SOE's vs private enterprises and the efficient management of credit risk in CEMAC

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Abstract. State owned-enterprises (SOEs) influence on CEMAC banking sector has grown considerably, with the potential of affecting both the banks and the private sector. This study aims to determine the influence of borrower's nature on the improvement of credit risk management in CEMAC Sub-region. The methodology used in the study consists of Data Envelopment Analysis and Tobit model. A panel dataset of the CEMAC countries from 2004 to 2014 is constructed from COBAC yearly reports, WDI and The Fraser Institute. The main findings from this research suggest that there is a negative and significant link between the tendency of CEMAC economies of using more private firms than SOEs investments and banking sector efficiency. The negative relationship is explained through weak CEMAC institutions. This study, unlike others studies on banking performances, gives a special attention to credit risk's effect. Indeed, the study even determined the risk-efficiency as the efficiency of the bank in producing healthy loans.

Keywords. Bank efficiency, Credit risk, Public enterprises, Private enterprises.

JEL. G28, G14, J16, L33.

1. Introduction

While sub-Saharan frontier countries have recorded significant improvements into their per capita growth since 90s, CEMAC economies' performances only have improved slowly (IMF, 2014). Issues like the weakness of business & governance climate, the infrastructure's gap, the low total factor productivity and the weak structural competitiveness among others, seem to be behind this inefficiency. Leading CEMAC Sub-region's financial system unable to fund the economic development of the Sub-region (Hugon, 2007; Fouda, 2009; Nzomo & Dombou, 2019). Indeed, the issue of CEMAC banking sector's inefficiency has been considerably highlighted in by the literature; linking inefficiency to banking competition, off-balance sheet activities and governance (Bany, 2015; Ningaye, Madaha, & Nembot, 2014; Eloundou & Befen Djinja, 2016). But, these studies neglect the risk's particular effect on CEMAC banking sector performances. Indeed, as argued by Clark (1996), removing risk factors can misguide the results of banks' efficiency (Clark, 1996). And, the risk can be either come from private or state borrowers.

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The IMF (International Monetary Fund) explains that the developed government bond markets contribute to the reduction of the market risks, for they are characterised by low bid-ask spreads and high turnover. Moreover, they ease the use of government securities as collateral, not only for central bank operations, but also between market operators (IMF, 2014). In 2013, the Treasuries of Cameroon, of Central African Republic and Gabon have started issuing Treasury and Government bonds, leading to some liquidity sterilization (CEMAC banking sector faces what literature call the excess liquidity paradox[2]). Indeed, as the interest rates are not efficient, the conduct of the monetary policy relies on liquidity. But, CEMAC economy is exposed to external shocks and its banking system potentially exposed to liquidity shocks. Indeed, Governments expenditures depends on oil revenues, which in turn affects banks resources and liquidity (IMF, 2014). According to the IMF, the lack of suitable instruments for liquidity management, lead banks to hold excess reserves during positive liquidity shocks. Leads, the inefficient liquidity management from individual banks, the high risk due the climate of business, information asymmetry, and the lack of collaterals explain the high lending rates. Consequently, the banks inability of efficiently assess the risk from borrowers, collapse the credit granted to the private sector.

For instance, in Cameroon, the largest economy of the sub-region, banking system vulnerabilities are quite important (IMF, 2018). According to an IMF report, there are substantial disparities across Cameroonian banks on meeting the prudential ratios. Indeed, 4 banks (around 13% of total banks' assets) are in distress; and, 3 of them even have negative capital. Together with declining economic activity, this have contributed to condense the private sector growth; Indeed, the latter has declined from 14 to 2% per year between 2014 and 2018 (IMF, 2018). Such a negative situation of banks is linked with some State-owned enterprises' (SOEs)[3] situation. Indeed, the financial situations of SOEs have considerably been deteriorated during the recent CEMAC economic recession. 8 of the 12 biggest State-owned companies have experienced net losses in 2016; 2 of them, including SONARA (an oil-refinery Cameroonian SOE), even have negative capital. Moreover, SOEs' value added ratio to GDP has declined by 29%, driven by CAMTEL (a telecommunication Cameroonian SOE), Douala Port, SONARA, and the Cameroon Development Corporation (CDC, SOE operating into the agricultural sector)[4].

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[2] The paradox of credit rationing with excess of liquidity is caused by, *ceteris paribus*, the lack of reliable information on borrowers (Avom & Eyeffa Ekomo, 2007). This paradox lead to inefficient monetary policy and the inefficiency of banking sector as bank cannot optimally allocate funds.

[3] Indeed, SOEs in Cameroon play a key role in the economy despite a share of less than 1% of the GDP. SOEs hold monopolies in key sectors of the economy including energy, telecommunication, water, and crop farming export (International Monetary Fund, Cameroon, 2018).

[4] This information comes from IMF reports.

