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Impact of Public Expenditure and Quality of Institutions on Private Investment in CEMAC's Countries

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Abstract

Private investment as a vehicle for growth and employment has been a major concern in recent years. This article analyzes the impact of public spending and the quality of institutions on private investment in CEMAC. The results of an econometric analysis using a spatial Durbinmodel (SDM) with random effects show that public investment expenditure, consumption and the quality of institutions have a positive impact on private investment in CEMAC.These results have made it possible to reformulate the implications of economic policies that go in the direction of strengthening public expenditure and improving the quality of institutions.

Keywords: public expenditure, institutions, private investment and CEMAC

Introduction

Theoretical, empirical and international organization studies highlight the importance of private investment in achieving economic growth objectives (Lucas, 1988; Barro, 1990; OECD, 2019; and Taiwo and Olusola, 2018). To this end, the issue of private investment promotion has been brought to the forefront of economic development policy debates (FAO, 2013; Gbenga et al., 2019). Private investment covers the gross expenditure of the private sector (including private nonprofit organizations) on the acquisition of domestic fixed assets (World Bank, 2018)

In CEMAC, the contribution of private investment to economic activity remains low. It does not exceed 20% of GDP (ranging from 15.3% of GDP in 2013 to 15.6% of GDP in 2018, with a maximum of 18.7% of GDP observed in 2015). From 2013 to 2015, private investment represented, on average, 16.6% of GDP. This rate of private investment participation in CEMAC remains below the 25% threshold that is a minimum threshold required to reach a growth rate of 7% (UNCTAD, 2014).

To address this situation, the authorities of CEMAC countries have undertaken various initiatives and implemented reform programsintended to develop the private sector. These include accession to the main international investment guarantee mechanisms such as the Multilateral Investment Guarantee Agency (MIGA), the International Centre for Settlement of Investment Disputes (ICSID) and the adoption of an Investment Charter governed by Regulation No. 17/99/CEMAC-20-CM-03 of 17 December 1999. In the same vein, the authorities of CEMAC's countries, in their economic and financial reform program adopted in 2017, devoted two general objectives[2] to private sector development (CEMAC, 2017).

Despite the initiatives taken and program implemented, the situation persists, which necessitates the continuation of research to strengthen the level of private investment in CEMAC. Some of the factors inherent to private investment are the functioning of the public sector and the quality of institutions. According to Mo Ibrahim's report published in 2017, the latter remains low in CEMAC compared to the African average. In 2017, CEMAC achieved a global governance score of 37.36%, an improvement of 0.4 points compared to 2008, while Africa's score was 49.9%, an improvement of 1 point compared to 2008.

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[2]The two general objectives are:
General objective 9:strengthening economic diversification and private sector development;
General objective 10: to improve the business climate

For the same year, Cameroon ranked first in the zone and 36th out of 54 African countries. The last place in the zone was held by the Central African Republic, which, at the African level, occupied 50th place out of 54 countries. Faced with this situation, it is essential to answer the following question: what is the impact of public expenditure and the quality of institutions on private investment in CEMAC countries? The aim of this paper is to analyze the impact of public expenditure and the quality of institutions on private investment in CEMAC countries.

Based on the theory of endogenous growth, which holds that public spending improves infrastructure (Barro, 1990) and human capital (Lucas, 1988); on the theory of the new institutional economy, according to which good institutional quality improves infrastructure through a better distribution of public investment; and on various studies (Mazuccato, 2013; Wolf, 2013; Gordon, 2011), which show that the majority of private enterprises come to life thanks to the public sector, the thesis defended in this work is that public expenditure and quality institutions have a positive impact on the private sector in CEMAC countries.

In addition to the introduction and conclusion, this article is structured in two sections. The first section presents the impact of public spending and the quality of institutions on private investment in the literature, and the second section analyzes it empirically in the case of CEMAC.

1. Impact of public spending and institutional quality in the literature

In this section, we examine the impact of government spending on private investment first and the impact of institutional quality second.

1.1. Public expenditure and private investment

The relationship between public spending and private investment has stimulated a burgeoning literature that, to date, remains controversial both theoretically and empirically. The latter allows two hypotheses to be identified: crowding in and crowding out.

Theoretically, the entrainment hypothesis suggests a positive impact of public spending on private investment (Keynes, 1936). This Keynesian argumentis based on the multiplier principle, according to which a change in public spending induces a larger change in output (Olweny and Chiluwe, 2012). From this perspective, endogenous growth theory, with its emphasis on technical and technological capital (Romer, 1986), physical capital (Barro, 1990) and human capital (Lucas, 1988), shows that government intervention through fiscal policy has positive effects on economic activity in general and on private investment in particular. Similarly, Aschauer (1989) shows that an increase in public investment expenditure leads to an increase in private investment through the availability of economic and social infrastructures that provide the private sector with services and conditions favorable to production in the short and long term.

Contrary to the training hypothesis, the substitutability hypothesis shows that public spending crowds out private sector investment. This hypothesis is based on crowding out theory (Diescth, 1985, Monique, 1982), which establishes a negative relationship between public spending and private investment. In this view, Voss (2002), focusing on sources of financing, shows that public spending financed by borrowing or issuing bonds on markets reduces loanable funds and increases the real cost of capital for private agents. This also refers to the crowding out phenomenon.

