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Does Trade Openness Reduce Unemployment in Developing Countries? Evidence from the Central African Economic and Monetary Community (CEMAC)

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Abstract

Countries in the Central African Economic and Monetary Community (CEMAC) face unemployment in the context of increased trade openness, making the zone among those with the highest unemployment rates. This study investigates the effects of trade liberalization on unemployment (overall and among young people) in the CEMAC by applying the standard error-corrected panel linear regression model (PCSE) and analyzing data from the six CEMAC countries for 2002 to 2022. The results show that trade openness reduces overall and youth unemployment. Accordingly, a one-point increase in the trade openness index is associated with a 4.4% and 8% reduction in overall and youth unemployment, respectively. These results suggest that policies that strengthen trade openness should be given greater prominence. Such policies include guaranteeing a trade-friendly environment by easing barriers to trade, such as customs duties, significantly improving the business climate, prioritizing trade agreements, and encouraging and incentivizing export-oriented products.

Keywords

Trade Openness, Unemployment, CEMAC, PCSE Model

1. Introduction

Considered a growing global threat (Ayhan, 2016), unemployment in general, and youth unemployment in particular, is a problem of great concern to decision makers in both developed and developing countries because of its economic, social, and psychological consequences. Economically, unemployment reduces a country's production potential and lowers household income and human capital,

thereby increasing poverty (Uddin et al., 2023; Siregar & Batubara, 2022; Restrepo et al., 2021). From a social perspective, the International Labour Organization (ILO, 2003) points out that unemployment leads to brain drain, crime, and the emergence of illegal businesses. Psychologically, unemployment is a source of exclusion from society and feelings of despair, which sometimes leads to suicide (Chen et al., 2022; Taris, 2002; Bolton & Oatley, 1987).

The ILO (2003) defines unemployment as the situation of a person of working age who, during a reference period, is without work, available for work, and seeking work. Unemployment is a challenge to economic development, and its reduction (job creation) is central to economic policy (ILO, 2003). To this end, in its Sustainable Development Goals (SDGs), specifically Goal 8, the United Nations urges countries to reduce unemployment by promoting policies that encourage entrepreneurship and job creation to achieve full and productive employment and decent work for men and women by 2030.

Despite numerous job creation initiatives, unemployment remains a major concern in the Central African Economic and Monetary Community (CEMAC). Indeed, according to ILO data, in 2022, the average unemployment rates in this zone will be 10.15% and 20.38% respectively for total unemployment and youth unemployment (aged 15 to 24), compared with 6.75% and 11.16% for low-income countries, 4.98% and 10.18% for lower-middle-income countries, and 5.3% worldwide. Several factors explain the differences in unemployment levels between countries and groups of countries, including the level of trade openness in their economies. With this in mind, this study analyzes whether trade openness is likely to reduce unemployment in CEMAC countries.

In the literature, the effects of trade openness on unemployment are analyzed through the fundamentals of international trade. This reveals two major opposing groups. The first group comprises authors who view trade openness as a factor in reducing unemployment (Gonese et al., 2023; Marzan et al., 2020). To support this view, they draw on theories of absolute advantage (Smith, 1776), comparative advantage (Ricardo, 1817a, 1817b), the mobility of multinational firms (Ajayi, 2006), and the Heckscher-Ohlin model (Heckscher & Ohlin, 1991).

The second group, based on the theory of infant industry protectionism (also known as educational protectionism), List (1941), and the theory of relocation of activities (Blinder, 2006), believes that trade openness leads to job creation by intensifying the level of unemployment.

At the theoretical level, the work carried out on this subject yielded to inconclusive results. On the one hand, some results indicate that trade openness is likely to reduce the level of unemployment, (Marzan et al., 2020; Asaleye et al., 2017). On the other hand, Famode et al. (2020), and Alkhateeb et al. (2017) prove that trade openness worsens unemployment.

The contradictions in the theoretical arguments presented above, combined with the divergence of empirical evidence on the effects of trade openness on unemployment and the growing scale of unemployment, demonstrate the need to

maintain the debate given that it is far from over. Therefore, it is essential to analyze the effects of trade liberalization on unemployment in developing countries, specifically in the CEMAC region, for at least three reasons.

