

Research Article

# Export Diversification and Economic Growth in the CEMAC Zone: An Analysis of Causality Tests

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**Abstract:** *The objective of this study is to verify the direction of causality between the diversification of exports and the economic growth of the Economic and Monetary Community of Central Africa (CEMAC). Johansen cointegration and Granger causality tests have been highlighted. The results show that the variables are cointegrated and have a long-term relationship between them. The relationship between export diversification and economic growth in CEMAC is reciprocal. In the case of countries taken individually, the same results are obtained except for the case of Gabon, which presents a one-way relationship between diversification and economic growth. It is important for CEMAC to continue diversifying its exports to show greater economic resilience in the face of severe macroeconomic shocks.*

**Keywords:** *Export Diversification; Economic Growth; Causality in the Sense of Granger, VAR Model, CEMAC Zone.*

**JEL Classification:** 013, 055, L25, P33

## I. INTRODUCTION

In the aftermath of their independence, African countries undertook policies aimed at diversifying their economic structures. These are based on a few basic products such as cocoa, cotton, coffee, and possibly mining and petroleum products. The import-substitution policies advocated aimed to develop the different sectors of the economy and reduce dependence on these products (Kamgna, 2007). The concern for mass production that can be exported in the raw state and transformed locally is of concern to African countries, hence the need for this diversification, which plays a very important role in the process of economic resilience.

The countries of the Economic and Monetary Community of Central Africa (CEMAC) are not left out in the process of diversifying their economies. The measures taken in the aftermath of the economic crisis in 1987, such as the liberalization and devaluation of the CFAF, have enabled these countries to reposition themselves on the path of economic growth. Thus, we note a positive growth trend of around 3.1% from 1995. This situation can be explained by the good performance of the production of basic products and a greater dynamism of import substitution activities. It is important to note that the devaluation of the CFAF made it possible to revive exports, which played a major role in the growth process, which amounted to CFAF 1,611.5 billion (Banque de France, 1995). The passage of the "trade exceeds 17.5% to 18.6%, between 1994 and 1995. Notably, these countries have depended for several decades on basic products such as mining, petroleum or agricultural products, hence the need for an overhaul of their economies. This strong dependence of the CEMAC on these products and mainly agricultural rent products has made them vulnerable to economic and financial shocks, both internal and external, which have occurred in recent years, the most recent being that of 2008 (subprime financial crisis) and 2014 (oil shock).

CEMAC was characterized in 2008 by a slight slowdown in real economic growth, which was 4.1% against 4.7% in 2007. The contribution of exports during this period is attributable to the increase in sales of crude oil and other raw materials such as gas, manganese, aluminum and cotton (BEAC, 2008). Several years later, in 2014, with the fall in commodity prices, there was a contraction in economic activity. Hence, the economic situation in CEMAC member countries was marked in 2015 by a gross domestic product decline at + 2.4% against + 4.8% in 2014. This led to a certain instability in CEMAC exports; for example 2015, we had nearly 14,553.3 billion CFA francs exported against 20,967.7 billion francs CFA in 2014 (BEAC, 2015). In these exports, petroleum products represent approximately 73.3% of CEMAC exports and represent more than half of the budget of most CEMAC member countries. Cameroon has shown resilience because of its more diversified economy than the others, which depend fundamentally on petroleum products.

This resurgence of macroeconomic imbalances has prompted the CEMAC rulers to once again place the diversification of their economy at the heart of their development policy (PREF, 2016). This can be justified through the holding of several conferences on diversification, whose promotion of horizontal and vertical diversification will make it possible to have new



export products and new international markets, which will make it possible to cope with observed declines in export earnings and significant declines in currencies or foreign assets.

Without ignoring the fact that the diversification of exports is a source of economic growth and that the latter makes it possible to free up resources for the promotion of diversification, despite its different magnitude from one country to another of the CEMAC countries, its contribution to economic growth should be taken into account; This is why this study is interested in analyzing the causal links that could exist between this diversification of exports and economic growth. The development revolves around the following points: besides the introduction, section 2 to the literature review, section 3 on methodology, section 4 to results and interpretations, and finally, the conclusion.