With respect to empirical verification, here again, the results are not conclusive. Some point to the existence of positive effects, while others conclude that there are negative effects of public spending on private investment. In terms of positive effects, Gbenga and Oluwasegun (2019) analyze the impact of public spending on private investment in Nigeria. The results obtained through the cointegration technique and Toda-Yamamoto causality analysis, using annual data covering the period from 1981 to 2016, demonstrate the existence of a two-way relationship between public and private investment.

Nevertheless, in the context of the Nigerian economy, the previous result corroborates those of Taiwo and Olusola (2018), obtained through the errorcorrection model (ECM) and annual data from the period 1980-2016. These results highlight the existence of a positive impact of public investment expenditure on private investment in the short run.

Similarly, Baotai (2005) examines the impact of government spending on private investment in Canada using annual data from the period 1962-2000. The results of the estimation through the error correction model show a positive impact of public spending on education and health on private investment. As an example of work that reveals a negative or neutral impact, Keho (2017) analyzes the impact of public investment spending in Togo. The results show that increased public spending crowds out private sector investment. These results are similar to those obtained two years earlier by Girish et al. (2015)who analyze the Indian economy using a vector error

correction model applied to quarterly data covering the period 1996Q2-2015Q1 and find that the greater the increase in the level of public expenditure, the lower the level of private sector investment.

Dash (2016), who assessed the relationship between public and private investment in India over the period from 1970 to 2013 using the ARDL model, indicated that public investment decreases private investment in both the long and short run. Furthermore, Dash (2016) found that public investment in infrastructure is complementary to private investment in India. In addition, the work of Njimanted and Mukete, (2013), conducted in Cameroon using annual data over the period 1980-2012 and a vector autoregressive approach, concluded that public spending had no effect on private investment.

1.2. Institutional quality and private investment

Institutions represent the regulatory framework that governs the operation of society. To this end, highquality institutions are essential for economic development because there is evidence that economic growth follows from democratic, stable institutions where property rights are respected and levels of corruption are low (Shleifer and Vishy, 1993). According to Mauro (1995), the presence of less corruption, respect for property rights and the rule of law in a society are fundamental factors in encouraging investment.

Several studies link the quality of institutions to macroeconomic variables, but their results are inconclusive. The existence of additional transaction costs, uncertainty and the misallocation of state resources favored by excessive bureaucracy are factors that justify the perverse effects of weak institutions on economic variables, particularly on private investment.

Indeed, the weakness of institutions characterized by high levels of corruption is considered the main obstacle to economic and social development (International Chamber of Commerce et al., 2018; Aidt, 2009) in that it distorts competition, weakens productivity and prevents sustainable economic growth. The OECD (2016) shows that on average, bribes paid under corrupt institutions correspond to 10.9 percent of the value of a transaction and 34.5percent of the profits related to a transaction. Similarly, the World Bank reports that approximately US $2.6 trillion is paid in bribes each year, while in Africa, the African Development Bank estimates that US $148 billion is lost to corruption each year.

Corruption erodes the confidence of society and investors in the state (IMF, 2014), discouraging investors, reducing investment and retarding economic growth (World Bank, 2017). One of the arguments why investors are discouraged by corruption is that corruption is a source of additional transaction costs, which reduce the profitability of investments (Nieves, 2017). According to the OECD (2016), bribes and difficult and protracted negotiations increase transaction costs because they represent hidden taxes and generate the additional investment costs.In addition to the reduced profitability of investments following an increase in transaction costs generated by weak institutions, the latter are also a source of uncertainty that is not conducive to investment.

In this regard, the OECD (2016) and World Bank (2014) argue that a firm cannot predict the value of bribes that will be required of it, nor can it predict whether other firms have offered bribes that work in their favor to obtain a contract. Under these conditions, bribes become unpredictable and make it difficult to control costs, reducing a company's profit and the efficiency of those who have to pay the bribes to stay in business (Augustino, 2014). Similarly, according to Mauro (1995) and Wei (2000), by creating uncertainty in investment and reducing expected returns, corruption discourages corporate investment activity, resulting in lower economic growth.

Corruption also negatively affects private investment indirectly through its negative effects on the allocation of public expenditure. In this view, Acemoglu and Verdier (2000) argue that corruption is closely linked to state intervention, as policy makers have discretionary power to choose the size and composition of projects. This can increase the potential for the diversion of funds from the central decision point to the endusers of public services. Mauro (1998) argues that public capital expenditure is easier to divert from public use to private interests.

Nevertheless, while many authors such as those cited above argue that corruption is harmful to investment, others, on the other hand, assume that corruption works like grease in the machinery, thus supporting the existence of the positive effects of corruption on investment (Dreher and Gassebner, 2013). The main advanced here is that corruption allows the circumvention of excessive regulations and inefficient institutions, which allows the private sector to remedy the errors and weaknesses of public authorities (Leff, 1964; Huntington, 1968 and Leys, 1965).

In terms of empirical work, Scahnazi and Gharagoz (2014) analyze the impact of corruption on private investment in 32 developing countries using the generalized method of moments and annual data for the period 2000-2010. The results of their work show that controlling corruption has a positive effect on private investment.

