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Effects of Bank Credit on Economic Growth in the Central African Economic and Monetary Community (CEMAC)

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Abstract

The objective of this study is to analyze the effects of bank credit on economic growth in the CEMAC. The data used come from the online databases of the World Bank (WDI) and the United Nations Conference on Trade and Development (UNCTAD). Our sample consists of six CEMAC member countries and the data are observed on an annual basis, with a frequency ranging from 2005 to 2021. The results obtained using the Generalized Method of Moments (GMM) in a dynamic panel show that bank credit has a negative and significant effect on economic growth. These results have led us to formulate the policy implications that suggest that the CEMAC authorities should pursue reforms aimed at improving the banking sector, encouraging the diversification of the economy to reduce the CEMAC's dependence on raw materials and enable SMEs and individuals to contribute more effectively to economic growth through bank credit.

Keywords

Bank Credit, Economic Growth, CEMAC

1. Introduction

Economic growth, well-being, and development depend on the banking sector, which is indispensable to the economies of all countries (Menchif et al., 2020). According to Olowofeso et al. (2015), economic growth is an endless improvement in the ability to satisfy demand for goods and services, resulting from an increase in the scale of production and productivity, which is generally measured over a certain period.

For several years, the search for sustainable and inclusive economic growth in a unique institutional context, that of an Economic and Monetary Union (EMU), has been a challenge for policymakers. The few studies that have explored this issue focus on the EMU constituted by the euro area countries (Laurent & Le Cacheux, 2010; Alouini, 2010; Gaffard & Napolitano, 2010) and recent work on the issue, particularly in the CEMAC zone, is scarce (Noula et al., 2016; Waofo Deffo, 2019; Koutima-Banzouzi et al., 2022). The scarcity of EMUs in the world probably explains the specificity of these studies. The present research contributes to this work through a field of investigation, which is the CEMAC.

The CEMAC is a (EMU) of six countries, namely Cameroon, Central African Republic, Congo, Gabon, Equatorial Guinea and Chad. These countries share both a common currency—the CFA franc (African Financial Community Franc)—and a free trade area supported by a World Trade Organization (WTO) Regional Trade Agreement (RTA). The challenge of sustainable and inclusive economic growth in the CEMAC zone is complex due to the heterogeneity of macroeconomic situations in the Member States. Indeed, each country has a different economic size, economic priorities do not converge and assumptions relating to the credit cycle differ within the CEMAC zone. As a result, the CEMAC countries are characterized by contrasting economic trajectories, particularly about growth. According to the Bank of Central African States (BEAC), the growth rate in 2021 was 3.6% in Cameroon, −1.5% in Congo, 1.1% in the Central African Republic, −0.5% in Gabon, 0.9% in Equatorial Guinea, 1.6% in Chad and 1.7% for the CEMAC zone (BEAC, 2023). At the regional level, the growth situation is no more satisfactory, with sub-Saharan Africa recording the lowest growth in the world with 4.7% in 2021 compared to 5% in the European Union, 5.7% in North America, 6.6% in Asia and 6.7% in Latin America and the Caribbean (IMF, 2024).

Various statistics demonstrate that economic growth is a problem not only in Sub-Saharan Africa (World Bank, 2019; IMF, 2022) but also at the CEMAC level (IMF, 2015; BEAC, 2023). To remedy this economic growth problem, bank credit is considered an appropriate solution, particularly in developing countries, as it contributes to improving the economy (Menchif et al., 2020). Similarly, Schumpeter (1912) asserted that bank credit plays an indispensable role in economic growth because it stimulates technological innovation through increased productivity. Banks play an essential role in financing both the private and public sectors through credit, which is the engine of economic growth in most developing and developed countries. Timsina (2014) defined credit as the total funds provided by commercial banks to individuals, businesses, industries, and the government for consumption and investment purposes.

Over the last few decades, theoretical and empirical discussions on the importance of bank credit in the economy have remained controversial and, therefore, have occupied a crucial place in the literature on financing of economic development.

Theoretically, there are two opposing perspectives. The first argues that bank credit positively affects economic growth and, thus, we rely on the theories of

economic evolution (Schumpeter, 1912) and financial liberalization (McKinnon, 1973; Shaw, 1973). However, the second indicates that bank credit has negative effects on economic growth and is based on the theories of asymmetric information (Stiglitz & Weiss, 1981), informal markets (Taylor, 1983; Wijnbergen, 1983), and effective demand (Burckett & Dutt, 1991). Empirically, the theoretical controversies developed over the years have led to several studies that can be divided into two categories. The first category includes studies that highlight the positive effects of bank credit on economic growth Dembele and Machrafi (2021); Ekamena Ntsama et al. (2022); Chuba and Hitlar (2022). Contrastingly, in the second category, the works of Koivu (2002); Ojeaga et al. (2013); Ishioro (2017); Tchouassi and Tomo (2022) and Okonkwo et al. (2022) highlight the negative effects of bank credit on economic growth.

In light of these concerns about growth, our research question is as follows: What are the effects of bank credit on economic growth in the CEMAC? To answer this question, the objective is to analyze the effects of bank credit on economic growth in the CEMAC. Knowing that the extractive industries sector, which accounts for 90.2% of total CEMAC exports in 2021 (UNCTAD, 2022), benefits more from foreign direct investment (FDI) than from bank credit, we hypothesize that bank credit has negative effects on economic growth in the CEMAC.

The rest of the work is organized in (5) points. After the introduction, the first point (1) presents the review of the literature. The second point (2) is devoted to the situation of economic growth and bank credit in the CEMAC. The methodology is presented in the third point (3). The fourth point concerns the presentation and discussion of the results. Finally, the fifth and final point (5) is devoted to the conclusion and implications of economic policies.

2. Literature Review

2.1. Theoretical Review

Economic theory, similar to all other fields of knowledge, has been debated by several researchers. Thus, throughout the history of the economic literature, we can observe controversies over the importance of the financial system.