First, in recent years, CEMAC countries have been facing a very high level of unemployment relative to other countries, which has worsened since the outbreak of the coronavirus pandemic in 2019. Indeed, according to statistics from the ILO, in 2022, the average unemployment rates in CEMAC were estimated at 10.89% and 19% for overall unemployment and unemployment among young people aged 15 - 24, respectively. In the same year, the overall unemployment rates were 5.9%, 8%, and 7.2% for the world, Africa as a whole, and Sub-Saharan Africa, respectively. These statistics show the extent to which CEMAC remains one of the areas most affected by unemployment compared to unemployment rates worldwide, Africa, and sub-Saharan Africa.

Second, CEMAC countries are characterized by low-quality institutions and poorly diversified economies. CEMAC countries thus ranked last in the World Bank's ease of doing business rankings, with Cameroon at the top (167th) and Chad at the bottom (189th). All countries in the zone have below average scores, with Cameroon holding the best score in the zone at 46.5, on a scale ranging from 0 to 100. Therefore, in a situation characterized by weak institutions, can open trade help to reduce unemployment?

Regarding the low level of diversification, the economies of CEMAC countries remain dependent on specialization of the primary type, with exports consisting essentially of raw materials, with oil and gas accounting for over 77% of total CEMAC exports (BEAC, 2021). In a poorly diversified economy, can we expect trade openness to reduce the level of unemployment?

The third reason justifying the choice of CEMAC zone countries as our field of application is that, although many studies analyzed the relationship between trade openness and unemployment; however, to our knowledge, few focused on the CEMAC countries besides those emphasizing trade openness and growth (Ekodo & Ngomsi, 2017; Koutima-Banzouzi, 2023). Thus, this work contributes to the existing literature on the relationship between trade openness and overall and youth unemployment by integrating a new field of investigation that is CEMAC countries. Additionally, rather than measuring trade openness by the share of the sum of exports and imports in gross domestic product, this study applies an alternative measure of trade openness, the "trade freedom index."

In view of the above, this study finds its quintessence in the following question: What are the effects of trade openness on unemployment in CEMAC countries? This study analyzes the effects of trade liberalization on unemployment in CEMAC countries. Because trade openness can potentially enhance economic growth by allowing access to goods and services, improving the efficiency of resource allocation, and improving total factor productivity through the diffusion of technology and knowledge (Barro & Sala-i-Martin, 1997; Rivera-Batiz & Romer, 1991), which are important elements in job creation, we postulate that

trade openness reduces unemployment in CEMAC member countries.

The remainder of this paper is organized as follows. The second section provides a review the literature. The third describes the methodology and fourth presents and discusses the results. The fifth and final section concludes the paper with economic policy implications.

2. Literature Review

In economic literature, the analysis of the effects of trade openness on unemployment mainly distinguishes between two groups of works whose considerations diverge from both the theoretical and empirical perspectives. While some studies show that trade openness is a factor that reduces unemployment, others prove the opposite. With this in mind, this literature review provides evidence that trade openness reduces unemployment. Second, it presents works that argue that trade openness increases unemployment.

2.1. Trade Openness: A Factor in Reducing Unemployment

Theoretically, authors who argue that trade openness reduces unemployment, drawing on free trade theories that highlight the benefits of international trade for the economy. These include classical free-trade theories (the theory of absolute advantage and the theory of comparative advantage), contemporary free-trade theory (Smith, 1776; Ricardo, 1817a, 1817b), the Heckscher-Ohlin-Samuelson model (HOS, Heckscher & Ohlin, 1991), and the theory of multinational firms (Ajayi, 2006).

The theory of absolute advantage (Smith, 1776), based on the principle of division of labor, stipulates that each economy must specialize in those sectors of activity where it has an absolute advantage. In other words, a country must focus on products with production costs lower than those of other economies. The economy in question will need to produce large quantities of these products not only to satisfy domestic demand but also to export them to economies where production costs are higher. Therefore, to satisfy both domestic and foreign demands, it is necessary to increase the workforce in the sectors concerned, which will, in turn, reduce unemployment.