Das and Parry (2011) conduct a study on the effect of corruption on investment in 74 selected developing countries for the period from 2000 to 2008. The results showed a negative overall effect. At the regional level, however, the results indicate that corruption has a positive effect on investment in sub-Saharan Africa, Latin America and the Caribbean and no effect on private investment in Asia. Asiedu and Freeman (2009) analyze the effects of corruption on private investment in Latin America, sub-Saharan Africa and countries in transition. Their results show that the effect of corruption on investment differs across regions. For example, the effects were negative in countries in transition, but not on firms in Latin America and sub-Saharan Africa.

Mauro (1997) analyzes the relationship among corruption, growth and investment. The results from an econometric analysis on a sample of 67 countries from 1960 to 1985showed that an improvement of one standard deviation in the corruption index leads to an increase in investment of 5% of GDP and an increase in the growth rate of 0.5%

1.3. Lessons from the literature review

The review of the literature (theoretical and empirical) that has just been presented allows a number of lessons to be drawn. The main lesson is that the debate on the impact of public expenditure and the quality of institutions on private investment is not closed. Some authors (Gbenga et Oluwasegun, 2019; Shleifer et Vishy, 1993) believe that government intervention in the economic sphere through public expenditure and the quality of its institutions is favorable to private investment, while others (Voss 2002, Huntington, 1968) contend that it has negative effects on private investment. This lack of theoretical convergence calls for empirical verification todetermine the situation in CEMAC countries. From an empirical point of view, these discrepancies stem from a number of factors, including the methods used, the state of development of the countries making up the fields of study, the types of expenditure taken into account, etc. The differences in methodology used are not always clear. Even if the results differ from the theories of endogenous growth and new institutional economics, they seem appropriate to address the subject of the effects of public spending and the quality of institutions on private investment; this is why the theoretical underpinning of this work will consist of these two theories.

2. Empirical analysis of the impact of public expenditure and the quality of institutions in CEMAC countries

This second section is structured in four points. These points are the methodology of the study, the description of the variables and data sources, the estimation procedure, and finally, the presentation and discussion of results.

2.1. Methodology of the study

In this first point devoted to methodology, we successively present the investigation and modeling of the impact of public spending and the quality of institutions on private investment.

2.1.1. Mode of investigation

The mode of investigation used in this work is documentary research. It consisted of the exploitation of various information on the effects induced by public spending and the quality of institutions on private investment. Thus, studies, research documents, articles, books and reports were identified through various libraries, institutions and search engines (Google, Google Scholarand NBER).

2.1.2. Modeling the effect of public expenditure and the quality of institutions on private investment

The theoretical model underlying this study and the model for estimation purposes are presented here.

2.1.2.1. Theoretical model

This study is based on a theoretical model based on the principle of the flexible investment accelerator (Koyck, 1954). The flexible-investment accelerator model complements the so-called simple accelerator model (Clark, 1917), following some criticism of the latter, particularly with regard to the immediate nature of the adjustment of the actual capital stock to the desired capital stock to achieve the anticipated output.

An explanation of the principles of the flexible investment accelerator is therefore preceded by an explanation of the simple investment accelerator.

Simple investment accelerator

The principle of acceleration of investment stipulates that there is a proportionate relationship between the level of desired output and the optimal volume of the corresponding capital stock (Gaëtan, 1993). This therefore implies thatto meet an anticipated increase in demand, a firm must increase the level of output, since the latter requires more technical capital and hence investment. Based on this definition of the investment accelerator,

according to Clark (1961), net investment in a given period is proportional to the corresponding increase in output. Formally, the investment function is expressed as:

$K_t = \beta(P_t - P_{t-1})$,where

β = the investment accelerator, which is the marginal coefficient of capital;

K_t =Investment in period t; and

$P_t - P_{t-1}$= output growth.

Acceleration of flexible investment

Based on the limits of the simple accelerator, Koyick (1954) contendsthat the process of adjusting actual capital to desired capital cannot be carried out in the immediate future given certain factors involved in the realization of the investment (time lags between capital goods requirements and the satisfaction of these requirements, taking expectations into account, etc.). This adjustment therefore takes place gradually over time, leading to a flexible type of acceleration.

In the same vein, Jorgenson (1963; 1967), starting from a capital stock adjustment model andunder the assumption that the coefficient of desired capital is constant, shows that the investment achievable in a given period is a function of the projects adopted in previous periods. For this purpose, the investment function can be formalized as follows:

$K_t = c_0 B_t + c_1 B_{t-1} + \cdots + c_n B_{t-n}$;

In this equation, $K_t$denotes the investment made in period t; c_0 is the proportion of the investment made in the current phase; and B_t represents the decisions made in period t. In the case in which investment decisions include both extension investment and replacement investment decisions and where the latter immediately satisfy the needs, only extension investment decisions are made to adjust the capital stock to its desired level. Thus, new investment projects cover the change in desired capital, hence:

$BN_t = P_t^* - P_{t-1}^*$. Under these conditions, the net investment function can be written as follows:

$KN_t = \sum c_i (P_{t-i}^* - P_{t-i-1}^*)$, is the adjustment dynamics of the capital stock:

$P_i = \sum c_i \, P_{t-1}^*$, avec $P_t^* = \alpha P_t$

$KN_t = \alpha(P_{t-i} - P_{t-i-1})$

$KN_t = \alpha[c_0(P_{t-i} - P_{t-i-1})]$

2.1.2.2. Model for estimation purposes

In this work, we analyze the impact of public spending and the quality of institutions in CEMAC countries, taking into account the spatial dimension. To estimate this impact by integrating the spatial dimension, we rely on the work of Yoshito and Yoshihiro (2017), who analyzed the effects of public spending on the private sector with the inclusion of the spatial dimension in Japan, andwe integrate the institutional variable. The general model to be estimated is as follows**:**

$\psi_{it} = m_1 \sum_{j=1}^{n} W_{ij} \, \psi_{ij} + m_2 \varphi_{ij} + m_3 \varphi_{i,t-1} + \varepsilon_{it}$, with:

$\varepsilon_{it} = \mu_{it} + \sqrt{\delta_i}\Pi_{it}, \qquad \Pi_{it} \sim N(0, \sigma^2)$

Either $\Psi_t = (\psi_{1t} \ldots \psi_{nt})', \Phi_t = (\varphi_{1t} \ldots \varphi_{nt})' \; and \; \varepsilon_t = (\varepsilon_{1t} \ldots \epsilon_{nt})'$and $W = w_{ij}$; the weight matrix in the dimension $n \times n$, the equation (1) can be written in the form:

$\Psi_t = S_{m2}(W)\Phi_t + S_{m3}(W)x\Phi_{t-1} + (I_n - m_1 W)^{-1}$, where

$S_{m2}(W) = m_2(I_n - m_1 W)^{-1} \; et \; S_{m3}(W) = m_3(I_n - m_1 W)^{-1}\varepsilon_t$, with I_n the order unit matrix$n \times n$.

Simultaneous marginal effects are then obtained by the derivative of $\psi_{it}$with respect to φ_{jt}

$\frac{\sigma \psi_{it}}{\sigma \varphi_{jt}} = S_{m2}(W)_{ij}$.

Similarly, the lagged marginal effects are given by the derivative of $y_{it}$with respect to$x_{j,t-1}$

$\frac{\sigma \psi_{it}}{\sigma \varphi_{j,t-1}} = S_{m3}(W)_{ij}$.

Long-term marginal effects are determined as follows:

$\frac{\sigma \psi_i}{\sigma \varphi_j} = (m_2 + m_3)(I_n - m_1 W)^{-1} = S^*(W)_{ij}$ (4)

The degree of effect of public spending on private investment is therefore interpreted from $\frac{\sigma\psi_{it}}{\sigma\varphi_j}$

The value of the derivative of the nth individual represented in equation (4) by $S_{m3}(W)_{ij}$ measures the effects of the same individual (country) if $i = j$ and the effects in neighboring countries if $i \neq j$.In other words, the elements on the diagonal of the matrix $S^*(W)_{ii}$ show the direct effects; those outside the diagonal of the matrix ($S^*(W)_{ij}$) show the indirect effects. However, since variations in public spending differ across countries, LeSage (2000) suggests the use of summary measures such as the average total effect ($\bar{E}_{total}$) the average direct effect ($\bar{E}_{direct}$) and the average indirect effect ($\bar{E}_{indirect}$), which are calculated and determined, respectively,as follows:

$\bar{E}_{\text{total}} = n^{-1} l_n' S^*(W) l_n$

$\bar{E}_{direct} = n^{-1} trace\ (S^*(W)$

$\bar{E}_{indirect} = \bar{M}_{total} - \bar{M}_{direct}$, *avec*

2.2. Description of variables and data source

The data used are annual data from each of the six CEMAC countries and cover the period from 2002 to 2018. They include:

-Private investment (invpr): this includes household investment, generally consisting of expenditures on housing purchases, and business investment, which consists of committing capital to the production process.

-public consumption expenditure (cospu): this represents all nonrefundable payments made by the general government with or without a counterparty, other than capital expenditure or subsidies. According to the Keynesian view, this category of public expenditure can have a positive impact on the level of private sector activity, in that an increase in public expenditure leads to an increase in domestic demand for private firms. Based on the simple accelerator principle according to which investment is a function of demand, the increase in demand resulting from an increase in public spending has a positive effect on the level of private investment. Hence, the expected sign of this variable is positive.

-public investment expenditure (invpu): this represents investment by public enterprises. This expenditure increases the marginal productivity of private capital and leads to a spillover effect on private investment (Cavello and Daude, 2011). The important role of public investment spending on infrastructure on total productivity in the private sector has also been recognized (Barro, 1990). Nevertheless, public capital expenditure can play an ambiguous role in private investment decisions (Blejer and Khen, 1984). The expected sign of this variable may therefore be positive or negative.

-governance indicator (qi): this is an overall average indicator of institutional governance reflecting the quality of institutions (Edison, 2003; Fatima, 2008). This variable positively affects private investment insofar as it restores investor confidence. According to Cavallo and Daude (2011), the weaker the institutions are, the lower the level of private investment. Similarly, according Udomkerdongkol (2012), investment is higher under favorable regimes, i.e., good governance. In this chapter, this indicator is approximated by the arithmetic mean of six global governance indicators (Kaufman et al., 2010). The expected sign of this variable is positive.

-credit granted to the private sector (crdpr): this variable reflects the ease of access to financing resources for companies. It is assumed that the cost of financing (interest rate) is one of the main factors in investment decision making, i.e., the easier access to credit is, the more private economic agents tend to invest. Thus, the expected sign of this variable is positive.