2.1.1. Analysis of Bank Credit on Economic Growth

1) The Theory of Economic Evolution

In his theory of economic evolution, Schumpeter (1912) argued that banks offer credit to entrepreneurs to finance economic activities that promote economic growth. For him, the banking sector must be able to select and finance the most creative investment projects of private enterprises, which are a source of economic growth. Economic growth is achieved if the banker provides capital and credit to the entrepreneur; thus, credit and banking occupy a primordial position in economic activity.

2) The Theory of Financial Liberalization

McKinnon (1973) and Shaw (1973) developed the theory of financial liberalization

in the early 1970s. They presented financial system liberalization as an effective and simple technique for activating economic growth in developing countries. Their hypotheses were based on the negative effects of financial repression on savings and investments in developing countries. According to them, only banks play a key role in financing investments by private companies. Furthermore, they question the role of the informal sector in financing economic activities. They added that low interest rates lead to low levels of investment as bank deposits decrease. This resolution affects the quality of investment, as banks that pay their deposits at low rates and lend them at lower lending rates increase risk and choose less risky projects instead of riskier but more profitable ones.

However, beyond the ambitious objectives provided by Schumpeter (1912) and McKinnon (1973) and Shaw (1973), several criticisms are worth analyzing.

2.1.2. Critical Analysis of Bank Credit on Economic Growth

1) The Theory of Asymmetric Information

Neo-Keynesians such as Stiglitz and Weiss (1981) asserted that asymmetric information is an obstacle in the banking sector that fundamentally impedes efficiency. They challenge the theory of economic evolution and financial liberalization by determining that asymmetric information in the credit market leads to credit rationing, which can justify the financial repression policy. Stiglitz and Weiss (1981) added that it is difficult for the policy of financial liberalization to act through a better allocation of resources and the orientation of savings toward productive investments since borrowers who agree to pay higher interest rates are partly those with the riskiest projects in the context of informational asymmetry.

2) Informal Market Theory

According to Taylor (1983) and Wijnbergen (1983), the informal sector is important for improving economies. For them, this market is characterized by an equilibrium rate that equalizes credit supply and demand, similar to the formal market. They argued that increasing bank lending rates can reduce the demand for money balances, which, in turn, reduces the supply of loanable money in the sector. In this sense, the growth rate in the informal sector will lead to an acceleration in the cost of capital and a reduction in investment.

3) Effective Demand Theory

According to Burckett and Dutt (1991), in line with Keynesian concepts, investment is determined by the anticipated effective demand and not by the sum of bank deposits (savings). They argued that the interest rate strongly influences the level of investment by private companies. Thus, an increase in bank interest rates can reduce investment and activity levels by exerting downward pressure on household consumption.

2.2. Empirical Review

2.2.1. Positive Results

Orji (2012) examines the determinants of bank savings in Nigeria as well as the impact of bank savings and bank credits on economic growth in Nigeria between

1970 and 2006 using two impact models: the distributed lag error correction model (DL-ECM) and the distributed model. The empirical results showed that bank credits have a positive influence on economic growth.

Dembele and Machrafi (2021) studied the effect of the banking sector on economic growth in Côte d'Ivoire during 1990-2019, using a VAR model. The results indicate a positive relationship between the banking sector and economic growth in Côte d'Ivoire.

Vasconcelos et al. (2021) tested the hypothesis that bank credit is necessary for economic growth, depending on the country's level of economic and financial development. To do this, the Granger causality methodology is used for panel data, with data from 106 countries for the period between 1970 and 2016. The main empirical results indicate that, in general, credit causes economic growth and vice versa.

Chuba and Hitlar (2022) examined the effect of commercial bank credit allocated to the agricultural sector on economic growth in Nigeria. Their survey results revealed that commercial bank credit allocated to the agricultural sector has a significant positive effect on economic growth in Nigeria.

Furthermore, Ekamena Ntsama et al. (2022) worked on the effect of bank credit and savings on growth in Cameroon using the ordinary least squares (OLS) method from 1980 to 2019. They observed that bank credit to private companies and savings had a positive and significant impact on Cameroon's economic growth during the study period.

2.2.2. Negative Results

Koivu (2002) analyses the link between finance and growth using a fixed-effects panel model and unbalanced panel data from 25 transition countries over the period 1993-2000. The results indicate that an increase in the amount of bank credit does not appear to accelerate economic growth. In some cases, credit growth may have led to a decline in growth rates. According to these results, the interest rate differential is significantly and negatively related to economic growth.

Ojeaga et al. (2013) examined the effect of bank lending on growth in Nigeria using data from 1989 to 2012. The estimation method used in the study was the quantile regression estimation method. Their results show that commercial bank lending has a negative effect on growth, whereas institutions do not sufficiently protect their customers from the negative effects that often arise during bank liquidation.

Ishioro (2017) analyzed the effects of banking sector reforms on economic growth in Nigeria using time series data from 1970 to 2013 and an ARDL approach. The study reveals that credit from banking sector to the private sector has been negative and statistically insignificant in Nigeria's economic growth.

Tchouassi and Tomo (2022) study the effects on economic growth of institutional reforms of financial development in the Economic and Monetary Community of Central Africa. The results obtained using the method of generalised moments on a balanced panel show that credit to the private sector does not

contribute to economic growth.

Okonkwo et al. (2022) examine the contributions of the banking sector to the growth of the Nigerian economy from 1986 to 2020 using ordinary least squares regression and Granger causality test. The results of the study revealed that bank credit has a significant negative effect on economic growth.

3. Economic Growth and Bank Credit Situation in the CEMAC

In its current form, the economic structure of the CEMAC is more dependent on the commodity sector. In 2021, commodities accounted for about 90.2% of total CEMAC exports, 70.8% of which was made up of fuels, especially oil (UNCTAD, 2022). Bank credit provided to the private sector by banks aims to reduce this dependence on oil and boost the contribution of the non-oil sector to GDP growth in the CEMAC zone.

3.1. Economic Growth Situation in the CEMAC

As far as economic growth is concerned, Figure 1 shows an upward trend. Between 2005 and 2008, the CEMAC zone experienced moderate economic growth, rising from 3.2% to 4.5%. The increase in commodity prices, particularly oil prices, has contributed to the improvement in the level of GDP growth, with the price of a barrel of oil rising from $54.4 ($) per barrel to $97.6 per barrel during this period (UNCTAD, 2022).

