



DO FINANCIAL INCLUSION AND BANK CONCENTRATION ENHANCE THE EFFECTIVENESS OF EMCCA BANKS?

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Abstract

The Economic and Monetary Community of Central Africa (EMCCA) was created in 1994. This paper analyses the effects of financial inclusion and banking concentration on the EMCCA bank's effectiveness. Using a parametric Stochastic Frontier Analysis model and a panel data model estimated by the Censored Tobit Method over the period 2004-2016, we find that: (i) the average allocative efficiency score is 0.72; (ii) financial inclusion and banking concentration increase efficiency of the banking system. The promotion of significant banking to enable banks through economies of scale to effectively incorporate technological change and the consolidation of financial inclusion strategies to strengthen competition, the use of technological innovation would be significant in consolidation of EMCCA banking system.

Keywords: EMCCA, Censored Tobit, Concentration, Efficiency, Financial Inclusion

INTRODUCTION

Bank efficiency is an issue of financial, economic and even social development (Owen and Pereira, 2018). It contributes at best to exalt investors, finance activities, consolidates financial relations, boosts economic growth (Kiendrebeogo and Minéa, 2013). Therefore, bank efficiency refers to the ability of banks to provide an optimal mix of outputs based on available resources and given technologies. The literature on the determinants of banking efficiency is well documented. Recent studies identify financial inclusion and banking concentration as main determinants of banks performance (Hussain et al., 2019; Chauvet and Jacolin, 2017).



In fact, financial globalization has first resulted in the abandonment of the financial repression that has given way to a strong liberalization whose threats to the financial and banking systems are still observed today. The Franc Zone in Africa has not been spared from the various causes: so many banks have faced a liquidity constraint and a growing insolvency, significantly reducing their intermediation activities. The importance of the financial and banking systems has given rise to the urgent need to initiate reforms aimed at restructuring banks and strengthening the institutional framework for banking regulation, promote the autonomy of monetary policy and, in particular, the credibility of the central banks. Paradoxically, these restructurings have resulted in banking concentration and a lack of financial innovation (Avom and Eyeffa, 2007).

The banking sector has remained repressive, heavily concentrated in urban areas, risk-averse and offering only a limited range of financial services due to real and monetary imbalances and information asymmetries. There are also significant changes in the capital structure of banks. For example, the share of public capital increased by 4.75% from 18.75% in 2004 to 23.50% in 2016, while the share of private capital increased from 81.25% to 76.50% (BEAC, 2018). In Cameroon, three of the thirteen banks share 50.5% of the balance sheet total, 49.8% of deposits and 54.5% of loans. The analysis by the Herfindahl-Hirschman Index indicates that the concentration of the banking market decreased by 312 points, from 2671 in 2004 to 2359 in 2016, and contributed to hindering the intermediation activities of banks. The rate of bank intermediation declined by about 20 percentage points, from 92.33% in 2004 to 72.49% in 2016 due to restrictive regulation and a poor institutional environment (BEAC, 2018).

Following the November 2010 G20 Summit in Seoul in North Korea, financial inclusion was recognized as a pillar of the global development agenda and contained in 7 of the 17 Sustainable Development Goals (GPFIs, 2011). According to World Bank Global Financial Inclusion Database (2017), financial inclusion increased from 51% in 2011 to 62% in 2014 to 69% in 2019, thanks to countries efforts in technological innovation and improving communication infrastructures. According to GFID, the number of non-banked adults increased from 2.5 billion people with nearly 200 million micros, small and medium-sized enterprises without access to financial services in 2011 to about 1.7 billion people in 2018. Access to formal financial services is uneven, disparate and low in CEMAC. Overall financial inclusion is at 12%. According to gender, it is 15% for men and 10% for women. Significant disparities remain between countries: Cameroon (15%), Central African Republic (4%), Congo (10%), Gabon (19%), Equatorial Guinea (20%) and Chad (10%).