State owned-enterprises influence on CEMAC banking sector has grown considerably. In Cameroon State owned-enterprises', SOEs' arrears[5] have been increasing with the potential of affecting both the government and the private sector. From IMF reports, SOEs' arrears have almost doubled since 2013, so as to reach 3.4% of GDP (compared to 1.8% of GDP in the past years); they are driven by SONARA (53%) and CAMTEL (13%). Indeed, SONARA is the main driver of Cameroonian banking system's risks. The latter accounts for 65% of SOEs' deposits and 62% of SOEs' credits, according to the IMF. And, among the 6 banks that have a positive net exposure to SONARA: one bank has negative capital, three banks will fail to meet minimum capital requirement if SONARA defaults, and two banks will lose around 50 to 85% of their respective excess capital (IMF, 2018).

So, are State owned-enterprises in CEMAC Sub-region riskier to fund by banks than private enterprises?

2. Related literature

2.1. Bank efficiency and credit risk

Economic literature goes both ways. An older view supports that measures taken by authorities and regulators are an important factor in improving the positive relationship between capital adequacy, credit risk management and bank efficiency (Aggarwal & Jacques, 1998; Jacques & Nigro, 1997; Shrieves & Dahl, 1992). The other side of the relationship places a special emphasis on the link between banks and their customers. Indeed, the quality of the credit granted to customers is crucial for banks (Arriaga & Miranda, 2009). Arriaga & Miranda (2009) have explained that the risk indicators used by banks, whether qualitative or quantitative, help to increase efficiency and reduce non-performing loans. Therefore, according to the latter, the problem is whether the risk assessment affects the efficiency of the banking sector or whether it affects its bank-costumer relationship.

The economic literature did not last too long before providing some key elements to this issue. Indeed, the recent cases of bank failures in several countries have been largely attributed to the rise in toxic assets in the commercial bank loan portfolio (Onaolapo, 2012). The latter suggest that there is a minimal causal link between deposit exposure (credit risk substitution management) and bank performance, but with a high dependence on operational efficiency parameters. The operational efficiency of banks is therefore essential to the proper functioning of the economy. Indeed, commercial banks play an important role as financial intermediaries for savers and borrowers in an economy. Almost all sectors depend on the banking sector for their resilience and development

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[5] According to the IMF, SOEs affect the financial sector through several channels: (i) directly in the form deposits and loans; (ii) through their fiscal relations with the government (taxes, subsidies, and contingent liabilities), and SOEs arrears accumulated towards their suppliers.

(Odunga, Nyangweso, Carter, & Mwarumba, 2013). This operational efficiency of banks results from credit risk and capital adequacy measures (Odunga, Nyangweso, Carter, & Mwarumba, 2013). One of the direct implications will be that the history of a company's performance will influence how a company develops itself, in order to streamline their operational strategies. Thus, according to Odunga, Nyangweso, Carter, & Mwarumba (2013), banks must seek mechanisms in order to improve their risk-based capital ratio in the way of improving their efficiency.

Others researches integrate credit risk in order to monitor bank efficiency, by using a by-production approach. Although the fact that banks usually exhibited efficiency improvements over time, their credit risk performances on the other side can decline declining (Salim, Arjomandi, & Dakpo, 2017). Considering this, Salim, Arjomandi, & Dakpo (2017) suggest that bank's credit quality can be better monitored across Iranian banks. Not very far from Iran, in China, Yong & Christos (2018) have investigated the interrelationships among banking risk, competition, and efficiency. They have found that Chinese commercial banks that record the higher efficiency scores have higher credit risk and insolvency risk, but lower liquidity risk and capital risk. They argue that greater competition decreases credit risk and insolvency risk, but increases liquidity risk. Moreover, credit risk and insolvency risk are significantly and positively related to efficiency, while liquidity risk and capital risk are significantly and negatively related (Yong & Christos, 2018). One could think that risk do not have the same cultural meaning in Middle East than in the rest of the world. But, on the other side of the relationship, non-performing loan (leading to the increase of the credit risk) is a significant predictor of bank's bankruptcy and, this is a major cause of financial weakness all over the world (Koju, Koju, & Wang, 2018). Indeed, an increase in loan percentage over the total assets does not automatically lead to an increase in non-performing loans. In fact, Koju, Koju, & Wang (2018) suggest that in India, high capital requirements and large bank size do not reduce default risk, however high profitability and strong income diversification policies lower the likelihood of default risk. Thus, the credit quality in the banking industry is mostly driven by profitability, banking supervision, high credit standards and strong investment strategies (Koju, Koju, & Wang, 2018).

2.1.1. Public vs private firms financing

The economic literature around the issue of access to finance's gap differences between private and public enterprises is not well documented. However, a closer issue, the private vs. public financing of companies is sufficiently documented. Work in this area can be traced back to Sharp (1951). But long before this debate, there is another, much more controversial. Indeed, privatization in developing countries is provoking much controversy. A debate around this topic is born, and can be summed up by the following question: what is the most important factor for business performance, is it competition or private property? This question gives rise to the following one: Do state-owned enterprises suffer more

from corporate governance issues? As Shirley & Walsh (2000) explain, the answers to these questions are in favour of corporate private ownership. In most cases, empirical research strongly favours private ownership in competitive markets over a state-owned counterfactual scenario. In addition, the choice governments face is choosing between keeping or privatizing, rather than between privatization and optimality (Shirley & Walsh, 2000). Thus, factors like quality in the governance of companies may constitute the main constraints to access to finance.