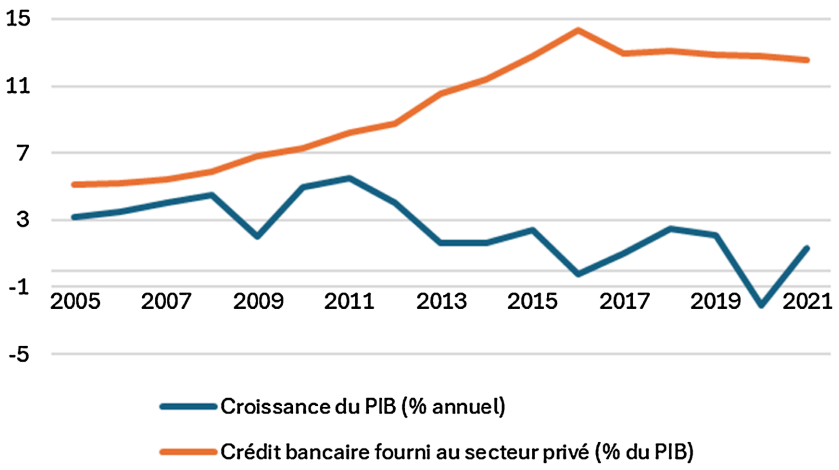


Figure 1. Evolution of the growth rate of GDP and bank credit provided to the private sector in the CEMAC zone for the period 2005 to 2021. Source: WDI (2023).

In 2009, the growth rate decreased by 2.5 percentage points year-on-year to 2%. This contraction in the growth rate was exacerbated by the global economic recession linked to the subprime crisis (2007-2008) and the sharp fall in oil prices—35.7 percentage points year-on-year at the end of December 2009, to $61.9 per barrel (UNCTAD, 2022).

During the 2009-2011 period, economic growth accelerated to 5.5% in 2011, largely due to higher oil prices to $110.9 per barrel in 2011. This increase in oil

prices was caused by political instability in Arab countries (Arab Spring) and the growing global demand for oil, especially in China.

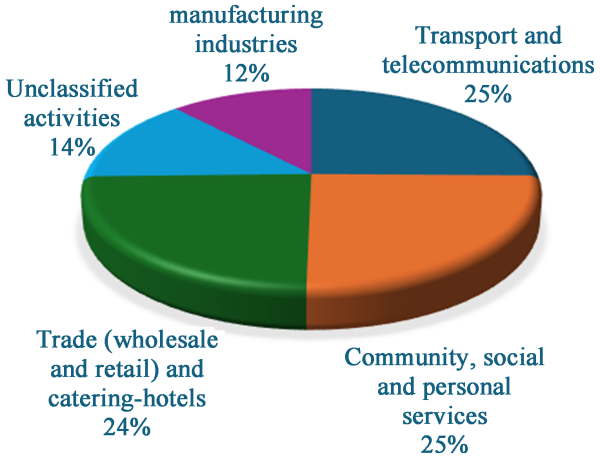
Between 2011 and 2020, economic growth in the CEMAC zone was weak and unstable, falling from 4% in 2012 to −2.1% in 2020. Growth has been held back due to two shocks. The first was the sharp drop in oil prices from $112 per barrel in 2012 to $42.3 per barrel in 2020 (UNCTAD, 2022) and the second was the economic recession in 2020 due to the COVID-19 pandemic. During this period, GDP growth was negative, i.e., −0.2% in 2016 and −2.1% in 2020. A moderate recovery in economic growth was observed in 2021 with an estimated growth rate of 1.3%. This improvement in economic growth is mainly due to the post-COVID-19 response measures under IMF and World Bank-supported programs.

3.2. Bank Credit Situation in the CEMAC

Figure 1 shows that GDP growth is more volatile than bank credit growth. The dynamics of bank credit and GDP growth diverge, which means that demand for bank credit comes more from the non-oil sector and not from the oil sector, which is the engine of growth in the CEMAC. As shown in the data in Figure 1, while bank credit provided to the private sector by banks held up well during the 2014 commodity crisis, GDP growth had slowed (Figure 1), showing the little impact of bank credit in its ability to boost GDP growth in the CEMAC. Similarly, in 2016, at the height of the commodity crisis, bank credit growth reached a historic level of 14.3% while GDP growth recorded a negative rate of −0.2%. These developments showed that the increase in bank credit could have a negative effect on GDP growth in the CEMAC zone.

The period between 2005 and 2016 saw a strong development of bank credit to the private sector. This significant increase in bank credit was supported by an increase in credit demand from companies and households. Credit momentum slowed between 2018 and 2021 (Figure 1). This slowdown can be explained by the collapse of oil prices, leading to a significant increase in unpaid and bad loans, and also by the COVID-19 crisis, which has slowed down economic activity. In response to the COVID-19 pandemic, bank credit has benefited the community, social and personal services to the tune of 25% as shown in Figure 2.

Overall, in 2021, bank credit in the CEMAC benefited the non-oil sector more (Figure 2). Bank credit allocated to manufacturing industries was limited to 12%, the lowest rate recorded compared to the transport and telecommunications sector, which captured 25%, or the trade (wholesale and retail) and catering-hotel sector, which accounted for 24% of bank credit distributed to the private sector. Another interpretation is that the extractive industries sector (oil, gas, minerals and metals) on which the CEMAC economy is based is by its nature financed more by extractive FDI from multinationals than by national bank credit. This explains the low level of bank credit enjoyed by manufacturing industries, which are mainly located in the extractive sector of CEMAC countries.



Source: BEAC (2021b).

Figure 2. Predominant sectors of activity in the destination of bank loans in the CEMAC zone in 2021.

4. Methodology

This section examines the theoretical and empirical modeling of the effects of bank credit on economic growth and presents the data sources and variables.