The theory of comparative advantage, also known as the "principle of comparative costs," was proposed by Ricardo (1817a, 1817b) and is based on three essential hypotheses: the uniqueness of labor as the sole factor of production, free circulation of labor on a national scale, and immobility of labor on an international scale. This theory stipulates that, even if a country has no absolute advantage, it will gain international trade if it specializes in the production of goods for which it has a relative advantage. This, in turn, contributes to the increase in employment needed to produce a large quantity of goods for export.

Unlike the first two theories, which consider labor as the sole factor of production, the HOS model integrates capital as the second factor of production. Dutt et al. (2009) consider that in economies producing capital-intensive goods, trade

openness leads to higher unemployment and higher wages. However, in economies that produce labor-intensive goods, trade openness reduces unemployment. In sum, the theories of absolute advantage, comparative advantage, and the HOS theory argues that trade openness acts as a brake on rising unemployment, insofar as it allows for the allocation of resources and boosts productivity and competitiveness.

Regarding the empirical evidence showing that trade openness reduces unemployment, several studies (Gonese et al., 2023; Nwosa et al., 2020; Marzan et al., 2020; etc.) converge on these results, despite the differences in the methodologies used, the variables selected to approximate trade openness, and the level of development of the economies constituting the fields of investigation.

In this context, Gonese et al. (2023) analyze the effects of trade openness and exports in countries of the Southern African Development Community (SADEC). The results obtained using the Pooles Mean Group (PMG) model and data covering 1980 - 2019 show that trade openness and exports have negative effects on the level of unemployment. In addition, Nwosa et al. (2020) analyze the effects of trade openness on unemployment in Nigeria using the Autoregressive Scaled Ratard (ARDL) technique and secondary data for the period 1980-2018. As in the previous case, the results show that trade openness negatively affects unemployment in Nigeria.

Marzan et al. (2020) analyze the impact of trade openness on unemployment in 34 Organizations for Economic Co-operation and Development (OECD) countries for the period 2004-2018. Their results, obtained through estimates using the Generalized Method of Moments (GMM), show that the greater the trade openness, the greater the job creation, which reduces the level of unemployment and contributes to economic development. Similarly, Gachoki (2022) use exports as a proxy for trade openness, ARDL as an estimation technique, and data covering the period 1980-2019 to verifies the effects of trade openness on women's sectoral employment in Kenya. The results establish a positive relationship between trade openness and women's employment in the agricultural sector, and consequently, a reduction in women's unemployment in this sector.

2.2. Trade Openness: A Factor Increasing Unemployment

From a theoretical perspective, the authors argue that trade openness is likely to amplify unemployment levels and rely on theories of protectionism to support their thinking. These include the theory of infant industry protection or educational protectionism (List, 1941) and the theory of relocation of activities (Blinder, 2006). The main idea is that trade openness increases competition between companies, which can lead to the relocation or even the closure of companies that are not yet competitive, resulting in job loss and, consequently, higher unemployment.

Continuing in the same vein, but from an empirical point of view, Nguyen (2022) analyzes the relationship between economic growth, foreign direct in-

vestment, trade openness, and unemployment in South Asia. The study analyzes four countries from 1998 to 2017 using the sum of exports and imports as a percentage of GDP as a measure of trade openness and a vector autoregressive (VAR) model. The results indicate that trade openness increases unemployment in South Asia.

Similarly, Alauddin & Khan (2021) explore the impact of trade openness on the unemployment rate in 12 least developed countries (LDCs) over the period 1995-2016. Using the sum of exports and imports as a percentage of the Gross Domestic Product (GDP) as a measure of trade openness and the least-squares method corrected by a dummy variable, they find that trade openness amplifies the unemployment rate. This result is also identical to that obtained by Kpognon et al. (2020). In this study, the authors analyzed 41 sub-Saharan African countries for 2002-2017 using the ordinary least squares (OLS) and two-stage instrumental variable least squares (IV-2SLS) regressions. In this study, trade openness was approximated by total exports and imports as a percentage of GDP.