In this regard, the table below presents some differences that exist in the governance of state-owned enterprises Vs. private enterprises.

Table 1. *Some differences in governance between the public and private sectors*

Governance	PrivateSector	Public Sector
Regulation	Corporations Act	Statutory legislation Regulator and regulated
Agents	For Shareholders	For Public
Objectives	Profit	Public good
Authority	Board	Government Minister/s Department Board
Responsibility	LegalResponsibility of board	Responsibilitydiffused
Independence	Legal Independence of board Selection and appointment of members	Ministerial control
Accountability	To shareholders	Diffuse
Reporting	Annual Report to shareholders	Ministers Parliament Auditor general Agency Heads Treasury and Finance

Source: Authors from literature and Armstrong, Jia, &Totikidis (2005).

Differences between state and private enterprises in governance may explain some differences in their financing sources. Cull & Xu (2003) focus on the factors that determine the sources of business investment financing, such as retained earnings, bank financing and government transfers. They explain that direct government transfers are not significantly associated with business profitability. In contrast, bank financing is positively related to profitability and reforms. Indeed, the reforms that allowed managers to self-select and expose themselves to higher risk are positively associated with the acquisition of bank funding (Cull & Xu, 2003). Although, private firms are smaller, opaquer in terms of information, riskier and more dependent on commercial credit and bank loans than state-owned enterprises (Dierkes, Erner, Langer, & Norden, 2013).

Financing private companies receives fewer attention from researchers because of data availability. Huynh, Paligorova, &Petrunia (2013) argue that debt ratios are lower for state owned-enterprises (SOEs) and the difference is almost entirely due to the greater reliance of private firms on

short-term debt. The authors explain that debt financing by private and public firms responds differently to industry shocks. In periods of positive industrial shocks, private firms rely more on long-term debt than public enterprises; Meanwhile, state-owned enterprises are making more use of short-term debt when conditions in the sector deteriorate (Huynh, Paligorova, & Petrunia, 2013).

There are also differences in the distribution of cash flows between private enterprises and public enterprises. According to Drobetz, Janzen, & Meier (2016), public enterprises are much more sensitive to investment than private companies. A rather rare fact, indeed, the authors suggest that the differences in sensitivity between investments and cash flow are not due to the stricter financial constraints imposed on public companies (Western European Companies). Instead, they suggest an agency-based explanation, as they believe that differences in the sensitivity of investments to cash flow can only be observed for the unexpected part of business cash flows. But, it should be noted that these findings are based on low-ownership country companies and liquid equity markets, where shareholders have less incentive to monitor executives and instead sell their shares in case of dissatisfaction (Drobetz, Janzen, & Meier, 2016). Findings difficult to accept in a context like the one of CEMAC economies where stock markets are gloomy. Stock market seems to have a significant contribution on that debate, but out of African countries. Acharya & Xu (2017) explain that SOEs in the external finance industries spend more on research and development and generate a better patent portfolio than their private counterparts (United States Firms). However, public enterprises in industries that depend on internal finance do not show a better innovation profile than private companies (Acharya & Xu, 2017).

3. Methodology

3.1. Data envelopment analysis

Due to the objective of this study, the orientation chosen in order to measure technical efficiency is the output orientation and the intermediation approach. Indeed, economic literature argues that services provided to the debtors of financial institutions are the appropriate concept of output in the process of decision making (Sealey & Lindley, 1977).

As CEMAC banks are not working in an optimal scale, the study chooses VRS (Variable Return to Scale) instead of CRS (Constant Return to Scale). Anyway, as explained by Berger & Humphrey (1997), there is no consensus on the preferred method for determining the best-practice frontier in order to measure the relative efficiencies.

The model is derived in order to determine the efficiency of CEMAC Sub-region banks when the objective is to produce Healthy Loans instead of just producing Gross Loans. Healthy loans at the time (t) for the bank (i) are Gross Loans at the time (t) for the bank (i) minus unrecovered loans for the same DMU (bank) at the same period.

Inputs: Deposits, Labour expenses, and General expenses;
Outputs: Healthy loans.
The mathematical model to solve is, therefore, the following one:

$$
\begin{cases}
Max \left(\dfrac{\beta_1.\, Healthy\ Loans_{it}}{\sum(\alpha_1.\, Deposits_{it} + \alpha_2.\, Labour\ Exp_{it} + \alpha_3.\, General\ Exp_{it})} \right) \\
Subject\ to: \dfrac{\beta_1.\, Healthy\ Loans_{it}}{\sum(\alpha_1.\, Deposits_{it} + \alpha_2.\, Labour\ Exp_{it} + \alpha_3.\, General\ Exp_{it})} \le 1:
\end{cases}
$$

With $i \in [1; 6]$ for the CEMAC countries;
With $\sum_{k=1}^{K} \alpha_k = 1$: input weight and $\sum_{k=1}^{K} \beta_k = 1$: output weigh;
With $t \in [2004; 2014]$ for the years, the study's data cover.