-unemployment: unemployment represents the state of inactivity of people of working age. It is a polysemy concept according to the criteria used in its determination. For example, we would discuss apparent, cyclical or cyclical, disguised, structural, technological, etc. unemployment (Economics Glossary, 2018). According to the International Labor Office (ILO), three criteria determine the status of an unemployed person. These are being without work, being available for work and having taken steps to find a job. In this paper, unemployment is approximated by the total unemployment rate, which represents the percentage of inactive persons of working age in the total population. Unemployment reduces the supply of jobs, which results in higher costs for businesses according to the law of supply and demand. Indeed, the expected sign of this variable is negative. The synthesis of these variables is presented in the table below.

Table 1: Summary of sources and description of variables

Variables	Sources	Abbreviations	Expected signs
Private investment	BEAC	invpr	Dependent variable
Public investment	BEAC	invpu	Positive
Public consumption	BEAC	cospu	Positive
Institutional indicator	WGI	qi	Positive
Credit to the private sector	WDI	crdpr	Positive
Unemployment	BEAC	chom	Negative

Source: author's construction

From Table 1 above, it can be seen that the data come from three sources. The main source is the database of the Bank of Central African States (BEAC). The other data come from the World Development Indicators database (WDI, 2018) and the World Governance Indicators database (WGI, 2018). It should be noted that the use of different databases is justified by the absence of the existence of all the data in a single database. Similarly, in addition to the effect that these variables may have on private investment as revealed in the literature, the choice of these variables also depends on the availability of the relevant data.

2.3. Estimation procedure

In this point, we present the panel nature specification test, the spatial interdependence analysis and the stationarity and cointegration of variables tests.

2.3.1. Specification test for the nature of the panel: Hsiao *(1986)*

The panel specification test is used to verify the homogeneous or heterogeneous specification of the process generating the data. Econometrically, this verification consists of testing the equality between the coefficients of the model studied in the individual dimension. In economic terms, the panel specification test makes it possible to determine whether the theoretical model under study is perfectly identical for all individuals or, on the contrary, whether there are particularities specific to each individual. Under these conditions, homogeneity suggests the possibility of using the same model for all individuals during estimation, while heterogeneity rules out the idea of using the same model for all individuals. The most widely used test for highlighting the nature of the panel is Hsiao's (1986) test. In the context of this work, the application of the speciation test for the nature of the panel yieldedthe results summarized in the table below.

Table 2: Results of the panel specification test

Various test steps			**Nature of the panel**	**Specification**
Assumptions	Fisher Statistics	P- value		
$H_0^1 : \alpha_i = \alpha$. et $\beta_i = \beta \ \forall i$	$F_1 = 2.4823197$	$P_1 = 0.00095482$	Partial homogeneity	Individual effects model
$H_0^2 : \beta_i = \beta \ \forall i$	$F_2 = 1.5553938$	**$P_2 = 0.07305706$**		$Y_{it} = \alpha_{it} + \beta X_{it} + \varepsilon_{it}$
$H_0^3 : \alpha_i = \alpha$	F3 = 6.7873287	$P_3 = 0.00002061$		

Source: Author based on data from BEAC, WDI and WGI.

It emerges from these results of the panel specification test that the panel is a partially homogeneous and that, therefore, the estimation can be performed through a single equation and not N equations (country-by-country estimation). Indeed, according to the decision rule (Appendix 1), the probability associated with F2 being greater than the 1%level (0.07305706), we have a difference in the constantsα_i, but the coefficients $\beta_i$associated with the vectors of the explanatory variables are identical.Hence the specification of the effects model

individuals : $Y_{it} = \alpha_{it} + \beta X_{it} + \varepsilon_{it}$. We can also check whether there is spatial autocorrelation between investments.

2.3.2. Study of spatial interdependence (spatial autocorrelation).

Spatial autocorrelation reflects the idea of dependence between observations, phenomena or variables in a given geographical space. It is defined for this purpose as a positive or negative correlation of a variable with itself resulting from the geographical arrangement of the data. When there is a spatial self-correlation for a variable, it means that there is a functional relationship between what happens at one point in space and at other points in space, thus bringing into play the concepts of "proximity" and "distance". This requires the use of weighting matrices (geographic weighting matrices) to capture the weight of spatial interactions in the economic phenomena under study. Spatial autocorrelation can be positive, negative or nil.

When spatial autocorrelation is positive, it is manifested on the map by a geographical grouping of observations of neighboring individuals, i.e., close locations are more similar than distant locations. On the other hand, if such autocorrelation is negative, it manifests itself by the geographical grouping of dissimilar observations, i.e., close locations are more different than distant locations. Spatial autocorrelation may also be zero, reflecting the spatial independence of the observed phenomena, i.e., the spatial distribution of observations is random, or there is no relationship between the proximity of locations and the degree of similarity.

Statistically, various indices are calculated to determine whetherspatial autocorrelation is present, the most widely used of which is the Moran index and its graphical representation.