In addition to the work presented above, Famode et al. (2020) econometrically assess the relationship between trade openness and unemployment in the Democratic Republic of Congo. They use a vector error correction model (VECM) to analyze data for 1991-2017, and the sum of exports and imports as a percentage of GDP as a measure of trade openness. The results indicate that trade openness has a significant positive effect on unemployment. They reveal that an increase of approximately 1% in trade openness leads to a 0.46% increase in unemployment. Famode et al. (2020) conduct a similar study in Bangladesh using a VECM and data covering 1991 to 2017. These results suggest that trade openness positively affects unemployment rate.

2.3. Lessons from the Literature

The theoretical and empirical literature presented above show that the effects of trade openness on unemployment do not converge. The results may vary because of the application of different methodologies, the level of development of the economies analyzed, and the measure chosen for trade openness. Various methods (VECM, IV-2SLS, OLS, and PMG) are employed. However, a panel linear regression model corrected for standard errors (PCSE) was not considered in the analyses of the relationship between trade openness and unemployment.

In terms of measures of trade openness, this empirical work highlights exports and the sum of exports and imports as a percentage of gross domestic product as proxies for trade openness. However, other measures of trade openness, such as the index of trade freedom, which considers the weighted average tariff rate and tariff and non-tariff barriers, have been highlighted in the economic literature. However, the index of freedom as a measure of trade openness has not been considered or used to a lesser extent in previous studies.

In view of the foregoing, the contribution of this study is empirical and occurs on three levels: First, we adopt a new method (PCSE) that has not yet been ex-

ploited to analyze the relationship between trade openness and unemployment, at least in the CEMAC.

This study contributes to the empirical literature on the relationship between trade openness and unemployment by integrating a new field of investigation: CEMAC countries. Although many studies analyze the relationship between trade openness and unemployment, to the best of our knowledge, few focused on the specific case of CEMAC countries other than those emphasizing trade openness and economic growth (Ekodo & Ngomsi, 2017; Koutima-Banzouzi, 2023).

Third, beyond the sum of exports and imports as a percentage of GDP variable usually used to capture trade openness, we introduce a new trade freedom index variable that allows us to account for quantity, price, regulatory, customs and investment restrictions, as well as direct government intervention.

3. Methodology

This section describes the data sources, choice and description of variables, model specifications, and estimation techniques.

3.1. Data Source and Variables

The data used in this study were obtained from the databases of TheGlobalEconomy.com, the Center for Prospective Studies and International Information (CPII), and World Development Indicators. They cover the period from 2002 to 2021, and the choice of variables is based on the economic literature. The study period was selected based on data availability. The selected variables are unemployment rates (overall and youth) and trade openness as the explained variables and variable of interest, respectively. The control variables are the economic growth rate, capital investment, consumer price index, population growth rate, stability, and absence of violence.

Unemployment: The dependent variable in this study follows the ILO definition; that is, the proportion of the working population who are unemployed but available and are looking for work during the reference period. Unemployment represents a major challenge to economic policy and remains at the heart of the research debate. We use overall unemployment and unemployment among young people aged 15 - 24 years.

Trade openness: A variable of interest that defines the capacity of a given economy (country) to trade with foreign countries in relation to domestic production. It is determined by the share of imports and exports in GDP, expressed as a percentage. It can also be understood through the index of trade freedom, which considers the restrictions on quantity, price, regulation, customs and investment, as well as direct government intervention. In this study, we approximate trade openness using the trade freedom index. Several studies (Nwosa et al., 2020; Nwaka et al., 2015; Gozgor, 2014) emphasize the importance of trade openness in reducing unemployment.

Economic growth rate: This represents the variation in gross domestic product,

with the latter being the sum of gross value added by all resident producers in the economy, plus taxes on products and minus subsidies not included in the value of products. Various studies (Hjazeen et al., 2021) examine the effects of economic growth on unemployment and concluded that an increase in the level of economic growth is accompanied by a reduction in unemployment.