## II. LITERATURE REVIEW

In analyzing the relationship between diversification and growth, most authors have used macroeconometric models where they sought to test the correlation between the level of growth and different indices of diversification. Berthélemy (2005) has shown that the objective of international trade in general is to promote the expansion and diversification of exports. The effect of exports on economic growth depends on the structure. From this perspective, Fosu (2002) shows that the impact of manufactured product exports is stronger on economic growth than that of raw materials. This situation explains the gap that has existed since the 1980s between these CEMAC countries and the emerging countries.

Certainly, export influences economic growth, but it is important to note with Hammouda et al. (2006) that the degree of diversification of these exports has an effect on economic development. Goldstein and Khan (1982) believe that production and demand are the main channels through which exports lead to growth and development. The production process may, therefore, improve as a result of increased exports since the export sector is a channel for transmitting technology transfers and economies of scale (Giles et al., 2001).

The expansion of exports can also lead to economic growth through Verdoon's law, which states that "the variation in productivity resulting from specialization in the production of goods attributable to the increase in exports, via an improvement in skills and skills in the sector and a reallocation of resources from the less performing sectors to more efficient sectors, would lead to an increase in the product".

Coxhead (2007) identified five countries (Malaysia, Thailand, China, Indonesia, and Sri Lanka) as being endowed with rich natural resources and having strong long-term growth. Another common denominator among these countries is the fact that some have diversified into manufacturing production, and others have transformed their resource-based production into sophisticated products. At the end of his study, the researcher argues that public investment in technologies and infrastructure in both urban and rural areas, a well-articulated trade openness regime, has positively impacted Malaysia's economic diversification (Sayef, B. 2017).

Several other empirical studies have shown that export diversification helps boost per capita income growth. Love (1986), for example, indicated that a country should avoid being heavily dependent on exporting a limited number of products as this reduced its ability to compensate for fluctuations in certain export sectors by sectors experiencing more stability. He concluded that export diversification was a sound strategy to reduce instability and should not be limited only to sectors other than agriculture.

Greenaway, Morgan and Wright (1999) have shown that not only does export growth drive economic growth, but the composition of exports also matters. Their study also corroborated the idea that there were more externalities linked to the manufacturing sector than to other sectors. From this perspective, for example, some authors have concluded that there can be a strong positive impact on economic growth when a country's total exports include a higher proportion of manufacturing exports.

Other work, such as that of Feenstra and Kee (2004), has highlighted the relationship between a country's productivity and the sectoral variety of its exports.

Ekanayake (1999) uses cointegration and error correction models to analyze the causality between export growth and economic growth in eight Asian countries from 1960 to 1997. Although traditional wisdom suggests that exporting contributes positively to economic growth, this study also provides strong evidence to support the hypothesis that growth is export-led. Empirical results show causality between export growth and economic growth in India, Indonesia, South Korea, Pakistan, Philippines, Sri Lanka and Thailand. There is also evidence of export growth in Malaysia. In addition, there is a short-term Granger causality between economic growth and export growth in all cases except Sri Lanka. However, no strong evidence exists for short-term causality ranging from export growth to economic growth (Ekanayake, 1999).

In addition to the fact that export diversification impacts growth and that the causal test between export diversification and economic growth depends on the techniques used, other authors have attempted to explain the impact of economic growth on diversification. of exports. Thus, for some authors such as Kaldor (1964), Lancaster (1980) or Krugman (1984), economic growth creates a favorable framework for the expansion of exports in a country. For these reasons, economic growth leads to an improvement in the economic environment, hence skills and techniques, which are the facts that contribute to the expansion of exports. Economic growth creates a favorable framework for expansion. Exports to a country and not the other way around. Along the same lines, Michaely (1977) and Helleiner (1986) show the need for a minimum level of development in order to observe the beneficial effects of the expansion of exports.