Table 3: Summary of spatial autocorrelation test results

Variable	Index calculated	Index Value	Index Statistics	p-value
	Moran (I)	-0.177	-27.641	0.000
Invpriv	Geary (C)	1.165	27.641	0.000
	Getis and Ord (G)	0.836	-27.641	0.000

Source: author based on data from BEAC, WDI and WGI

The results of the spatial autocorrelation tests of the different indices (Moran, Geary, Getis and Ord) contained in the table above are convergent regarding the existence of spatial interdependencies between private investments in the different countries of the CEMAC zone. Indeed, the t-statistics of all three indices calculated are statistically significant at the critical threshold of 5% ($p<0.05$), which leads to the rejection of the H0 of an absence of spatial autocorrelation. This implies that the geographical proximity or the great distance between two countries in the area could have an impact on the level of their private investment. In the context of the present research, this impact is negative, since the value of the Moran index is negative, reflecting a negative relationship between private investment in country iin the zone and that of its neighbors, as shown in the Moran diagrambelow.

Figure 1: Moran chart

The Moran diagram above plots in the form of a scatterplot the pairs of values corresponding to the centered value of private investments (linvpr) for each individual in the area (country) on the abscissa and the average investment of neighboring individuals (Wlinvpr) on the ordinate, represented by the weight matrix. The said average is called a "spatial lag" or "spatially lagged variable".

The Moran diagram contains four quadrants, having in common the intersection of the lines linvpr = 0 and Wlinvpr = 0, in which the Wlinvpr regression line also passes as a function of linvpr, the slope of which is the value of the Moran index. The first two quadrants, at the top right and bottom left, respectively, contain the points at which the investments of country i are spatially positively correlated with those of its neighbors. The last two quadrants, on the other hand, the top left and bottom right, contain the points at which investment in country i is spatially negatively correlated. With regard to the arrangement of our scatter plot, it is noted that the majority of the points grouped together are located in the last two quadrants, which confirms the existence of negative spatial interdependencies between the private investments of country i in the zone and those of neighboring countries, thus making it possible to envisage the use of spatial econometrics.

2.3.3. Stationarity and cointegration of variables.

One of the necessary conditions in studies using both time-series and panel data is the verification of whether unit root exists in the data.In other words, studying the stationarity of variables so that those that are not stationary can be made stationary. In panel data econometrics, several tests are used to assess the stationarity of variables (Hurlin, 2004). In this third section, the Levin, Lin and Chu (2002) test, the Im, Pesaran and Shin (2003) test and the LM test by Hadri (2000) were used.

The Levin, Lin and Chu test (LLC, 2002) is an old test of the first generation based on the Dickey and Fuller (1979) test. This test tests the null hypothesis of the presence of a unit root but does not take into account the problem of autocorrelation of the residuals. This insufficiency can be identified by the test of Les tests of Im, Pesaran and Shin (2003), which is inspired by the test of Philips and Perron (1988) within the framework of time-series data. However, in the presence of breaks in the data, the first two tests are no longer appropriate. In such a situation, Hadri's (2000) stationarity test, which is based on the null hypothesis of stationarity or the absence of a unit root, is justified. Hadri's (2000) test is based on the stationarity test proposed by Kwiatkowski et al. (1992) for time-series data econometrics. The application of these three tests yielded the results summarized in the table below.

Table 4: Results of the different stationarity tests

	linvpr	linvpu	lcospu	qi	lcrdpr	chom
			Variables in level			
LLC	-0.8367	-4.2491***	-3.9764*	-5.1764*	-1.2879	-4.2159*
IPS	-0.8125	-1.3291	-1.0517	-2.2347*	-0.3882	-1.6222
HADRI	15.2601*	11.9220*	21.7239*	8.6820*	22.1926*	22.0773*
			Variables in first difference			
LLC	-9.2432*	-5.0878***	-6.5805*	-10.2386*	-5.7721*	-5.6261*
IPS	-4.4028*	-3.1386*	-3.3056*	-4.5460*	-3.0477*	-2.0273***
HADRI	-0.7784	3.7230*	0.2437	0.0389	-0.0972	2.8219*

Source: Author based on data from BEAC, WDI and WGI.

; **; * Significance at the 1%, 5% and 10% levels, respectively*

The table above highlights the synthesis of the results of the various stationarity tests, obtained in levels and first difference. These results show that three level variables (invpr, conspu, credpr) are not stationary, regardless of the test (LLC, IPS or HADRI) considered. Indeed, for the three tests, the hypothesis of the presence of a unit root (nonstationarity) cannot be rejected, in the sense that the statistics linked to the LLC and IPS tests are not statistically significant whatever the threshold, whereas those linked to the Hadri tests are significant even at the 1% level.

In first differences, the results reveal that for each variable, the associated t-statistic is significantly different from zero for at least one test. This calls into question the H0 of stationarity, highlighting the existence of a unit root, in favor of an alternative H1, which confirms the stationarity of the variables. Thus, all our variables are stationary in first differences and henceintegrated of order one [I (1)]. This means that to make our variables

stationary, it is sufficient to differentiate them only once. The stationarity of the variables in first differences suggests the existence of a long-term cointegration relation among the variables. However, this relationship must be proven through different tests called "cointegration tests". Several of these tests are applicable in the context of stationarity studies in panel data. In this chapter, we use those of the latest generation (Ficher, Kao, and Pedroni). The application of these tests leads to the results summarized in the table below.