4.1. Specification of the Theoretical Model

Our study used the Solow (1956) model developed by Pagano (1993). Capital and labor are remunerated according to marginal productivity. To analyze the effects of bank credit on growth, we followed Ekamena Ntsama et al. (2022) approach. We assumed a Cobb-Douglas production function whose output at time t is given by:

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} \tag{1}$$

with $0 < \alpha < 1$ et $0 < \beta < 1$.

Y: product, K: capital, L: labor, and A: level of technology.

In this sense, the productivity of Factor A complements the other factors of production and is presented by the following equation:

$$A_t = A_0 F_t^e CP_t^z \left(F * CP\right)_t^{\partial} e^{(g_t + \mu_t)} \tag{2}$$

The initial equation becomes:

$$Y_t = A_0 F_t^e CP_t^z \left(F * CP\right)_t^{\partial} e^{(g_t + \mu_t)} K_t^{\alpha} L_t^{\beta} \tag{3}$$

Regarding the assumption of convergence in the Solow (1956) method, after developing and introducing the logarithm, we obtained the following final equation:

$$\Delta Y_t = \beta_0 + (\alpha - 1) Y_{t-1} + \beta L_t + \alpha K_t + eF_t + zCP_t + \partial \left(F * CP\right)_t + g_t + \mu_t \tag{4}$$

with CP private sector credit and F financial development, Equation (4) links our two study variables.

4.2. Specification of the Empirical Model

Considering the different variables retained, the estimation model is given by

$$GDP_{it} = \delta_0 + \delta_1 CP_{it} + \delta_2 CPS_{it} + \delta_3 FDI_{it} + \delta_4 IMPORT_{it} + \delta_5 CPI_{it} + \varepsilon_{it} \quad (5)$$

where δ_i are parameters to be estimated; i and t represent the country and year indices, respectively; and ε_{it} is the random term. We focused on the main variables that serve as the basis for our estimates.

4.2.1. Presentation of Data Sources and Model Variables

The data used in this study come from the online databases of the World Bank (WDI) and the United Nations Conference on Trade and Development (UNCTAD). Our sample is made up of the six CEMAC member countries. The data are observed on an annual basis, with a frequency ranging from 2005 to 2021.

GDP growth represents the growth rate of gross domestic product as an annual percentage. This indicator assesses a country's level of economic activity. Its expected sign is positive (Dembele & Machrafi, 2021).

CP represents the rate of credit granted to the private sector by banks and is an indicator that measures the ratio between the amount of credit granted to private companies by banks and GDP. Its expected sign is positive (Olowofeso et al., 2015).

CPS refers to the number of cell phone subscribers. It is an essential variable of the digital economy. Its expected sign is positive (Gbame & Silue, 2022).

FDI captures the importance of foreign financial flows in relation to production. Its expected sign is positive (Ekamena Ntsama et al., 2022).

Inflation rate (CPI) measured by the relative change in consumer price index, corresponds to a general increase in the prices of goods and services in an economy. Its expected sign is negative (Noula et al., 2016).

IMPORT represents the value of all goods and other market services received from the rest of the world. Its expected sign is positive (Karaca, 2023).

4.2.2. Analysis of Descriptive Statistics for Selected Variables

This section presents a descriptive statistical analysis of the variables to be estimated. The results are presented in **Table 1**.

Table 1. Descriptive statistics results

Variables		Mean	Std. Dev	Min	Max	Comments
GDP	Overall	2,253,705	6,723,346	−36,39198	1,779,911	N = 102
	Between		11,551	1,210,205	3,676,252	n = 6
	Within		6,639,314	−35,36184	1,884,261	T = 17
CP	Overall	9,817,887	4,109,861	201,042	1,918,942	N = 102
	Between		1,908,278	6,917,618	1,214,276	n = 6
	Within		3,718,375	2,226,012	1,940,502	T = 17
CPS	Overall	5,615,588	3,935,259	2,098,948	1,491,076	N = 102
	Between		3,553,623	2,123,783	1,150,089	n = 6
	Within		2,204,208	−8,337828	902,546	T = 17

Continued

FDI	Overall	4,897,933	7,895,215	−18,91777	3,981,094	N = 102
	Between		4,333,116	1,612,696	1,298,375	n = 6
	Within		6,821,505	−27,00359	3,172,513	T = 17
IMPORT	Overall	364,461	1,338,084	1,684,618	8,577,826	N = 102
	Between		1,222,006	2,396,094	5,548,443	n = 6
	Within		7,305,691	1,811,896	6,673,993	T = 17
CPI	Overall	3,033,803	2,957,157	−8,97474	1,489,868	N = 102
	Between		0,7943665	2,335,985	4,362,727	n = 6
	Within		286,596	−8,624203	1,356,976	T = 17

Source: Author based on WDI (2023) data.

Table 1 shows that the average GDP of all CEMAC countries is 2.53%. Additionally, the standard deviation between countries is equal to 1.15%, whereas for each country, it is 6.63% of an overall standard deviation of 6.72%. Thus, economic growth in the CEMAC region averaged approximately 2.53%. This average was far from 100%. Hence, on average, CEMAC countries demonstrate weak economic growth—the minimum level of the GDP growth rate is −36.39%, the maximum level is approximately 17.79%, and the dispersion is strong around the average value. The importance of the temporal dimension (17 years per country) over individual dimensions (6 countries) explains this result.

5. Presentation and Interpretation of Results

5.1. Identifying the Estimation Technique to Be Used

We used an appropriate estimation method to achieve our specific objective. However, to determine this model and the types of data to be applied, it is necessary to conduct economic and econometric tests.

5.1.1. Pesaran and Yamagata Test

Pesaran and Yamagata (2008) proposed the Δ test as an improved version of Swamy's slope homogeneity test. Table 2 presents the results of homogeneity tests.

Table 2. Pesaran and Yamagata's (2008) findings.

Homogeneity test	Δ Stat	P-Value
ΔTest	−1.830	0.067

Source: Author based on WDI (2023) data.