Beck and Cull (2015) noted that banking systems in Africa are less inclusive than those in other continents. Certainly, the development of the financial system has helped stimulate

economic growth, although financial services remain concentrated in urban areas. Current developments can stimulate or hinder financial inclusion with the emergence of mobile banking systems and consolidated growth prospects in many countries. However, gaps in financial inclusion remain between men and women, rural and urban areas, developed and developing countries. Overall, the banking system in developed and developing countries is characterised by elitism, with little diversified financial services. Over the past two decades, the banking firm has been a privileged field of application for advances in the industrial economy. Banking concentration is one of these interesting areas of study (Scialom 1999). One of the explanations of concentration is that it contributes to the productive strength and effectiveness of banks through three effects: economy of scale, economy of range, and Efficiency-X (Jeffers and Oheix, 2003). The literature remains non-consensual on the impact of concentration on the efficiency of the banking system (Samir et al. 2012). Financial inclusion allows households to save, to borrow, to consolidate financial stability, monetary policy effectiveness, and financial sustainability (Guérineau and Jacolin, 2014).

Following from the objective of this work, we use data at national levels from the Central African Banking Commission of 6 African countries over the period 2004-2016. In doing so, our contribution to the existing literature is threefold. First, to the best of our knowledge, this is the first empirical study which appreciate the effect of financial inclusion and banking concentration on banking efficiency. Second, we determine score of banking system thus their determinant. Third, its originality is above all methodological, by using Stochastic Frontier Analysis model.

After this introduction, the rest of the paper is organized as follows. Section 2 reviews the literature on the determinants of happiness. Section 3 describes the methodology and data. Section 4 presents and analyses the results. Section 5 concludes.

LITERATURE REVIEW

The neoclassical theory based on pure and perfect competition deepens the problems of efficiency of the firms that already appeared in filigree among the classical authors, particularly in Adam Smith (1776) through the metaphor of “the invisible hand”. Until the early 1930s, the effectiveness of firms was absent from previous studies (Hicks, 1946; Carlson, 1939). The theoretical anchor of bank effectiveness dates back to the seminal work of Berle and Means (1932) which favoured the emergence of the human capital theory initiated by Mincer (1962) and the Efficiency-X theory developed by Leibenstein (1966) based on the observation that firms use their resources in a sub-optimally perspective. To these are added the contributions of Mc Kinnon (1973), Shaw (1973) who laid the foundations for the influence of financial reforms and in particular financial inclusion on the efficiency of banks. It was not until the golden thirties

that this concept was born and strengthened. Debreu (1951) have contributed firstly to theoretical and empirical work on this important concept of financial stability. Thus, Farrell (1957) distinguishes between economic efficiency, technical efficiency, allocative efficiency, relative efficiency and absolute efficiency. The extension to the banking system follows the attempts to resolve the banking crises of the 1980s, and the restructuring begun at the beginning of the 1990s still shows mixed results (Grigorian and Manole, 2000). Recent literature highlights that bank efficiency is directly determined by bank concentration and financial inclusion (Chauvet and Jacolin, 2017; Fouopi and Song, 2016).

The role of market concentration in banking performance can be traced back to the seminal work of Bain (1951) for industrial enterprises, then tested in the banking sector by Schweiger and McGee (1961). These theoretical contributions favoured the emergence of the Structure-Conduct-Performance hypothesis anchored in the theory of market power. Empirically, the impact of market concentration on banking efficiency is non-consensual and emerged through three assumptions: (i) the quiet life hypothesis developed by Hicks (1935); (ii) the structural efficiency hypothesis developed by Demsetz (1973); and (iii) the information generation hypothesis developed by Marquez (2002). Specifically, market concentration can stimulate (Demirgüç-Kunt et al. 2009; Goddard et al., 2007; La Porta et al., 2002), hinder (Delis and Papanikolaou, 2009; Casu and Girardone, 2009; Koetter et al., 2008; Berger and Hannan, 1998), where to be meaningless (Samir et al., 2012; Fu and Heffernan, 2009) on bank efficiency.