Table 5: Summary of Pedroni Cointegration Test Results

Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistics	**Probability**	Weighted **Statistics**	**Probability**
Panel v-Statistic	-0.852475	0.8030	-1.558326	0.9404
Panel rho-Statistic	0.967857	0.8334	1.574402	0.9423
Panel PP-Statistic	-5.922295*	0.0000	-4.895324*	0.0000
Panel ADF-Statistic	-4.879030*	0.0000	-3.252949*	0.0006
Alternative hypothesis: individual AR coefs. (between-dimension)				
		Statistics		**Probability**
Group rho-Statistic		2.350016		0.9906
Group PP-Statistic		-7.188322*		0.0000
Group ADF-Statistic		-3.7242100*		0.0001
Kao ADF Statistic		**-5.127971***		**0.0000**

Source: Author based on data from BEAC, WDI and WGI.

; **; * Significance at the 1%, 5% and 10% levels, respectively*

The results of the various cointegration tests contained in the table above show that there are long-term cointegration relationships among the variables. Indeed, out of seven (7) Pedroni cointegration tests, four present significant statistics at the 1% level.

Similarly, the statistic of the Kao test is also significant at the 1% level; this confirms the existence of long-term cointegration relationships among the variables, whichallows the use of a dynamic model. The related results are summarized in Table Six (6) below.

2.4. Presentation and discussion of results

Here, we first present the results of the estimation and then turn to their discussion.

2.4.1. Presentation of estimation results.

Table 6: Summary of estimation results

Variables	*Coefficients*	*Probability*
Main		
linvpu	**0 .0862467 *** **	**0.085**
lcospu	**0.351131***	**0.008**
qi	**1.263796***	**0.000**
lcrdpr	0.0045712	0.962
chom	-0.0686067*	0.005
_cons	6.853657*	0.002
Wx		
linvpu	-0.0310939	0.757
lcospu	-0.1959186	0.515
qi	-1.359446	0.118
lcrdpr	0.2291711	0.317
chom	-0.1039219	0.337
LR_Direct		
linvpu	**0.0904246*** **	**0.085**
lcospu	**0.3579363***	**0.006**
qi	**1.369091***	**0.000**
lcrdpr	-0.0043471	0.964
chom	-0.0646709*	0.003
LR_Indirect		
linvpu	-0.0453246	0.611
lcospu	-0.2351029	0.348
qi	**-1.363219***	**0.069**
lcrdpr	0.1983082	0.276
chom	-0.0817583	0.374
LR_Total		
linvpu	0.0450999	0.629
lcospu	0.1228334	0.628
qi	0.0058717	0.994
lcrdpr	0.1939611	0.285
chom	-0.1464293	0.165
Spatial		
rho	-1.20	-1.20
Variance		
lgt_theta	-7.73*	0.000
sigma2_e	6.87*	0.000
R2		
within	0.7311	
between	0.6098	
overall	0.5937	

Source: Author based on data from BEAC, WDI and WGI.
*;**;***: Significance at the 1%; 5% and 10% levels, respectively

Table 6 above presents the estimation results of the three spatial models with random effects. The results show that the time and individual random effects model (SDMboth)) is the best in that it has less information loss (Akaike =-10.08139) than the other two,

Which have Akaike values of 102.4937 and 22.57017 for the time random effects model (SDM time) and the individual random effects model (SDM ind), respectively (Appendix2). In addition, its coefficient of determination (R2) is 0.6098. This means that within the CEMAC countries, 60.98% of the variability of private investment is explained by the variability of the variables in the model. In light of the above, it appears that the SDM (both) model is of good quality and that the results obtained from it valid for inference.

2.4.2. Discussion of the results

The analysis of the results from the estimation of the SDM model (both) with random effects highlights a major lesson: *In the CEMAC countries, public spending and the quality of institutions are conducive to private investment*.

❖ **Public expenditure: a driver of private investment**

According to the present results, the positive effects generated by public expenditure on private investment in CEMAC can be explained statistically by the fact that the coefficients associated with the linvpu and lcospu variables are positive and significant at the 10% and 5% levels, respectively, for public investment and consumption. This means that public investment and public consumption evolve in the same direction as private investment.

In other words, an increase in both public investment and consumption increases the level of private investment and vice versa. The results show that a 10%increase in public investment expenditure, all other things being equal, increases the level of private investment by 1.03%. Similarly, a 10%increase in government final consumption expenditure, ceteris paribus, generates a 6.93%increase in private investment.

The present results obtained fortheCEMAC countries, highlighting the existence of a knock-on effect of public expenditure on private investment, reinforce the Keynesian view on the economic role of the state (Keynes, 1936; Blanchard, 2001). They corroborate the results of other works, such as Mawussé (2016) on public expenditure and the private sector in WAEMU countries, Mohib et al. (2015) on the effects of public expenditure on private investment in Pakistan, and many other authors (Awolaja et al., 2015; Sallahuddinb et al., 2011) in Nigeria, Ethiopia and Malaysia.

However, they disagree with the classical vision of the state (Aschauner, 1989; Fatos and Mihov, 2001) and oppose the results obtained by Yovo (2017) in a study on public expenditure, private investment and economic growth carried out in Togo; Girish et al. (2015) for the Indian economy;and those obtained by Furceri et al. (2009) in their study on the impact of public spending on the private sector: a crowding out effect or spillover effect frompanel data from 145 countries.