3.2. Tobit model

Inspired from Iannota *et al.,* (2007), the specification of the Tobit model is presented as follows:

$$
y^*{}_{it} = \sum_{k=1}^{K} x_{it\,k}.\beta_i + v_i + \varepsilon_{it}
$$

Where k is the number of independent variables.
- Dependent variable:

Bank Risk-Efficiency scores, computed with the Data Envelopment Analysis method. The data used to compute those efficiency scores come from COBAC yearly reports.
- Independent variables:

The independent variables are constituted of both external determinants (Macroeconomic aspect) and internal determinants (Microeconomic aspect) of banking performance. The description of those variables is given into the following Table 2:

Table 2. *Description of independent variables for the Tobit model*

Variable	Description
Micro-Economic Variables	
Gap α	The variable Gap α is computed from the data obtained in COBAC yearly reports. The objective of this variable is to measure the influence of removing the adverse selection-based risk that is the ratio Net Loans to Gross loans. Gap $\alpha = 1 - (Net\ Loans/Gross\ Loans)$
Risk β	The variable Risk β is made to determine the influence of a moral hazard-based risk on banks efficiency. Below is how it is computed: $Risk\ \beta = Net\ Provisions/Gross\ Loans$
Banking Sector Size	The variable Banking Sector Size measures the number of banks operating in each CEMAC countries over time. Data are from COBAC yearly reports.
Equity to Asset Ratio	The variable is computed from COBAC annuals report as the ratio of aggregated bank equity to the total balance sheet.
Macro-Economic Variables	
Public Credit Registries	Public Credit Registries are a measure of information asymmetry on financial markets. The study uses public instead of private credit bureaus as there is no private credit bureau in CEMAC up to 2017. Another reason is as on (Djankov, McLiesh, & Shleifer, 2007): public credit bureaus is a feature of French civil law countries.

Interest rate	As lending interest rates were not available over the period of study for the selected countries, the study chooses Deposit Interest rate to measure the influence of interest rates. Deposit interest rate is as defined on WDI: the rate paid by commercial or similar banks for demand, time, or savings deposits.
Economic Freedom Index	The index measures the degree of economic freedom of each country. It focuses on five key aspects of the economic environment over which governments typically exercise policy control: the size of government; the legal system and security of property Rights; the sound money; the freedom to trade internationally; and the regulation. The higher the value of the index, the higher the economic freedom and the lower the burden of institutions. This variable is useful to control the influence of institutions, and indirectly the influence of information asymmetry. The variable comes from The Fraser Institute.
Legal System & Property Rights	This variable enables to determine whether or not the ability of government to secure legal system can influence the performances of banks (La Porta, López-de-Silanes, Shleifer, & Vishny, 1997). In such a context, bank may easily recover they unpaid loans. According to the methodology use by The Fraser Institute, security of property rights, protected by the rule of law, provides the foundation for both economic freedom and the efficient operation of markets.
State ownership of banks	The variable provides evidence on the extent to which the banking industry is privately owned. According to Iannota, Nocera & Sironi (2007), public banks are less efficient than private ones.
Private sector credit controls	The variable reflects the conditions in the domestic credit market. The greater the value of the index, the lower the presence of state regulations over the private sector credit market. The variable comes from The Fraser Institute Database.
Interest rate controls	The variable reflects the conditions in the domestic credit market. The greater the value of the index, the lower the presence of state regulations over the private sector credit market. The variable comes from The Fraser Institute Database.
Variables for Borrower's nature	
Self-employment	Self-employment is a relatively practical measure when it comes to measuring entrepreneurship in SSA countries. The lack of data[6] imposes to exclude the use of indicators such as those from the Global Entrepreneurship Monitor or Global Entrepreneurship Development Institute. The choice of this variable is inspired from Nyström (2008), who uses it to investigate the institutional determinants of entrepreneurship OECD countries. The variable comes from the WDI.
Female Self-employment	The female self-employment is the share of female self-employment over the total female employment. Indeed, self-employed is defined as: the workers who are working on their own account, with a several partners or cooperative. Variable extracted from the WDI.
Male Self-employment	The male self-employment is the percentage of male self-employed over the total male employed. The data also come from the WDI.
Gender	The variable Gender is the difference between male self-employment and female employment.
Government enterprises	The variable comes from The Fraser Institute Database. It measures the extent to which countries use private investment and firms rather than government investment and enterprises. The idea is that, state-owned enterprises play by rules that are different from those to which private enterprises are exposed. The variable increases when countries use more of private firms than government investments or state-owned firms.

Source: Authors.

From the above table, macroeconomic variables data come from the database of World Development Indicators (WDI), and The Fraser Institute, 2018 last update.