Ultimately, the positive contribution of export diversification to economic growth has been demonstrated by the authors cited above. On the other hand, the degree varies from country to country and depends on the nature of the diversified product. The diversification of commodity exports does not have the same magnitude as the diversification of sophisticated products on economic growth. This is already calling on the CEMAC countries to review their diversification strategy. Also, the causality test shows the reciprocal case and the unilateral case, which are from one country to another. The authors have finally shown that growth is an important prerequisite for export diversification.

### III. METHODOLOGY

#### A) Model Specification

The character of the data allows us to use the VAR model. This autoregressive model considers the series with integrations of order 0 and 1, making it possible to capture the evolution of short, and long-term variables. Generically, the model is written:

$$Y_t = \lambda_i + \sum_{t=1}^p \alpha_i Y_{t-i} + \sum_{t=1}^q \beta_i X_{t-j} + \mu_i$$

With,  $\lambda_i$ : constant (adjustment variable or restoring force);  $Y_{t-i}$ : delayed dependent variable;  $X_{t-j}$ : independent variable,  $p$ : number of shifts for the  $Y_{t-i}$ ;  $q$ : number of shifts for the  $X_{t-j}$ ;  $\alpha_i$ : parameters of  $Y_{t-i}$ ;  $\beta_j$ : parameters of  $X_{t-j}$  and  $\mu_i$ : Stochastic error term

From this model comes the specified model inspired by N'zué (2004) in the context of his study on Côte d'Ivoire.

$$\text{Export}_t = \gamma_0 + \sum_{i=1}^p \gamma_{1i} \text{Export}_{t-i} + \sum_{i=1}^p \gamma_{2i} \text{Crois}_{t-i} + \varepsilon_{1t}$$

$$\text{Crois}_t = \beta_0 + \sum_{i=1}^p \beta_{1i} \text{Crois}_{t-i} + \sum_{i=1}^p \beta_{2i} \text{Export}_{t-i} + \varepsilon_{2t}$$

With:

$\text{Crois}_t$ : the economic growth rate measured by the GDP of each country in the CEMAC zone

$\text{Export}_t$ : Export diversification index

#### B) Nature of Data

The data collected for this study are annual secondary data covering 1995-2015. This study period is explained by the fact that the devaluation of the FCFA in 1994 aimed to boost exports, hence its diversification, which made it possible to have positive economic growth from 1995. Until then 2015, the policies and strategies put in place by the countries of the CEMAC zone were to continue this diversification, and it is indeed in 2016 that these countries sought more to diversify following multiple oil and security shocks triggered during the first half of the 2010 decade. In particular, the economic growth variable ( $\text{Crois}$ ) measured from the real gross domestic product and the export diversification variable ( $\text{Export}$ ) was adopted from the main products exported both by the whole of CEMAC and by each country. They were taken from the reports of the Banque de France on the countries of the Franc zone and of the Bank of the States of Central Africa.

#### C) Estimation techniques

##### a. Augmented Dickey-Fuller Tests

For simple Dickey-Fuller tests, the process  $\varepsilon_t$  is, by assumption, white noise. However, there is no reason why, a priori, the error should be uncorrelated; taking into account this hypothesis is called Augmented Dickey-Fuller tests (ADF, 1981) (Bourbonnais, 2005).

ADF tests are founded, under the alternative hypothesis  $|\phi| < 1$ , on the estimate by the ordinary least squares of the following three models:

$$\Delta x_t = \beta x_{t-1} - \sum_{j=2}^p \phi_j \Delta x_{t-j+1} + \varepsilon_t$$

$$\Delta x_t = \beta x_{t-1} - \sum_{j=2}^p \phi_j \Delta x_{t-j+1} + c + \varepsilon_t$$

$$\Delta x_t = \beta x_{t-1} - \sum_{j=2}^p \phi_j \Delta x_{t-j+1} + c + b_t + \varepsilon_t$$

The test is carried out similarly to the simple Dickey-Fuller tests, only the different statistical tables. The value of  $p$  can be determined according to the criteria of Akaike or Schwarz, or again, starting from a sufficiently large value of  $p$ , we estimate a model with  $p-1$  delay, then with  $p-2$  delay, up to that the coefficient of the poor delay is significant.