The null hypothesis for the slope heterogeneity test is that the slope coefficients are homogeneous. Therefore, we opted to study panel data with a model for estimation purposes.

$$GDP_{it} = \delta_0 + \delta_1 CP_{it} + \delta_2 CPS_{it} + \delta_3 FDI_{it} + \delta_4 IMPORT_{it} + \delta_5 CPI_{it} + \varepsilon_{it}$$

5.1.2. Testing the Stationarity of the Variables Used in the Model

This section examines whether the variables used in the model are stationary. In other words, we need to determine whether there is at least a cointegrating or long-term relationship among the variables. This relationship is verified using several econometric tests. Therefore, we retain three unit root tests in this study: the Levin, Lin, and Chu (LLC) test (2002); Im, Pesaran, and Shin W-stat (IPS) test (2003); and Hadri's LM test (2000). The findings are presented in **Table 3**.

Table 3. Stationarity test results.

Variables	Test	Statistics In level	Statistics In difference	Decision
GDP	LLC	−2.24500**	−6.19239***	I (1)
	IPS	−1.32283*	−6.22464***	I (1)
	HADRI	3.51216***	2.45632***	I (1)
CP	LLC	−2.41791***	−3.00609***	I (1)
	PIS	0.07315	−2.25632**	I (1)
	HADRI	5.09769***	2.45925***	I (1)
CPS	LLC	−3.49136***	−2.24209**	I (1)
	IPS	−1.44385*	−3.03702***	I (1)
	HADRI	4.75814**	3.39433***	I (1)
FDI	LLC	−2.25766**	−4.37375***	I (1)
	IPS	−1.58313*	−5.42576***	I (1)
	HADRI	1.84412**	4.61312***	I (1)
IMPORT	LLC	−0.34536	−5.32117***	I (1)
	IPS	−0.73701	−4.95948***	I (1)
	HADRI	1.28801*	−7.24747***	I (1)
CPI	LLC	−4.34342***	−10.6728***	I (1)
	IPS	−4.44800***	−9.56667***	I (1)
	HADRI	2.06331**	4.72424***	I (1)

The significance thresholds were set to 1% (***), 5% (**), and 10% (*). Author based on WDI (2023) data.

H0: The panel is non-stationary.

H1: The panel is stationary

The acceptance rule consists of rejecting H0 if the p-value is insufficient at the chosen risk of error threshold (5% in this case).

In fact, the elaboration of these results allows us to conclude that the LLC, IPS, and Hadri tests, notably those of the first and second generations, indicate that all

six (6) panel variables are non-stationary in level. In other words, all variables in the model are integrated in order (1), that is, the first difference, which leads us to analyze whether there is at least one cointegration relationship among the selected variables.

5.1.3. Presentation of Cointegration Test between Variables

To examine the existence of a long-term relationship between growth and credit, as well as other control variables (number of CPS, foreign direct investment, imports, and inflation), we use Pedroni (1999, 2004) cointegration tests based on stationarity tests on estimated residuals. The test results are listed in **Table 4**:

Table 4. Pedroni cointegration test results.

Statistics	Standardized values	
Panel refers to the "within" dimension		
v-Statistic Panel	−0.867038	−2.010198
rho-Statistic Panel	0.725891	0.957389
PP-Statistic Panel	−8.427879***	−8.422975***
ADF-Statistic Panel	−6.104758***	−5.675894***
Group refers to the "between" dimension		
rho-Statistic Group	1.890.894	
PP-Statistic Group	−11.82396***	
ADF-Statistic Group	−5.603448***	

Source: Author based on WDI (2023) data. The significance thresholds were set to 1% (***), 5% (**), and 10% (*).

Pedroni (1999, 2004) cointegration test results indicate that the set of statistics for a between-panel (panel: rho, PP, and ADF) and a within-panel (group: rho, PP, and ADF) that are significant are greater than those that are nonsignificant. In fact, all of these tests validate the existence of a cointegrating or long-term relationship.

Subsequently, having noted the existence of a cointegrating relationship based on Pedroni (1999) test, it is now crucial to apply an efficient model to estimate systems of cointegrated variables in panel data. To this end, we can distinguish several mechanisms: the GMM model; the error-correction estimators of Pesaran, Shin, and Smith (1999); mean group; pooled mean group; static fixed effect; dynamic fixed effect; the fully modified OLS model suggested by Phillips and Hansen (1990) and applied by Pedroni; the dynamic OLS method by Saikkonen (1991), Stock and Watson (1993) and developed by Kao and Chiang (2001).

Among the abovementioned models, we retain the GMM dynamic panel model because it allows for estimation when explanatory variables are assumed to be weakly exogenous. Thus, they can be influenced by present or past realizations of the variable to be explained, although they are uncorrelated with future realizations

of the error term. Therefore, it is an exceptional model that has attracted the attention of macroeconomists for several years (Kpodar, 2005).

5.2. Estimation of the Long-Run Relationship with the GMM Model

The GMM model is an efficient estimation technique for nonstationary panel data. Although several models exist, it has been widely applied in econometrics. A method is dynamic when it includes one or more lags of the dependent variable as explanatory variables.

Thus, by integrating the lagged dependent variable, Equation (6) becomes

$$Y_{i,t} - Y_{i,t-1} = (\alpha - 1) Y_{i,t-1} + \beta' X_{i,t} + v_i + \varepsilon_{it} \tag{6}$$

where $Y_{i,t}$ represents the GDP rate, X represents the model's explanatory variables, β' represents the model's parameters, v the time-specific effect, ε the error term, i the country index, and t the time index.

Equation (7), which is a growth equation following Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) studies, corresponds to in our work and can be formulated as follows:

$$\begin{aligned} GDP_{i,t} = {} & \alpha GDP_{i,t-1} + \delta_1 GDP_{i,t} + \delta_2 CP_{i,t} + \delta_3 CPS_{i,t} + \delta_4 FDI_{i,t} \\ & + \delta_5 IMPOR_{i,t} + \delta_6 CPI_{i,t} + v_t + \varepsilon_{it} \end{aligned} \tag{7}$$

Therefore, the presence of the lagged explained variable in the above method hampers the use of standard econometric techniques such as OLS because they generate biased results.