Consumer price index: measures the general trend in prices of consumer goods and services. It provides information on inflation when prices are rising (index above 100) or deflation when prices are falling (index below 100). Abugamea (2018) concludes that the level of inflation has a positive and significant impact on the level of unemployment.

Urban population growth rate: This variable has a significant influence on unemployment. Various works (Maijama'a et al., 2019) reveal that an increase in population induces an increase in job demand, thus worsening the unemployment situation.

Capital investment: Several studies (Alrabba, 2017) establish a negative relationship between private investment and unemployment. Alrabba (2017) shows that an increase in private investment lowers unemployment by 2.64% and 1.58% in the 2nd and 4th periods.

Political stability and absence of violence/terrorism. This index, developed by the United Nations Development Program, measures people's perceptions of the likelihood of destabilization or overthrow of the current regime through unconstitutional means or politically motivated violence and terrorism. Its value ranges from −2.5 to 2.5. A value close to −2.5 implies a situation of high instability, and one close to 2.5, implies high stability. Qasim et al. (2025) established an inverse relationship between political stability and the level of unemployment. Therefore, the expected sign is negative. Table 1 summarizes the variables used in the study.

Table 1. Summary of variables, source, measurement and expected signs.

Variables	Abbreviation	Source	Sign
Overall unemployment rate	Chomt	the globalEconomy.com	
Unemployment rate for young people	Chomj	the globalEconomy.com	
Trade openess	Ouv	the globalEconomy.com	Negative
Inflation	Ipc	World development indicators	Negative
Investment	Invest	CPII	Negative
Economic growth	Tcrss	the globalEconomy.com	Negative
Urban population	Popu	the globalEconomy.com	positive
Corruption perception index	Ipccor	WDI	Negative
Political stability	Polest	the globalEconomy.com	Negative
Secondary school enrolment	Tbsc	CPII	positive
Higher education enrolment	Tbss	CPII	positive

Gross secondary and tertiary enrolment rate: This is the ratio between the number of students enrolled in secondary and tertiary education, regardless of age, and the size of the population officially eligible for schooling at the corresponding levels. Mincer (1991) points out that the main benefit of education is its contribution to reducing the risk of unemployment, which indicates an inverse relationship between unemployment and education level. Thus, the expected signs of these variables were negative.

3.2. Model Specification

Based on the employment models of Islam and Nazara (2000) and Anjum and Perviz (2016), the effects of trade openness on unemployment can be written implicitly as

$$chom = f\left(ouv; X\right), \tag{1}$$

where chom represents unemployment, ouv is trade openness, and X is a vector of other variables that explain unemployment. Indeed, the economic literature shows that, in addition to trade openness, variables such as the growth rate, inflation, population growth rate, investment, and institutional quality can also affect unemployment.

Several studies highlight the effects of these variables. For example, the Phillips' (1958) curve establishes an inverse relationship between unemployment and inflation. On economic growth, Hjazeen et al., (2021) and Stephen (2012) show that an increase in the rate of economic growth induces a fall in the unemployment rate. Regarding the relationship between the population growth rate and unemployment rate, Maijama'a et al. (2019) highlight the positive effects of the population growth rate on unemployment. Other authors (Alrabba, 2017), demonstrate successive negative effects of private investment and institutional quality on unemployment. Considering all these variables and assuming that the implicit function (1) is linear, we have

$$chom_{it} = ouv_{it} + invst_{it} + ipc_{it} + pop_{it} + polest_{it} + tcrss_{it} + tbsc_{it} + tbss_{it} + ipccor_{it} \tag{2}$$

As cross-sectional data generally contain specification errors, it is important to consider these errors by including the error term in equation (2). Thus, our model for estimation is

$$chom_{it} = ouv_{it} + invst_{it} + ipc_{it} + pop_{it} + polest_{it} + tcrss_{it} + tbsc_{it} + tbss_{it} + ipccor_{it} + \varepsilon_{it} \tag{3}$$