#### b. Philips and Perron Test

This test is built on a nonparametric correction of the Dickey-Fuller statistics to take into account heteroscedastic errors (Bourbonnais, 2005). It takes place in four stages:

Ordinary least squares estimation of the three basic models of the Dickey-Fuller tests and calculation of the associated statistics, namely, the estimated residual.

Estimation of the so-called short-term variance

Estimation of a corrective factor established from the structure of the covariances of the residuals of the previously estimated models such that the transformations performed lead to distributions identical to those of the standard Dickey-Fuller.

Calculation of the PP statistic:  $t_{\phi 1} = \sqrt{k} \frac{(\phi-1)}{Y} + \frac{n(k-1)Y}{\sqrt{k}}$ . This statistic will be compared with the critical values of the Mackinnon table.

#### c. Johansen Cointegration Test

This test is chosen to study the nature of the relationship between the variables. thus, if the statistical trace > critical value 5%, we accept the hypothesis  $H_0$  and in the contrary case we accept  $H_1$ .

#### d. Akaike Criterion (AIC)

The AIC criterion (Akaike Information Criterion) allows us, within the framework of our estimation, to determine the optimal number of delays in our model.  $AIC(h) = \ln\left(\frac{SCR}{n}\right) + \frac{2h}{n}$

With SCR: Sum of Squares of Residues for the  $h$ -lag model

$n$ : number of observations available (each delay results in the loss of an observation)

$\ln$ : natural logarithm

#### e. Causality in the Sense of Granger

Granger proposed in 1969 the concepts of causality and exogeneity: the variable  $y_{2t}$  is the cause of  $y_{1t}$ , if the predictability of  $y_{1t}$  is improved when information about  $y_{2t}$  is incorporated into the analysis. Consider the VAR ( $p$ ) model for which the variables  $y_{1t}$  and  $y_{2t}$  are stationary:

$$\begin{pmatrix} y_{1t} \\ y_{2t} \end{pmatrix} = \begin{pmatrix} a_0 \\ b_0 \end{pmatrix} + \begin{pmatrix} a^1 & b^1 \\ a^2 & b^2 \end{pmatrix} \begin{pmatrix} y_{1t-1} \\ y_{2t-1} \end{pmatrix} + \dots + \begin{pmatrix} a^p & b^p \\ a^p & b^p \end{pmatrix} \begin{pmatrix} y_{1t-p} \\ y_{2t-p} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}$$

The block of variables ( $y_{2t-1}, y_{2t-2}, \dots, y_{2t-p}$ ) is considered exogenous with respect to the block of variables ( $y_{1t-1}, y_{1t-2}, \dots, y_{1t-p}$ ) if the fact of adding the block  $y_{2t}$  does not significantly improve the determination of the variables  $y_{1t}$ . This consists of carrying out a restriction test on the coefficients of the variables  $y_{2t}$  of the VAR representation (denoted RVAR = Restricted VAR). The delay  $p$  is determined by the AIC criteria (Bourbonnais, 2005). We have:

$y_{2t}$  does not cause  $y_{1t}$  if the following hypothesis is accepted  $H_0: b_1 = b_2 = \dots = b_p = 0$

$y_{1t}$  does not cause  $y_{2t}$  if the following hypothesis is accepted  $H_0: a_1 = a_2 = \dots = a_p = 0$

If we are led to accept the two hypotheses that  $y_{1t}$  causes  $y_{2t}$  and that  $y_{2t}$  causes  $y_{1t}$ , we speak of a “feedback effect” feedback loop. Thus, our study is based on causality in the sense of Granger. The test is performed by estimating the regressions on export diversification and economic growth.