3.3. Data

The data cover 6 CEMAC countries (Cameroon, Central African Republic, Congo, Gabon, Equatorial Guinea & Chad) and comes from

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[6] The data are not available over time when it comes to African countries. In addition, not all the CEMAC countries are represented over each indicator in most databases.

COBAC[7], yearly reports from 2004 to 2014, The Fraser Institute database and the World Development Indicator database (WDI)[8].

DEA model variables come from aggregate countries' banking sector financial statements. As on December 31st, 2014, 50 commercial banks are operating the CEMAC banking system has: 13 in Cameroon, 4 in Central African Republic, 10 in Congo, 10 in Gabon, 5 in Equatorial Guinea and 8 in Chad (COBAC, 2014).

4. Results and discussion

4.1. CEMAC banking sectors need state-owned enterprises to improve their risk-efficiency

The study reveals a negative and significant link between strong absence of public owned enterprises and risk efficiency gap in the CEMAC sub-region. This study revealed the existence of a negative and significant link between the strong absence of state-owned enterprises and the level of risk-efficiency of the CEMAC banking sectors. The variable is labelled "Government enterprises" and measures the extent to which CEMAC countries use private investment and firms rather than government investment and enterprises. An institutional variable that increases when the countries use more of private firms than government investments or state-owned firms. The results are presented in the Table 3 below:

Table 3. *Results of Tobit model estimation for bank risk-efficiency*

Bank risk-efficiency						
	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Self-employment	0,0066***	0,001	4,99	0,000	0,004	0,009
Gap α	0,4824	0,351	1,38	0,169	-0,205	1,170
Risk β	-2,3861**	1,050	-2,27	0,023	-4,444	-0,328
Equity to Asset ratio	2,1951***	0,459	4,78	0,000	1,296	3,095
Public credit registry	0,0093***	0,001	6,6	0,000	0,007	0,012
Economic Freedom Index	0,2488***	0,087	2,85	0,004	0,078	0,420
Government enterprises	-0,0285***	0,010	-2,92	0,004	-0,048	-0,009
Legal System & Property Rights	0,0319	0,033	0,96	0,337	-0,033	0,097
State ownership of banks	0,0173	0,018	0,96	0,339	-0,018	0,053
Private sector credit controls	-0,0122	0,008	-1,56	0,119	-0,028	0,003
Interest rate controls	0,0274	0,030	0,92	0,356	-0,031	0,086
_cons	-1,4459***	0,392	-3,69	0,000	-2,213	-0,678
/sigma_u	9,7E-07	898,71	0	1,000	-1761,4	1761,4
/sigma_e	8,0E-02***	0,013	6	0,000	0,054	0,106
rho	1,5E-10	0,272			0	1
Wald chi2(11) =		209,63				
Log likelihood =		59,635				
Prob > chi2 =		0,000				

Source: Authors from Stata software

The reasons that may explain this result are not exhaustive. The main one might be that the weak institutional context characterised by the prevalence

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[7] Banking Commission of Central Africa.

[8] Depending on the availability of the data.

of information asymmetry between private companies and banks makes the state-owned companies much more secure to finance. Indeed, the majority of enterprises in the CEMAC Sub-region are informal and operate in an environment where information asymmetry is high. It is therefore more profitable and less risky for banks to lend to the state than to private companies.

Moreover, it is known that states rarely go bankrupt. Indeed, about public financing, the risk-bearing is transferred to the tax-payer (Sharp, 1951). Lending to the state or to its companies would therefore reduce the risk of having unpaid debts. This would help increase the risk-efficiency of banks, and, not having the opportunity to lend to the state would represent a shortfall for the banks. This is why the strong presence of state-owned enterprises improve the risk-efficiency of CEMAC banks.

Why to encourage the presence of state enterprises in the credit market when the majority of the literature is opposed to? In this regard, Keynes speaks of the possibility of eviction effect following a strong presence of state investments. He explains that private businesses may lack funding due to eviction. As response, in the CEMAC sub-region, companies lack funding while banks face excess liquidity (Avom & Eyeffa Ekomo, 2007). In addition, the context of sub-Saharan African countries is a context in which the asymmetry of information creates distortions in the markets, as economic theory explains for the whole markets (Akerlof, 1970).

Therefore, this study finding does not encourage the presence of state's owned enterprises in the whole world, in Europe or America, but this study finding does encourage the presence of state's owned enterprises in CEMAC sub-region. Indeed, State investment are still extremely needed in CEMAC. About that, a report from the International Monetary Fund (IMF) states that like in most of sub-Saharan Africa, the infrastructure gap in the CEMAC Sub-region remains large. From the World Bank's Africa Infrastructure Country Diagnostic estimates, USD 93 billion of spending per year in public infrastructure was needed from 2005 to 2015 for sub-Saharan Africa to fill its infrastructure gap. In most of CEMAC Sub-region, even basic infrastructure needs remain unmet according to the IMF. Moreover, around USD 6 billion per year till 2025 would be needed to meet basic infrastructure requirements in CEMAC countries (IMF, 2014).