From an economic point of view, the present results suggest that in CEMAC countries, public spending is favorable for the development of the private sector. Two elements may explain this situation: (i) the share of infrastructure investment expenditure that contributes to the reduction of costs for enterprises and (ii) the increase in the demand addressed to private sector agents, particularly national enterprises.

❖ **Institutional quality: a lubricant for private investment**

As in the case of public expenditure, the results obtained in this paper also indicate that the quality of institutions has a positive effect on the level of private sector investment. Indeed, according to the results, the coefficient associated with the quality of institutions variable (qi) is simultaneously positive and significant at the 1% level. This implies that the quality of institutions and private sector investment have a similar evolution and that, consequently, the higher the quality of institutions becomes, the higher the level of private sector investment. Thus, an improvement in the quality of institutions by one point, all other things being equal, increases the level of private investment by 1.26%. This result reinforces the NIS approach, particularly on the theory of transaction costs, and converges with the work of Mauro (1997) and Scahnazi and Gharagoz (2014). Indeed, when we have quality institutions, transaction costs become low, which contributes to the development of private sector activities. However, calls into questionthe work of Dreher and Gassebner (2013), Leys (1965) and Huntington (1968), which show that corruption is positively related to the level of private investment.

Economically, the results obtained in this study suggest that improving the quality of institutions is favorable for the development of the private sector in CEMAC countries.

Conclusion

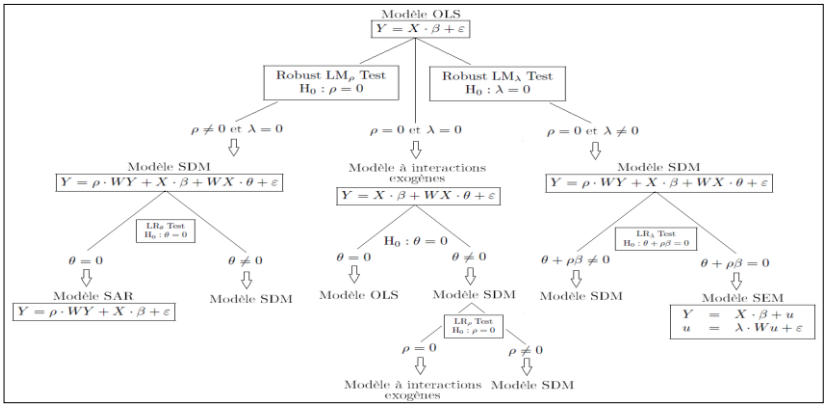
The objective of this paper was to analyze the impact of public expenditure and the quality of institutions on private investment in CEMAC countries. It was structured in two sections. The first section focused on the theoretical foundations and work on the impact of public spending and the quality of institutions on private investment. The secondempirically analyzedthis impact in the case of CEMAC.

In the first section, the literature review concluded that there were divergent views on both the theoretical and empirical aspects.Beyond these divergences, the theories of endogenous growth (Romer, 1986; Barro, 1990 and Lucas, 1988), which highlight the importance of the economic role of the state, in particular the favorable effect of public spending on private investment,and that of transaction costs (Coase, 1937 and Williamson, 2000) advocated by the NIS, provided the theoretical underpinning for this work.

In the second section, the results obtained using the dynamic spatial random effects model (SDM (both)) and annual data for the period 2002-2018 showed that public spending and quality institutions have a positive impact on private investment and therefore constitute a lubricant for private investment. These results validate

our hypothesis that public spending and the quality of institutions have a positive impact on private investment. Inlight of the present results, it would be interesting to focus on policies intended to strengthen public expenditure, with particular emphasis on those devoted to infrastructure, education and research. The latter will reduce the transaction costs of private sector agents and encourage them to invest more. Similarly, reforms in the area of measures intended to improve the business environment should be strengthened to minimize obstacles to investment and restore investor confidence. These measures could include (i) the strengthening and strict enforcement of anti-corruption measures, (ii) the creation of a framework enabling government staffers to lead a decent life, including remuneration commensurate with purchasing power and (iii) the development of the values of integrity through training aimed at promoting a culture that values honesty within administrations.

Appendix 1: Sequential procedure for panel determination tests



Source: Elhost (2010)

Appendix 2: Estimation results of the different SDM models

	linvpr	***SDM (time)***	***SDM (ind))***	***SDM (both)***
Main				
	linvpu	0.1030968	0.0750565	0.135512
	lcospu	0.6928011*	.3291301*	0.2572601
	qi	3.184915*	1.22666*	1.546665*
	lcrdpr	3.184915	0.0079914	-0.4829092*
	chom	-0.036002*	-0.0732946*	-0.0546803
Wx				
	linvpu	-0.9870645*	-0.0231736	0.171752
	lcospu	-2.48747*	-0.1674384	0.2521967
	qi	5.186033*	-1.291361	0.9459262
	lcrdpr	0.9223592	0.2050461	-1.430503*
	chom	0.158373	-0.1166635	-0.0575679
Spatial				
	rho	-0.7845697*	0.274	-0.9176712*
Variance				
	sigma2_e	0.1044547*	0.000	0.000*
AIC		**102.4937**	**22.57017**	**-10.08139**

Source: Author based on data from BEAC, WDI and WGI

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