We consider two types of unemployment to analyze the effects of trade liberalization on unemployment: overall unemployment and youth unemployment. By replacing $chom_{it}$ in equation (3) with overall unemployment $\left(chomt_{it}\right)$ and youth unemployment ($chomj_{it}$), we have equations (4) and (5), respectively:

$$chomt_{it} = ouv_{it} + invst_{it} + ipc_{it} + pop_{it} + polest_{it} + tcrss_{it} + tbsc_{it} + tbss_{it} + ipccor_{it} + \varepsilon_{it} \tag{4}$$

$$chomj_{it} = ouv_{it} + invst_{it} + ipc_{it} + pop_{it} + polest_{it} + tcrss_{it} + tbsc_{it} + tbss_{it} + ipccor_{it} + \varepsilon_{it} \tag{5}$$

where

$chomt_{it}$	: overall unemployment rate in country i at time t
$chomj_{it}$	youth unemployment rate in country i at time t
ouv_{it}	: trade openness in country i at time t
$invst_{it}$	: capital investment in country i at time t
ipc_{it}	: consumer price index in country i at time t
pop_{it}	: population growth rate urban population in country i at time t
$polest_{it}$	: political stability and absence of violence in country i at time t
$tcrss_{it}$	: higher education enrolment rate in country i at time t
$tbsc_{it}$	: secondary school enrolment rate in country i at time t
$tbss_{it}$	: higher education enrolment rate in country i at time t
$ipccor_{it}$	corruption perception index in country i at time t
ε_{it}	: error terms in country i at time t

3.3. Estimation Procedure

To estimate the effects of trade openness on unemployment in the CEMAC zone, we follow Kouladoum (2023) and Ndombi Avouba et al., (2023) and apply a panel linear regression approach corrected for standard errors (PCSE).

The PCSE is a panel regression model that considers the possibility of contemporaneous correlation, accounting for deviations from spherical errors and enabling better inference from linear models. Unlike the Ordinary Square-Wave (OSSW) method, which requires compliance with classical assumptions (absence of error autocorrelation, heteroscedasticity, and endogeneity), the PCSE model has the advantage of being able to correct for these biases, which are frequent in the context of temporal data. Details of the estimation procedure for a PCSE model are described in Hoechle (2007).

4. Results and Discussion

We first present the results. Second, we discuss the results of the estimation of the effects of trade openness on unemployment in the CEMAC.

4.1. Results

The results of the descriptive statistics, correlation matrix, pre-estimation tests (unit root, Haussmann, heteroscedasticity, and autocorrelation), and the estimation results are presented in turn.

The descriptive statistics (Table 2) show that for the period under review, the average unemployment levels are 9.82% and 18.26% for overall unemployment and youth unemployment, respectively. Similarly, the maximum unemployment rates were 22.67% and 42.8%, whereas the minimum unemployment rates were 0.63% and 1.5%, respectively. These results show that the unemployment rates vary considerably around the average. The average level of trade openness, the

Table 2. Descriptive statistics.

Variables	Average	Maximum	Minimum	Observations
Overall unemployment rate	9.82	22.67	0.63	126
Unemployment rate for young people	18.26	42.8	1.5	126
Trade openess	54.31	62	45	126
Investment	24.77	59.72	6.4	126
Scolarisation au secondaire	42.02	75.53	14.77	126
Scolarisation au supérieur	4.36	13.13	0.96	126
Economic growth	3.31	38	−36.39	126
Political stability	−0.78	0.41	−2.7	126
Corruption perception index	106.54	169.94	65.58	126
Urban population	3.88	8.10	0.67	126
Corruption perception index	22.87	37	16	126

Table 3. Correlation matrix.