4.2. Robustness of the relationship

Even by controlling the effect of our variables of interest by multiple other variables used in the literature, the initial hypothesis is still confirmed. That is the case of the banking sector size and the level of interest rate. Including CEMAC banking sectors' sizes do not remove the significance of Government enterprises' influence on banking risk-efficiency. Indeed, the results presented in the above table are closed to the economic though suggesting that the size of the banking sector has a positive impact on performance (Short, 1979). This study shows that CEMAC banking sector size has a positive and significant influence on

CEMAC banking sector efficiency. This, without hampering the link between the nature of borrowers and the bank risk-efficiency.

Table 4. *Robustness of the results of Tobit model estimation for bank risk-efficiency*

Bank risk-efficiency								
	Coef.	Std. Err.	P>z	Coef.	Std. Err.	P>z	Coef.	Std. Err.	P>z
	Model 1			Model 2			Model 3		
Self-employment	0,0040***	0,001	0,007						
Female Self-employment				0,0034***	0,002	0,023			
Male Self-employment							0,0042***	0,001	0,003
Gap α	1,1644***	0,381	0,002	1,1993***	0,395	0,002	1,2015***	0,365	0,001
Risk β	-3,5674***	1,020	0,000	-3,5205***	1,039	0,001	-3,5917***	1,006	0,000
Equity to Asset ratio	2,4495***	0,446	0,000	2,5489***	0,463	0,000	2,3011***	0,438	0,000
Public credit registry	0,0076***	0,001	0,000	0,0075***	0,001	0,000	0,0073***	0,001	0,000
Economic Freedom Index	0,1435*	0,086	0,094	0,1646*	0,087	0,058	0,1190	0,086	0,164
Government enterprises	-0,0200**	0,009	0,033	-0,0213**	0,010	0,027	-0,0183*	0,009	0,050
Legal System & Property Rights	0,0052	0,033	0,873	-0,0059	0,033	0,857	0,0091	0,032	0,773
State ownership of banks	0,0057	0,017	0,737	0,0034	0,017	0,846	0,0051	0,016	0,755
Private sector credit controls	-0,0164**	0,007	0,024	-0,0202***	0,007	0,005	-0,0124	0,008	0,100
Interest rate controls	0,0106	0,028	0,701	0,0105	0,028	0,708	0,0107	0,027	0,693
Interest Rate	-0,0464**	0,019	0,014	-0,0450**	0,020	0,022	-0,0502***	0,018	0,006
Size of banking sector	0,0210**	0,008	0,011	0,0230***	0,008	0,006	0,0207**	0,008	0,010
_cons	-0,4750	0,462	0,304	-0,5318	0,489	0,277	-0,3491	0,441	0,429
/sigma_u	0,0000	97,480	1,000	0,0000	48,509	1,000	0,0000	473,296	1,000
/sigma_e	0,0730***	0,012	0,000	0,0744***	0,012	0,000	0,0720***	0,012	0,000
rho	0,0000	0,272		0,0000	0,272		0,0000	0,272	
Wald chi2(11) =	263,9			252,22			272,85		
Log likelihood =	64,690001			63,678773			65,438995		
Prob > chi2 =	0,0000			0,0000			0,0000		

Source: Authors from Stata software

It's the same for the interest rate control. Indeed, the economic literature suggests that in some countries, interest rates negatively affect the profitability of banks (Afzal, Raja, Imran, & Saima, 2018). This is also the case of this study for CEMAC countries. An influence that, like the previous one, is not detrimental to the link between the nature of the borrower and the efficiency of the banking system in CEMAC Sub-region.

The fact that the gender difference in entrepreneurship does not affect credit risk management does not mean that entrepreneurship does not affect credit risk management. The self-employment variable shows it enough. Indeed, the variable has a positive and significant influence on banking risk-efficiency. Moreover, an environment marked by the presence of female entrepreneurs improves efficiency in credit risk management; It is the same for an environment where there is male entrepreneurship. Although the effect of male entrepreneurship seems to be slightly higher than female, as might be expected from a part of the theory (Loscocco & Robinson, 1991), there is no significant gender gap in the efficient management of credit risk in CEMAC on the period of study. As Male entrepreneurship, female's entrepreneurship does contribute to improve the efficient management of credit risk in CEMAC. Therefore, women entrepreneurs should not have their credit application rejected because of their gender.

5. Conclusion

State owned-enterprises' influence on CEMAC banking sector has grown considerably. In some countries of the Sub-region, SOEs' arrears have been increasing with the potential of affecting both the government and the private sector. SONARA, one of the biggest SOE of the biggest Economy of the Sub-Region is the main driver of the latter's banking system risks. Among the 6 banks that have a positive net exposure to SONARA: one bank has negative capital, three banks will fail to meet minimum capital requirement if SONARA defaults, and two banks will lose around 50 to 85% of their respective excess capital. This is one of the two factors that motivate the investigation of the influence of some borrower's nature on the efficient management of credit risk in CEMAC Sub-region.