It is also noteworthy that there are two variants of dynamic panel GMM estimators: the first-difference GMM estimator was developed by Arellano and Bond (1991), and the second system GMM estimator was developed by Arellano and Bover (1995) and Blundell and Bond (1998). The latter provides solutions for the simultaneity bias, reverse causality, and omitted variables. The consideration of these two estimators assumes quasi-stationarity of the variables in the level equation and the absence of autocorrelation in the residuals.

Each estimator exhibits unique features. Considering the particularity of the model, the results are presented in **Table 5**.

The results of the panel data estimation using the GMM in difference and in system with long-run coefficients on the effects of bank credit on economic growth in CEMAC countries are presented in **Table 6**. Similarly, considering the results of the two GMM estimates (**Table 5** and **Table 6**), the difference estimate yields better results than the system estimate. Therefore, in our study, we applied the GMM in difference.

The results obtained in **Table 5** indicate that according to the Wald chi^2 test, in addition to the number of instruments being lower than the number of observations, we can conclude that the method is appropriate. The Sargan and Hansen tests did not reject the hypothesis of acceptance of the instruments used, because the probabilities assigned to them were 0.743 and 1, respectively. Similarly, according to the Arellano-Bond tests, the presence of the AR effect (1) is shown at

Table 5. Effects of bank credit on economic growth in the CEMAC results of panel estimation using GMM in difference.

GDP growth rate (GDP)	Long-term coefficients
Delayed GDP growth rate (L. GDP)	−0.304***
	(0.000)
Credit to private sector as % of GDP (CP)	−2.242***
	(0.000)
Cell phone subscribers as % of GDP (CPS)	0.119
	(0.188)
Foreign direct investment as % of GDP (FDI)	−0.028
	(0.404)
Imports as % of GDP (IMPORT)	0.151**
	(0.027)
Consumer price index as % of GDP (CPI)	−0.057***
	(0.002)
Number of observations	90
Number of groups	6
AR (1)	0.073
AR (2)	0.562
Sargan	0.743
Hansen	1.000
Wald	0.000
Number of instruments	73

Source: Author based on WDI (2023) data. The significance thresholds were set to 1% (***), 5% (**), and 10% (*).

Table 6. GMM dynamic panel estimation results.

Variables GDP growth rate (TCPIB)	GMMD Long-term coefficients	GMMS Long-term coefficients
Lagged GDP growth rate (L. GDP)	−0.304***	−0.057
	(0.000)	(0.150)
Credit to private sector as % of GDP (CP)	−2.242***	−1.311***
	(0.000)	(0.005)
Cell phone subscribers as % of GDP (CPS)	0.119	0.046***
	(0.188)	(0.000)
Foreign direct investment as % of GDP (FDI)	−0.028	−0.051
	(0.404)	(0.198)

Continued

Imports as % of GDP (IMPORT)	0.151**	−0.058*
	(0.027)	(0.084)
Consumer price index as % of GDP (CPI)	−1.068***	−0.533***
	(0.002)	(0.000)
Constant		17.172***
		(0.002)
Number of observations	90	96
Number of groups	6	6
AR (1)	0.073	0.078
AR (2)	0.562	0.452
Sargan	0.743	0.583
Hansen	1.000	1.000
Wald	0.000	0.000
Number of instruments	73	126

Source: Author based on WDI (2023) data. The significance thresholds were set to 1% (***), 5% (**), and 10% (*).

the 10% threshold; however, the probability associated with it is 0.073, and the existence of the AR effect (2) is rejected, that is, an allied probability is 0.562. In other words, according to the Arellano-Bond tests, we can conclude that there is no second-order autocorrelation, but rather a first-order autocorrelation, which validates the obtained results that can be interpreted.

Interpretation of Results

The results of the estimate contained in **Table 6** show that a 1% increase in bank credit to the private sector leads to a decrease in GDP of 2.24%. However, bank credit to the private sector has a negative and significant effect on economic growth in the CEMAC at the 1% threshold. Similar results are found by many previous studies, including (Ishioro, 2017; Tchouassi & Tomo, 2022; Okonkwo et al., 2022). These results can be explained in the context of the CEMAC by the fact that the extractive industries sector (oil, gas, minerals and metals) on which economic growth in the CEMAC is based is financed more by foreign direct investment (FDI) from the multinationals that dominate this sector than by financing by bank credit from the host country. Another explanation is the rigidity of banking regulations in the CEMAC, the narrowness of the financial sector, the low level of financial inclusion, and poor management of bank credit. The predominance of short-term credit in the CEMAC hinders long-term investment projects and benefits traders who use them to finance imports of common consumer products into the CEMAC. More specifically, imports have a positive and significant effect on economic growth in the CEMAC at the 5% threshold (**Table 6**). Thus, an

increase in imports of 1 point, all other things being equal, improves the economic growth of the CEMAC by 0.15%. Similar results are found by many studies (Karaca, 2023; Esposito & Hassan, 2003; Jinjarak, 2007). However, the coefficient associated with the inflation rate variable is negative and significant at the 1% threshold, suggesting that inflation has a negative effect on economic growth in the CEMAC. An increase of 1 point in the inflation rate translates into a decrease in the level of economic growth in the CEMAC of 1.06%. This result is in line with those found by Noula et al. (2016); Ekamena Ntsama et al. (2022) and Nkwenka Nyanda (2021). In the CEMAC as elsewhere, the countries' import activities are carried out through trade credits. Inflation and imports are influenced by the CEMAC government to varying degrees of complexity. The BEAC (2021a), which defines and conducts CEMAC monetary policy, notes that imports have maintained an upward trend in the general price level due to a structural deficit in agricultural production in the CEMAC but also due to supply difficulties for importers. Thus, inflation in the CEMAC could have an external origin or trade with the outside world could be the transmission channel of inflation in the CEMAC, thus depressing economic activity (Nkwenka Nyanda, 2021). Future research will try to address this concern.