### IV. RESULTS AND INTERPRETATIONS

#### A) Stationarity Result

Before starting econometric modeling, it would be important to remember that an analysis of the stationarity of the proposed data series is a prerequisite for any econometric analysis, especially regarding macroeconomic or financial data. This analysis is currently highly recommended because of the problems of spurious regressions that can arise if the variables are not stationary. For this, we use the unit root tests, of which the most recommended are those of Dickey-Fuller augmented (ADF) and Phillips-Perron (PP). These tests have been the subject of numerous presentations in the empirical literature and will not be formally presented here. Recall that the ADF test only takes into account the presence of autocorrelations in the series, and the null hypothesis is that of the existence of a unit root. The reported statistic must be less than the critical value for the series to be considered stationary. The results of these tests are summarized in the following table:

**Table 1: Dickey-Fuller test**

| Variables | Statistical test | Critical value 1% | Critical value 5% | Critical value 10% |
|-----------|------------------|-------------------|-------------------|--------------------|
| Export    | -1,183           | -3,750            | -3,000            | -2,630             |
| Crois     | -1,365           | -3,750            | -3,000            | -3,630             |

Mackinnon approximate p-value: 0,6809 et 0,5989

**Table 2 : Phillips-Perron test**

| Variables | Statistical test | Critical value 1% | Critical value 5% | Critical value 10% |
|-----------|------------------|-------------------|-------------------|--------------------|
| Export    | -1,284           | -3,750            | -3,000            | -2,630             |
| Crois     | -5,761           | -3,750            | -3,000            | -2,630             |

Mackinnon approximate p-value: 0,6365 et 0,0000

**B) Cointegration Result**

Table 3 below shows the result of Johannsen's cointegration test between export diversification and economic growth. It emerges that the variables of export diversification and economic growth present cointegration in order 1, which makes it possible to highlight the existence or absence of a long-term relationship. There is cointegration because the null hypothesis of the absence of cointegration has been rejected ( $63.6044 > 15.41$ ) at the 5% level. -The null hypothesis that there is 1 cointegrating relation was accepted because  $1.9796 < 3.76$ . It is then noted that for all the specifications (variants with or without constants), there is a long-term cointegration relation.

**Table 3: Johansen cointegration test**

|   | Trace statistique | Valeur critique 5% |
|---|-------------------|--------------------|
| 0 | 63,6044           | 15,41              |
| 1 | 1,9796*           | 3,76               |

*Source: The authors from Stata. Note: (\*) significant at 5%***C) Causal Outcome**

The sense of economic causality is an essential element in making economic policies or in making forecasts. Consequently, in order to draw the necessary lessons in the case of the CEMAC sub-region, the proven cointegration of the two variables leads us to analyze the Granger causality test by an econometric estimate of this causality, estimation of the results of which are shown in Table 4 below. It appears that at the 5% threshold, the Granger test shows us that with a delay of 6 obtained thanks to the Akaike criterion (AIC), there is a circular relationship between the diversification of exports and economic growth. In CEMAC. In other words, the diversification of exports causes economic growth in the sub-region, which is in accordance with economic theory, and economic growth, in turn, causes the diversification of exports; this is thanks to the favorable framework that growth could create more investment, for example, in export-oriented sectors. By looking for the optimal number of lags for our model, it turned out that it was from the sixth lag that we noted a reciprocal causality between our two variables.

**Table 4: Granger Causality Test**

| Equation | Excluded | Chi2   | Df | prob>Chi2 |
|----------|----------|--------|----|-----------|
| Export   | Crois    | 24,244 | 6  | 0,000     |
| Export   | All      | 24,244 | 6  | 0,000     |
| Crois    | Export   | 859,17 | 6  | 0,000     |
| Crois    | All      | 859,17 | 6  | 0,000     |

*Source: The authors from Stata. prob<5% for H1 the opposite case we accept H0***D) Result for Each Country**

Table 5 shows the results for each CEMAC country. The Granger test allows us to observe that at the 5% threshold in Cameroon, CAR, Congo, Equatorial Guinea and Chad, the diversification of exports leads to economic growth. Conversely, economic growth acts positively on the diversification of exports. On the other hand, we can also see that in the case of Gabon, only the diversification of exports causes economic growth. This is not the case in the opposite direction, i.e. economic growth does not cause the diversification of exports at the 5% threshold.