The study focuses itself on 2 types of borrowers' nature influence on banking risk-efficiency management:The public borrower (through the prevalence of State-owned enterprises and investments) and private borrower (through private entrepreneurship).

The methodology used in the study consists of Data Envelopment Analysis and Tobit model. On the first hand, the DEA method is used to compute the risk-efficiency scores of CEMAC banking sectors. The data are on a panel basis: The overall 6 CEMAC countries and from 2004 to 2014, depending on the availability of the data source. Indeed, they are constituted from end of year's COBAC reports. On the other hand, the Tobit model is used to find the influence of borrowers' nature on bank risk-efficiency through the linear regression model with panel-level random effects. The data comes from WDI and The Fraser Institute.

The main findings from this research suggest that there is a negative and significant link between the tendency of CEMAC economies of using more private firms than SOEs or investments and banking sector efficiency. Therefore, the nature of the borrower as private or public firm matters.

But, the negative sign of the influence is quite unusual. The reasons behind this can be found into the institutional environment and the state of public infrastructures. Indeed, the weak institutional context marked by the prevalence of information asymmetry between private companies and banks makes the state-owned companies much more secure to finance. Moreover, the majority of enterprises in the CEMAC Sub-region are informal and operate in an environment where information asymmetry is high. It is therefore more profitable and less risky for banks to lend to the state than to private companies. Lending to the state (buying state's bonds and others) or to its firms would therefore reduce the risk of having unpaid debts. This would help increase the risk-efficiency of banks, and, not having the opportunity to lend to the state would represent a shortfall for the banks. This is why the strong presence of state-owned enterprises improve the risk-efficiency of CEMAC banks. Therefore, this study finding does not encourage the presence of state's owned enterprises in the whole world, in Europe or America, but this study finding does encourage the

presence of state's owned enterprises in CEMAC sub-region where there is still a huge need of infrastructures.

The study recommends to CEMAC authorities to harmonize credit policies such as reserve requirements across the Sub-region. Indeed, as suggested by IMF, harmonizing the reserves requirements may definitely lead to progress in the regional money market growth, and the ability of the BEAC to effectively manage the overall liquidity issues in the sub-region. Another recommendation is to encourage CEMAC government bond issues to finance infrastructure projects. Direct loans to SOEs must be carefully monitored. Indeed, even if they are more profitable and less risky, an exogenous shock could cause considerable damage to the banking system.

References

Acharya, V., & Xu, Z. (2017). Financial dependence and innovation: The case of public versus private firmsol. *Journal of Financial Economics*, 124(2), 223-243. doi. 10.1016/j.jfineco.2016.02.010

Afzal, A., Raja, R., Imran, U.C., & Saima, S. (2018). Interest rate and financial performance of banks in Pakistan. *International Journal of Applied Economics, Finance and Accounting*, 2(1), 1-7. doi. 10.33094/8.2017.2018.21.1.7

Aggarwal, R., & Jacques, K. (1998). Assessing the impact of prompt corrective action on bank capital and risk. *Economic Policy*, 4, 23-32.

Akerlof. (1970). The market for "lemons": Quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, 84(3), 488. doi. 10.2307/1879431

Armstrong, A., Jia, X., & Totikidis, V. (2005). Parallels in private and public sector governance. *Contemporary Issues in Governance*, 5(1), 28-30.

Arriaga, C., & Miranda, L. (2009). Risk and efficiency in credit concession: A case study in Portugal. *Managing Global Transitions*, 7(3), 307-326.

Avom, D., & Eyeffa Ekomo, S. M.-L. (2007). Quinze ans de restructuration bancaire dans la CEMAC: Qu'avons-nous appris?. *Revue d'Economie Financière*, (89), 183-205. doi. 10.3406/ecofi.2005.3935

Bany, R.F. (2015). Les activités de hors bilan améliorent-elles l'efficience bancaire? Une vérification empirique dans le cas de la CEMAC. *Journal of Economics and Development Studies*, 3(3), 19-35. doi. 10.15640/jeds.v3n3a3

Berger, A., & Humphrey, D. (1997). Efficiency of financial institutions: international survey and directions for future research. *Finance and Economics Discussion Series*. [Retrieved from].

Clark, J.A. (1996). Market structure, risk and profitability: The quite-life hypothesis revisited. *Quarterly Review of Economics, and Business*, 36(1), 45-56.

COBAC. (2014). Rapport Annuel d'Exercice.