	Chomt	Chomj	Ouv	invest	Ipc	Tcss	Tbsc	Tbss	Pop	Crr	Polest
Chomt	1.00										
Chomj	0.99	1.00									
	0.00										
Ouv	**0.19**	**0.18**	1.00								
	0.03	**0.04**									
invest	0.23	0.22	0.17	1.00							
	0.01	0.01	0.06								
Ipc	0.03	0.03	0.04	−0.17	1.00						
	0.72	0.77	0.69	0.06							
tcrss	−0.08	−0.06	−0.14	−0.11	−0.02	1.00					
	0.37	0.48	0.12	0.21	0.81						
Tbsc	0.89	0.88	0.33	0.32	0.00	−0.10	1.00				
	0.00	0.00	0.00	0.00	0.99	0.26					
Tbss	0.80	0.82	0.21	0.21	−0.07	−0.03	0.63	1.00			
	0.00	0.00	0.02	0.02	0.47	0.78	0.00				
popu	−0.07	−0.05	0.11	0.20	−0.16	0.23	0.15	−0.08	1.00		
	0.41	0.59	0.23	0.03	0.07	0.01	0.10	0.35			
	0.00	0.00	0.73	0.01	0.92	0.89	0.33	0.00	0.29		
Polest	0.76	0.77	0.24	0.36	−0.11	0.03	0.82	0.65	0.27	0.25	1.00
	0.00	0.00	0.01	0.00	0.22	0.75	0.00	0.00	0.00	0.00	

explanatory variable in this study, was 54.31. The maximum and minimum levels were 62 and 45 over the period.

The correlation between unemployment rates and trade openness (Table 3) highlights a positive and significant correlation at the 5% threshold between unemployment and trade openness in the CEMAC zone. This result suggests a similar evolution of these variables, implying that an increase in the level of trade openness is accompanied by a deterioration in unemployment.

Regarding the pre-estimation results (Table 4 and Table 5), they that all variables are stationary at level (Table 4), that is, integrated of zero order [I(0)] as all coefficients associated with the LLC test for each variable are significant at the 1% level (associated probability less than 0.01). This allows us to reject the null hypothesis H0 of the non-stationarity of the variables and retain the alternative hypothesis H1 of the absence of a unit root. However, the results in Table 5 support the fixed effects model (Haussmann test) and highlight the existence of autocorrelation and heteroscedasticity problems. These problems reinforce the use of the PCSE model for the eventual correction.

Table 4. Unit root test.

Variables	In level	
	LLC	IPS
Overall unemployment rate	−2.68293	−1.42478
	(0.0036)	(0.0771)
Unemployment rate for young people	−3.97647	−2.89681
	(0.0000)	(0.0019)
Urban population	−1.66943	0.68937
	(0.0475)	(0.7547)
Trade openess	−1.83530	−1.49572
	(0.0332)	(0.0674)
Indice de prix à la consommation	−6.30518	−6.68398
	(0.0000)	(0.0000)
Investment	−26.0149	−13.2332
	(0.0000)	(0.0000)
Economic growth	−5.53161	−2.90997
	(0.0000)	(0.0018)
Political stability	−2.56019	−3.26588
	(0.0052)	(0.0005)
Secondary school enrolment	−2.21825	−3.03084
	(0.0133)	(0.0012)
Higher education enrolment	−5.53161	−2.90997
	(0.0000)	(0.0018)

Table 5. Results of autocorrelation and heteroscedascidicity tests.

	Overall unemployment	Youth unemployment
Autocorrelation	F(1, 5) = 12.644	F(1, 5) = 4.807
	Prob > F = **0.0163**	Prob > F = **0.0798**
heteroscedascidicity	chi2 (6) = 1362.26	chi2 (6) = 460.16
	Prob > chi2 = 0.0000	**Prob > chi2 = 0.0000**

Table 6. Estimation results using the PCES method.

Variable	Overall unemployment	Probability	Youth unemployment	Probability
Trade openness	−0.0442694*	0.065	−0.0801343*	0.053
Investment	−0.0317513**	0.035	−0.0498928**	0.039
Inflation	−0.0423934**	0.000	−0.0802159**	0.000
Urban population	−0.0494191	0.724	0.0033784**	0.01
Corruption perception index	−0.0478185	0.243	−0.0606548	0.389
Political stability	−1.031641**	0.002	−1.404034**	0.008
Economic growth	−0.0165836*	0.081	−0.028393*	0.066
Secondary school enrolment	0.3163935**	0.000	0.5485263**	0.000
Higher education enrolment	0.7312918**	0.000	1.640347**	0.000
Constant	1.607724	0.425	2.707477	0.440
Observations	216		126	
R^2	0.8863		0.89	
Wald chi2(9)	2535.15		2555.71	
Prob > chi2	0.0000		0.0000	

Source: author. * and ** indicate significant at the 10% and 5% thresholds, respectively.