6. Conclusion and Policy Implications

This article analyzes the effects of bank credit on economic growth in the CEMAC. After highlighting the problem and the economic literature, the results obtained using the Generalized Method of Moments (GMM) show that bank credit has a negative and significant effect on economic growth in the CEMAC. In light of current results, the policy implications require CEMAC countries to diversify their economies to promote other sectors of activity outside the extractive industries sector (oil, gas, minerals and metals), which is known to be capital-intensive. This sector, which is essential for economic growth in the CEMAC, is dominated by multinationals that finance it through foreign direct investment (FDI) and not by bank credit from the host country. Economic diversification would allow SMEs and individuals to contribute effectively to economic growth through bank credit. In addition, the CEMAC should continue its policy of developing its financial system with a view to improving financial inclusion, increasing banking competition, and increasing the supply of credit to the private sector, which is important for promoting economic growth. Tax incentives for the private sector should also be considered.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Alouini, O. (2010). Taille des pays, performance économique et économie politique de la zone euro. *Revue de l'OFCE, 112,* 191-212. https://doi.org/10.3917/reof.112.0191

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies, 58,* 277-297. https://doi.org/10.2307/2297968

Arellano, M., & Bover, O. (1995). Another Look at the Instrumental Variable Estimation of Error-Components Models. *Journal of Econometrics, 68,* 29-51. https://doi.org/10.1016/0304-4076(94)01642-d

BEAC (2020). *Banque des États de l'Afrique centrale. Rapport Annuel 2020. Imprimerie–BEAC.* Rapport-annuel-beac-2020_version-du-22-11_21.pdf

BEAC (2021a). *Bank of Central African States. Note on the Evolution of Inflation in the CEMAC as of December 31, 2021 and Short and Medium-Term Outlook.* https://www.beac.int/wp-content/uploads/2022/04/note_inflation_cemac_T12022_VF.pdf

BEAC (2021b). *Bank of Central African States. Monetary Policy Report.* https://www.beac.int/wp-content/uploads/2021/10/Rapport-de-PM-BEAC_Septembre-2021_publiable_vf.pdf

BEAC (2023). *Economic and Statistical Bulletin. Banque des Etats de l'Afrique Centrale.* https://www.beac.int/wp-content/uploads/2024/05/bulletin-economique-et-statistique-N%C2%B020-.pdf

Blundell, R., & Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics, 87,* 115-143. https://doi.org/10.1016/s0304-4076(98)00009-8

Chuba, M. A., & Hitlar, I. (2022). Effect of Commercial Banks' Credit Allocated to Agricultural Sector on Economic Growth in Nigéria. *International Journal of Advanced Economics, 4,* 131-141. https://doi.org/10.51594/ijae.v4i7.377

Dembele, B. S., & Machrafi, M. (2021). L'impact du secteur bancaire sur la croissance économique en Côte d'Ivoire de 1990 à 2019. *Revue Internationale du Chercheur, 2,* 511-529. https://journals.indexcopernicus.com/api/file/viewByFileId/1225105.pdf

Ekamena Ntsama, N. S., Ngo Bilong, A. M., & Alhadji, A. D. (2022). Banking System and Economic Growth in Cameroon. *Munich Personal RePEc Archive,* 1-15. https://mpra.ub.uni-muenchen.de/112649/

Esposito, F., & Hassan, F. (2003). Import Competition, Trade Credit, and Financial Frictions in General Equilibrium. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.4363366

Gaffard, J. L., & Napoletano, M. (2010). Performances et politiques de croissance. *Revue de l'OFCE, 112,* 213-248. https://doi.org/10.3917/reof.112.0213

Gbame, H. D., & Silue, D. (2022). Development Financier, Diffusion des tic et Croissance Economique dans les pays de l'Uemoa. *European Scientific Journal, 18,* 847-881. https://doi.org/10.19044/esj.2022.v18n34p18

Hadri, K. (2000). Testing for Stationarity in Heterogeneous Panel Data. *The Econometrics Journal, 3,* 148-161. https://doi.org/10.1111/1368-423x.00043

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Reprint of: Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics, 234,* 56-69. https://doi.org/10.1016/j.jeconom.2023.03.002

IMF (International Monetary Fund) (2015). *Central African Economic and Monetary Community (CEMAC).* IMF Country Report No. 15/222. https://www.imf.org/external/pubs/ft/scr/2015/cr15222.pdf

IMF (International Monetary Fund) (2022). *Regional Economic Outlook Report Sub-Saharan Africa. Living on the Edge.* Data IMF Library 9798400221989.

IMF (International Monetary Fund) (2024). *IMF Data*. https://www.imf.org/en/Data

Ishioro, B. O. (2017). Banking Sector Reforms and Economic Growth: Recent Evidence from a Reform-Bound Economy. *Binus Business Review, 8,* 49-60. https://doi.org/10.21512/bbr.v8i1.1798

Jinjarak, Y. (2007). On the Causality between Trade Credits and Imports: Evidence and Possible Implication for Trade Penalties on Debt Defaults. *International Economic Journal, 21,* 317-333. https://doi.org/10.1080/10168730701568304

Kao, C., & Chiang, M. (2001). On the Estimation and Inference of a Cointegrated Regression in Panel Data. In Baltagi, B.H., Fomby, T.B. and Carter Hill, R., Eds., *Nonstationary Panels*, *Panel Cointegration*, *and Dynamic Panels* (Advances in Econometrics, Vol. 15), Emerald Group Publishing Limited, 179-222. https://doi.org/10.1016/s0731-9053(00)15007-8

Karaca, C. (2023). Dynamics of Trade Credit, Bank Credit Extension, Sustainable Economic Growth, and Imports: Evidence from the European Non-Financial Sector. *Sustainability, 15,* Article 12857. https://doi.org/10.3390/su151712857

Koivu, T. (2002). Do Efficient Banking Sectors Accelerate Economic Growth in Transition Countries? *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1015710

Koutima-Banzouzi, J. M., NKale Bougha Obouna, E., & Hakizimana, J. (2022). Size of Countries and Economic Growth in the CEMAC Zone. *Revue Française d'Economie et de Gestion, 3,* 163-185. https://www.revuefreg.fr/index.php/home/article/view/933

Kpodar, K. (2005). *Manuel d'initiation à Stata*. Centre d'études et de recherches sur le développement international, France. https://ideas.repec.org/c/wpa/wuwppr/0501107.html

Laurent, É., & Le Cacheux, J. (2010). Taille des pays et stratégies de croissance. *Revue de l'OFCE, 112,* 171-190. https://doi.org/10.3917/reof.112.0171

Levin, A., Lin, C., & James Chu, C. (2002). Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics, 108,* 1-24. https://doi.org/10.1016/s0304-4076(01)00098-7

McKinnon, R. I. (1973). *Money and Capital in Economic Development*. The Brookings Institution.