Cull, R., & Xu, L.C. (2003). Who gets credit? The behavior of bureaucrats and state banks in allocating credit to Chinese state-owned enterprises. *Journal of Development Economics*, 71(2), 533-559. doi. 10.1016/S0304-3878(03)00039-7

Dierkes, E.C., Langer, T., & Norden, L. (2013). Business credit information sharing and default risk of private firms. *Journal of Banking & Finance*, 37(8), 2867-2878. doi. 10.1016/j.jbankfin.2013.03.018

Djankov, S., McLiesh, C., & Shleifer, A. (2007). Private credit in 129 countries. *Journal of Financial Economics*, 84(2), 299–329. doi. 10.1016/j.jfineco.2006.03.004

Drobetz, W., Janzen, M., & Meier, I. (2016). Investment and financing decisions of private and public firms. *29th Australasian Finance and Banking Conference*. doi. 10.1111/jbfa.12367

Eloundou, E.F., & Befen Djinja, D.M. (2016). Internal mechanisms of governance and risk bearing of banks: The case of the CEMAC zone. *International Journal of Financial Research*, 7(5), 190-202. doi. 10.5430/ijfr.v7n5p190

Fouda, O. (2009). La surliquidité des banques en zone franc: comment expliquer le paradoxe de la CEMAC. *Revue Africaine D'intégration*, 3(2), 43-90. doi. 10.5539/ijef.v6n6p127

Hugon, A. (2007). Rentabilité du secteur bancaire et défaillances du financement du développement: le cas de la CEMAC. *Revue Tiers Monde*, 192(4), 771-788. doi. 10.3917/rtm.192.0771

Huynh, K., Paligorova, T., & Petrunia, R. (2013). Public/private transitions and firm financing. *Bank of Canada Staff Working Papers*, No.2013-36. [Retrieved from].

Iannota, G., Nocera, G., & Sironi, A. (2007). Ownership structure, risk and performance in the European banking industry. *Journal of Banking and Finance*, 31(7), 2127-2149. doi. 10.1016/j.jbankfin.2006.07.013

IMF. (2014). Central African economic and monetary community. Washington, DC: IMF Country Report, No.14/305. [Retrieved from].

International Monetary Fund. (2018). *Cameroon*. IMF Country Report No.18/256. [Retrieved from].

Journal of Economics Bibliography

Jacques, K., & Nigro, P. (1997). Risk-based capital, portfolio risk, and bank capital: A simultaneous equations approach. *Journal of Economics and Business*, 49(6), 533–547. doi. 10.1016/S0148-6195(97)00038-6

Koju, L., Koju, R., & Wang, S. (2018). Does banking management affect credit bisk? Evidence from the Indian banking system. *International Journal of Financial Studies*, 6(3). 67-78. doi. 10.3390/ijfs6030067

La Porta, R., López-de-Silanes, F., Shleifer, A., & Vishny, R. (1997). Legal determinants of external finance. *Journal of Finance*, 52(3), 1131–1150. doi. 10.1111/j.1540-6261.1997.tb02727.x

Loscocco, K., & Robinson, J. (1991). Barriers to women's small-business success in the United States. *Gender & Society*, 5(4), 511-532. doi. 10.1177/089124391005004005

Ningaye, P., Madaha, Y.M., & Nembot, N.L. (2014). Competition and banking efficiency in the CEMAC zone. *International Journal of Economics and Finance*, 6(6), 127-139. doi. 10.5539/ijef.v6n6p127

Nyström, K. (2008). The institutions of economic freedom and entrepreneurship: evidence from panel data. *Public Choice*, 136(3-4), 269–282. doi. 10.1007/s11127-008-9295-9

Nzomo, J., & Dombou, D. (2017). Stock markets, volatility and economic growth: evidence from Cameroon, Ivory Coast and Nigeria. *Panorama Economico*, 12(24), 145-175.

Odunga, R., Nyangweso, P., Carter, D., & Mwarumba, M. (2013). Credit risk, capital adequacy and operating efficiency of commercial banks in Kenya. *International Journal of Business and Management Invention*, 2(9), 6-12.

Onaolapo, A. (2012). Analysis of credit risk management efficiency in Nigeria commercial banking sector. *Far East Journal of Marketing and Management*, 2(4), 39-52.

Salim, R., Arjomandi, A., & Dakpo, H. (2017). Banks' efficiency and credit risk analysis using by-production approach: the case of Iranian banks. *Applied Economics*, 49(30), 1-15. doi. 10.1080/00036846.2016.1251567

Sealey, C., & Lindley, J.T. (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions. *Journal of Finance*, 32(4), 1251-1266. doi. 10.2307/2326527

Sharp, C. (1951). Public and private financing of industrial enterprise. *The Economic Journal*, 61(244), 804-811. doi. 10.2307/2226982

Shirley, M., & Walsh, P. (2000). Public versus private ownership: The current state of the debate. The World Bank. [Retrieved from].

Short, B. (1979). The relationship between commercial bank profit rates and banking concentration in Canada, Western Europe and Japan. *Journal of Banking and Finance*, 3(3), 209-219. doi. 10.1016/0378-4266(79)90016-5

Shrieves, R., & Dahl, D. (1992). The relationship between risk and capital in commercial banks. *Journal of Banking and Finance*, 16(2), 439- 457. doi. 10.1016/0378-4266(92)90024-T

Yong, T., & Christos, F. (2018). Risk, competition and efficiency in banking: Evidence from China. *Global Finance Journal*, 35(3), 223-236. doi. 10.1016/j.gfj.2017.12.001