The problem of the banking firm has changed considerably over the years, as a result of changes in the financial sector. Financial inclusion has emerged as a modern determinant. Thus, the literature highlights the investigation of the links between financial inclusion and aspects of financial development (Neaime and Gaysset, 2018), then, between financial inclusion and economic development aspects (Kim et al., 2018; Sharma, 2016). Subsequently, De La Torre et al., (2011) found that financial inclusion increases transactions covered by financial intermediaries. This leads to the appearance of risks and information asymmetries that could endanger financial stability. Le et al., (2016) in a sample of 31 developed and developing countries over the period 2004-2016, using the Feasible Generalized Least Squares (FGLS) found that financial inclusion negatively affects financial efficiency and positively affects financial sustainability. Chauvet and Jacolin (2017) considering a sample of 55,596 firms from 79 countries, found that the financial inclusion approximated by the distribution of financial services increases the performance of firms. Owen and Pereira (2018) find that the consolidation of banks and their enhanced supervision following the 2008 financial crisis have increased the impact of market structure and financial inclusion on bank effectiveness. Recently, Hussain et

al., (2019) have shown that financial inclusion by increasing the financial resilience of countries helps to strengthen the efficiency of the banking system.

METHODOLOGY

Empirical model

According to Fouopi and Song (2016), Brissimis et al. (2010), bank efficiency scores are determined by the following translogarithmic equation:

$$\begin{aligned} \ln (CT)_{it} = & \beta_0 + \sum_{k=1} \beta_k \ln (Y_{it}) + \sum_{h=1} \alpha_h \ln (P_{it}) + \frac{1}{2} \sum_j \sum_k \beta_{jk} \ln (Y_{jt}) \ln (Y_{kt}) \\ & + \frac{1}{2} \sum_h \sum_j \alpha_{hj} \ln (P_h) \ln (P_{jt}) + \sum_j \sum_k \lambda_{jkt} \ln (P_{jt}) \ln (Y_{kt}) + v_{it} + u_{it} \end{aligned} \quad (1)$$

Where, CT refers to the Total Cost which includes all financial costs (expenses on operations with clients) and operational costs (personnel and operating overhead).

P is the input price vector. Three types of inputs are considered: (i) physical capital as measured by tangible and intangible net assets (Mlambo and Ncube 2011); (ii) human capital as measured by the number of employees (Weill 2006); (iii) financial capital as measured by financial charges (Mwega, 2011). Thus, the price of physical capital is approximated by relating allocations to depreciation, leasing and leasing expenses to tangible and intangible assets. The price of human capital is approximated by relating personnel costs to the average annual staff complement of banks. The price of financial capital is approximated by the average cost of resources borrowed.

Y is the output vector, consisting of: (i) credits that group together net loans to banking and non-banking clients (Weill, 2006); (ii) deposits approximated by all deposits made by banking and non-banking clients (Weill, 2006); (iii) financial securities that integrate transaction securities, investment securities and investment securities (Hassan and al., 2012).

For each country, $i = 1, \dots, N$ and $\forall t = 1, \dots, T$; $\forall k = 1, \dots, K$ and $\forall h = 1, \dots, H$; N is the number of countries; T is the number of years; K represents the number of outputs; H is the number of input prices; v_{it} is the error term distributed independently according to the normal distribution law $N(0; \sigma_v^2)$; μ_{it} is the inefficiency defined positively with an asymmetric distribution and independent of that of the v_{it} .

The likelihood function is defined by:

$$\ln L = N/2 \ln(2/\pi) - N \ln \sigma - 1/2\sigma^2 \sum \varepsilon_i^2 + \sum \ln[\varphi(\varepsilon_i/\sigma)] \quad (2)$$

Allocative efficiency levels are calculated using the following formula:

$$E(u_i / \varepsilon) = \left[\sigma \lambda / (1 + \lambda^2) \right] \left[\varphi(\varepsilon_i \lambda / \sigma) / (\rho(\varepsilon_i \lambda / \sigma) + \varepsilon_i \lambda / \sigma) \right]$$

With $\varepsilon_i = v_i - u_i$; $\sigma^2 = (\sigma_u^2 + \sigma_v^2)$; $\gamma = \sigma_u^2 / (\sigma_u^2 + \sigma_v^2)$; $\lambda = \sigma_u / \sigma_v$.