We next present the PCES model results. Then, we present the robustness verification results obtained by estimating a fixed-effects model. These two results are summarized in Table 6 and Table 7.

4.2. Robustness Check

The PCSE model results show that the values of the coefficients of determination are 0.88 and 0.89, respectively, for the overall model and youth model. This suggests that more than 88% of the variability in unemployment in the CEMAC is explained by the variability of the additional variables in the model. The Wald statistic is also significant at the 5% level, indicating that at least one explanatory variable explains unemployment. These two elements converge and confirm that the PCSE model is of good quality; and we can thus accept and discuss the results.

Table 7. Fixed-effect model estimation results.

Variable	Overall unemployment	Probability	Youth unemployment	Probability
Trade openness	−0.0305677**	0.011	−0.0445403**	0.004
Investment	0.0117007	0.227	0.0084713	0.491
Inflation	−0.0065485	0.287	−0.0022931	0.769
Urban population	−0.1517605*	0.087	−0.1662375	0.139
Corruption perception index	−0.0625107**	0.036	−0.0767538**	0.043
Political stability	−0.1569933	0.468	−0.4511063	0.102
Economic growth	0.0087942	0.214	0.0045668	0.611
Secondary school enrolment	0.1629209**	0.000	0.153619**	0.001
Higher education enrolment	−0.5203025**	0.001	−0.6197925**	0.001
Constant			18.99982**	0.000
Observations	126		126	
R^2	0.5709		0.4978	
F (5. 111)	292.86		649.76	
Prob > F	0.0000		0.0000	

Source: author. * and ** indicate significant at the 10% and 5% thresholds, respectively.

4.3. Discussion

This study analyzes the effects of trade openness on unemployment in the CEMAC. The estimation results highlight a major lesson: Trade openness is a factor in reducing unemployment in the CEMAC. This result is justified by the fact that the coefficients associated with trade openness for both overall and youth unemployment have negative signs and are significant at the 10% level. Hence, trade openness and unemployment move in opposite directions within the CEMAC. In other words, an increase in the level of trade openness is accompanied by a reduction in the number of unemployed individuals, and therefore, in job creation. From an econometric perspective, the results show that in the CEMAC zone, an increase in trade openness of one percentage point leads to a reduction in unemployment of approximately 4.4% of the overall population. Similarly, a 1 percentage point increase in trade openness, all other things being equal, leads to an 8% reduction in unemployment among the young working population aged between 15 and 24 years.

The present results in the CEMAC context corroborate those of previous studies such as those by Gonese et al. (2023), Marzan et al. (2020), and Nwosa et al. (2020) in SADEC countries, OECD countries, and Nigeria, respectively. However, it invalidates those carried out by Alauddin & Khan (2021), Kpognon et al. (2020), and Famode et al. (2020) for the 12 least developed economies, 41 sub-Saharan African countries, and the Democratic Republic of Congo, respectively.

5. Conclusion

CEMAC countries have some of the highest unemployment rates. To this end, this

study analyzes the effects of trade openness on overall and youth unemployment in the CEMAC. We applied a PCSE model to analyze data covering 2002 to 2022 for the six CEMAC countries. The results highlight that trade openness reduces both overall and youth unemployment. According to these results, a one-point increase in the trade openness index is associated with a 4.4% and 8% reduction in unemployment, respectively. This result is reinforced by the similar results obtained from a fixed-effects model analyzed to verify robustness. The findings therefore validate the hypothesis that trade openness contributes to unemployment reduction. In view of the finding that trade openness is a factor in reducing unemployment in CEMAC countries, the economic policy implications would be to prioritize policies that reinforce trade openness. These include

- Ensuring a favorable environment for trade, notably by easing trade barriers such as customs duties;
- Significantly improve the business climate;
- Prioritizing trade agreements; and
- Encouraging and promoting export-oriented products.

Declaration of Competing Interest

The author declares no conflict of interest.

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