Menchif, M., Chemlal, M. & Sifouh, N. (2020). L'évolution du secteur bancaire et la croissance économique: Quel effet sur le Maroc? *International Journal of Business and Technology Studies and Research, 2,* 1-14. https://doi.org/10.5281/zenodo.3824652

Nkwenka Nyanda, P. G. (2021). Déterminants et effets économiques de l'inflation dans la CEMAC. *Journal of Academic Finance, 12,* 187-203. https://doi.org/10.59051/joaf.v12i1.427

Noula, A. G., Bkwayep Nguemnang, Y. R., & Mba Fokwa, A. (2016). Influence De La Bancarisation Et Du Credit Bancaire Sur La Croissance Economique Dans La Zone Cemac. *European Scientific Journal, 12,* Article No. 31. http://dx.doi.org/10.19044/esj.2016.v12n31p373

Ojeaga, P. I., Odejimi, D. O., Okhiku, J. O., & Ojeaga, D. (2013). *Does Commercial Bank Lending Growth? The Impact of Commercial Lending on Real Sector Growth in Nigeria*. University College Olomouc Czech. http://eprints.covenantuniversity.edu.ng/id/eprint/4264

Okonkwo, J. J., Anachedo, C. K., Jeff-Anyeneh, E. S., & Nnoje, I. A. (2022). The Contribution of Banking Sector to the Growth of the Nigerian Economy. *International Journal of Research, 9,* 85-101. https://doi.org/10.5281/zenodo.6334264

Olowofeso, E. O., Adeleke A. O., & Udoji, A. O. (2015). Impact of Private Sector Credit on Economic Growth in Nigeria. *CBN Journal of Applied Statistics*, *6,* 81-101.

Orji, A. (2012). Bank Savings and Bank Credits in Nigeria: Determinants and Impact on Economic Growth. *International Journal of Economics and Financial Issues, 2,* 357-372. https://ssrn.com/abstract=2364011

Pagano, M. (1993). Financial Markets and Growth. *European Economic Review, 37,* 613-622. https://doi.org/10.1016/0014-2921(93)90051-b

Paul, B., & Dutt, A. K. (1991). Interest Rate Policy, Effective Demand, and Growth in LDCs. *International Review of Applied Economics, 5,* 127-153. https://doi.org/10.1080/758533094

Pedroni, P. (1999). Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors. *Oxford Bulletin of Economics and Statistics, 61,* 653-670. https://doi.org/10.1111/1468-0084.61.s1.14

Pedroni, P. (2004). Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis. *Econometric Theory, 3,* 579-625. https://doi.org/10.1017/s0266466604203073

Pesaran, M. H., & Yamagata, T. (2008). Testing Slope Homogeneity in Large Panels. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.671050

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. *Journal of the American Statistical Association, 94,* 621-634. https://doi.org/10.2307/2670182

Phillips, P. C. B., & Hansen, B. E. (1990). Statistical Inference in Instrumental Variables Regression with I(1) Processes. *The Review of Economic Studies, 57,* 99-125. https://doi.org/10.2307/2297545

Saikkonen, P. (1991). Asymptotically Efficient Estimation of Cointegration Regressions. *Econometric Theory, 7,* 1-21. https://doi.org/10.1017/s0266466600004217

Schumpeter, J. A. (1912). *The Theory of Economic Development.* Harvard University Press. https://doi.org/10.1590/S0034-75901961000200012

Shaw, E. S. (1973). *Financial Deepening in Economic Development.* Oxford University Press.

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics, 70,* 65-94. https://doi.org/10.2307/1884513

Stiglitz, J. E., & Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. *The American Economic Review, 71,* 393-410. https://api.semanticscholar.org/CorpusID:152864224

Stock, J. H., & Watson, M. W. (1993). A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems. *Econometrica, 61,* 783-820. https://doi.org/10.2307/2951763

Taylor. L. (1983). Structuralist Macroeconomics: Applicable Models for Third World. Basic Books.

Tchouassi, G., & Tomo, C. P. (2022). *Modélisation des effets des réformes institutionnelles sur le développement financier pour la croissance économique en zone CEMAC. University Library of Munich.* https://mpra.ub.uni-muenchen.de/113482/

Timsina, N. (2014). Bank Credit and Economic Growth in Nepal: An Empirical Analysis. *NRB Economic Review, 26,* 1-24. https://doi.org/10.3126/nrber.v26i2.52577

United Nations Conference on Trade and Development (UNCTAD) (2022). *Handbook of Statistics 2022.* https://unctadstat.unctad.org/EN/Index.html

Vasconcelos, M. R., Reginato, V. G., & Cunha, M. S. D. (2021). An Empirical Analysis of the Relationship between Bank Credit and Economic Growth. *Textos de Economia, 24,*

1-24. https://doi.org/10.5007/2175-8085.2021.e72868

Waofo Deffo, A. L. (2019). Monetary Conditions and Economic Growth in the CEMAC Zone. *Global Journal of Management and Business Research, 19,* 27-45. https://doi.org/10.34257/GJMBRCVOL19IS5PG27

WDI (World Development Indicators) (2023). https://datacatalog.worldbank.org/search/dataset/0037712/World-Development-Indicators

Wijnbergen, S. (1983). Interest Rate Management. *Journal of Monetary Economics, 12,* 433-452. https://doi.org/10.1016/0304-3932(83)90063-6

World Bank (2019). *Global Economic Prospects: Heightened Tensions, Subdued Investment*. World Bank. https://doi.org/10.1596/978-1-4648-1398-6