219 (0.00566)		0.0332** (0.0135)		0.00656*** (0.00219)	0.00656*** (0.00154)	0.00612*** (0.00154)	
c.ln_FC_ij#c. AfCFTA_ij			-0.00326* (0.00185)		-0.000798*** (0.000291)	-0.000798*** (0.000207)	-0.000792*** (0.000207)	
var(e. Unemployment_ij)		0.0148*** (0.000277)		0.0156*** (0.000330)				
c. ln_GDP_Cap_i #c.ln_GDP_Cap_i							-0.00108*** (0.000359)	
sigma_u								0.133*** (0.00558)
sigma_e								0.0134*** (0.000147)
Constant	0.893*** (0.00195)		0.899*** (0.00429)		0.855*** (0.00206)	0.855*** (0.00106)	0.863*** (0.00793)	
Observations	5,724	5,724	4,459	4,459	4,459	4,459	4,459	4,459
Number of identifiant					288	288	288	288
R-squared					0.396	0.396		
<b>Note(s):</b> Standard errors in parentheses								
*** $p < 0.01$ , ** $p < 0.05$ , * $p < 0.1$								
<b>Source(s):</b> Authors' compilation								