**Table 5: The result for each CEMAC country**

| Cameroon |          |        |    |           | Congo    |          |        |    |           |
|----------|----------|--------|----|-----------|----------|----------|--------|----|-----------|
| Equation | Excluded | Chi2   | Df | prob>chi2 | Equation | Excluded | Chi2   | Df | prob>chi2 |
| Crois    | Export   | 20,487 | 6  | 0,002     | Crois    | Export   | 126,29 | 6  | 0,000     |
| Crois    | All      | 20,487 | 6  | 0,002     | Crois    | All      | 126,29 | 6  | 0,000     |
| Export   | Crois    | 36,921 | 6  | 0,000     | Export   | Crois    | 170,88 | 6  | 0,000     |
| Export   | All      | 36,921 | 6  | 0,000     | Export   | All      | 170,88 | 6  | 0,000     |

*Source: The authors from Stata*

| Gabon    |          |        |    |           | Equatorial guinea |          |        |    |           |
|----------|----------|--------|----|-----------|-------------------|----------|--------|----|-----------|
| Equation | Excluded | Chi2   | Df | prob>chi2 | Equation          | Excluded | Chi2   | Df | prob>chi2 |
| Crois    | Export   | 34,133 | 6  | 0,000     | Crois             | Export   | 39,277 | 6  | 0,000     |
| Crois    | All      | 34,133 | 6  | 0,000     | Crois             | All      | 39,277 | 6  | 0,000     |
| Export   | Crois    | 12,049 | 6  | 0,061     | Export            | Crois    | 78,589 | 6  | 0,000     |
| Export   | All      | 12,049 | 6  | 0,061     | Export            | All      | 78,589 | 6  | 0,000     |

Source: The authors from Stata

| RCA      |          |        |    |           | Tchad    |          |        |    |           |
|----------|----------|--------|----|-----------|----------|----------|--------|----|-----------|
| Equation | Excluded | Chi2   | Df | prob>chi2 | Equation | Excluded | Chi2   | Df | prob>chi2 |
| Crois    | Export   | 20,102 | 6  | 0,003     | Crois    | Export   | 113,49 | 6  | 0,000     |
| Crois    | All      | 20,102 | 6  | 0,003     | Crois    | All      | 113,49 | 6  | 0,000     |
| Export   | Crois    | 104,12 | 6  | 0,000     | Export   | Crois    | 98,122 | 6  | 0,000     |
| Export   | All      | 104,12 | 6  | 0,000     | Export   | All      | 98,122 | 6  | 0,000     |

Source: The authors from Stata

## V. CONCLUSION

The objective of this study was to study the causality between export diversification and economic growth in CEMAC. The literature review enabled us to list some works done in the field. Some studies have shown that export diversification contributes to economic growth and, conversely, economic growth contributes to creating the conditions for export diversification. The methodology followed for the statistical estimations is based on an approach with three main steps, namely, the stationarity test (ADF, PP), the Johansen cointegration test, and the Granger causality test. The results showed that the export diversification variables and the expressed economic growth are stationary. The variables are also cointegrated, so they evolve together over the long term. The relationship between export diversification and economic growth is two-way. In other words, in the sense of growth, the diversification of exports caused economic growth and vice versa in the CEMAC zone over the period 1995-2015. At the level of individual countries, Cameroon, Central African Republic, Congo, Equatorial Guinea and Chad, the Granger causality test at the 5% threshold was positive for both variables. Only the case of Gabon has shown us that export diversification would positively affect economic growth, and the reverse is negative. This could undoubtedly lead the governments to develop not only new export products and new markets but also to stimulate the production of existing ones in order to shift the transformation of these products, a source of inclusive growth.

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