Where, φ is the normal density function, represents the standard cumulative normal distribution. Taking into account banking costs, we will from specification (1) put the analysis variables of the stochastic boundary in relation. In the case of three outputs and three input prices, the specification contains 34 parameters of interest to be estimated. To gain in terms of degree of freedom, we apply two constraints¹: a symmetry constraint ($\beta_{jk} = \beta_{kj}$ et $\alpha_{hj} = \alpha_{jh}$) and a homogeneity constraint².

Estimation technique

Highlighting the effects of financial inclusion and market structure on the allocative efficiency of the CEMAC banking system is done by reducing allocative efficiency scores on a set of variables. Censored models and Ordinary Least Squares (OLS) are reported in the literature. However, the dependent variable (Bank Effectiveness) taking the values in the range]0;1], we cannot perform a regression by the OLS, but, by censored models such as the Generalized and Censored Poisson Model or the censored Tobit model, recommended when the values of the endogenous variable belong to a specific interval. The Generalized and Censored Poisson Model is recommended when the values are natural integers. Conversely, the Tobit model is used when the values are continuous in an interval, and the probability for them to take null values is positive. Since the dependent variable is continuous in the range]0;1], these two technique cannot be used. Since the values are not natural integers, the use of the Generalized and Censored Poisson Model is not appropriate (Greene, 1997). To solve this constraint, we estimate rather the ineffectiveness of the banks, since the ineffectiveness scores take not only the null and/or positive values, but, are continuous in the interval [0;1]. We use the Tobit model which belongs to the family of models with limited dependent variable, continuous and observable only over a certain interval. These are censored or truncated regression models. In light of the above, the censored Tobit model can be used.

¹ These two constraints lead to a gain of thirteen degrees of freedom, and therefore 21 parameters to be estimated.

² It is taken into account by standardizing in accordance with usage all costs by one of its components in this case the price of human capital.

Considering Y_i that represents the level of inefficiency of bank i , the model can be specified as follows:

$$\begin{cases} Y_{it} = X_{it}\beta + u_i \\ \text{avec } \begin{cases} Y_{it} = Y_{it}^* \text{ si } Y_{it} > 0 \\ Y_{it} = 0 \text{ si non} \end{cases} \end{cases} \quad (3)$$

Where, X_i is the vector of the explanatory variables, β is the vector of parameters to estimate, Y_i^* a latent variable considered as the threshold from which the variables X_i affect the efficiency of the banks. The dependent variable “inefficiency” is continuous and limited to zero. Assuming that errors are normally distributed, the censored Tobit model estimate involves maximizing the logarithm of likelihood that is written:

$$\log L = \sum_{i=1}^n \log[1 - \Phi(X_i\beta/\delta)] + \sum_{i=1}^n \log\left(\frac{1}{\sqrt{2\pi}\delta}\right) - \frac{\sum_{i=1}^n (Y_i X_i\beta)^2}{2\delta^2} \quad (4)$$

Where, n is the number of observations, and δ is the standard deviation.

The model to be estimated, based on Fouopi and Song (2016) is specified as follows:

$$\begin{aligned} Ineff_{it} = & \alpha_0 + \alpha_1 Fin_incl_{it} + \alpha_2 Ban_conc_{it} + \alpha_3 Pub_Own_{it} + \alpha_4 Pri_Own_{it} + \alpha_5 Eco_struc_{it} \\ & + \alpha_6 Pop_den_{it} + \alpha_7 Fin_edu_{it} + \alpha_8 Bran_num_{it} + \alpha_9 Bank_num_{it} + w_{it} \end{aligned} \quad (5)$$

Where, $Ineff$ represents the score of allocative inefficiency. Financial inclusion (Fin_incl) measures the accessibility, penetration and use of financial services. Market structure (Mar_struc) is measured by the banking market concentration approximated by the Herfindahl-Hirschman Index³ (IHH). Public ownership structure (Pub_Own) measured by the composition of the public capital of banks in the area. Private ownership structure (Pri_Own) measured by the private capital composition of banks in the area. Economic structure (Eco_struc) measured by the rate of GDP growth in the countries of the area. Population density (Pop_den) measured by the number of inhabitants of each country in the sample for a bank agency. Financial education (Fin_edu) is approximated by customer knowledge in terms of language and financial instruments. $Bran_num$ (Branches numbers) is measured by the number of banking group branches operating in CEMAC. Banks number ($Bank_num$) is approximated by the banking units of each group or subsidiary operating in CEMAC.

³ IHH < 1000 corresponds to a weakly concentrated banking market. 1000 < IHH < 1800 corresponds to a moderately concentrated banking market. IHH > 1800 corresponds to a highly concentrated banking market.

The interpretation of the coefficients must be carefully analysed. The sign of the parameters that explain the inefficiency means that these parameters have an inverse effect on the allocative efficiency.

Data

The dataset consists of observations from the six countries of the Central African Economic and Monetary Community over the period 2004-2016. The choice of this period is justified by the availability of data, the various bank restructurings occurred, in terms of shareholder structure of capital, regulation in terms of banking capital, creation of new banks and their location. It is also necessary to consolidate the choice of this period by the adverse effects of the subprime crisis which has led to renewed interest in the efficiency of the banking system. The data come from two sources. The list of countries in the sample (Appendix 1), the sources of the variables (Appendix 2), and the descriptive statistics (Appendix 3) are returned in appendices.

EMPIRICAL RESULTS AND DISCUSSION

Results and discussion of allocative efficiency score

Table 1 presents allocative efficiency scores by year, country and CEMAC banking system. The average allocation efficiency score for the sample is 0.72. Thus, the CEMAC banking system could reduce its costs by 28% in order to hope to improve its performance. In other words, the distance between the actual situation and the border of efficiency is 28%. In addition, with the same inputs used and outputs offered, banks must improve their score by 28% to reach the border of efficiency approximated by the unit. Thus, the results show that, on average, the banking system experienced an inefficiency of its higher profits in 2008, due to the financial crisis. The efficiency score increased from 0.73 in 2004 to 0.74 in 2016 as a result of restructuring that resulted in bank over-liquidity, credit rationing, microfinance development, and a low propensity for innovation. The average allocative efficiency score is lower than that obtained by Pasiouras et al. (2009) for African banks, Isik and Hassan (2002) for Turkish banks, Sophocles et al. (2010) for European banks. But this score is higher than Avom and Nana (2017), Fouopi and Song (2016) for banks in the same area, and Khumbakar and Wang (2006) for western banks. From a country point of view, allocative efficiency scores are also below unit. Cameroon stands out with the highest average score (0.78), followed by Equatorial Guinea (0.75). The Central African Republic has the lowest average efficiency level of 0.64, which means a cost reduction of around 36% in order to hope to improve its performance.

Table 1: Allocative efficiency scores of CEMAC banks

Year/Countries	Cameroon	CAR ⁴	Congo	Gabon	Equatorial Guinea	Chad	CEMAC
2004	0,78	0,66	0,77	0,76	0,75	0,71	0,73
2005	0,81	0,66	0,79	0,75	0,79	0,72	0,75
2006	0,83	0,68	0,70	0,74	0,78	0,64	0,72
2007	0,82	0,61	0,72	0,72	0,8	0,74	0,73
2008	0,71	0,63	0,68	0,68	0,70	0,69	0,68
2009	0,73	0,64	0,67	0,73	0,72	0,73	0,70
2010	0,78	0,66	0,74	0,69	0,71	0,74	0,72
2011	0,75	0,65	0,73	0,70	0,73	0,72	0,71
2012	0,76	0,63	0,75	0,73	0,72	0,74	0,72
2013	0,81	0,65	0,78	0,74	0,78	0,71	0,74
2014	0,84	0,67	0,71	0,75	0,79	0,65	0,73
2015	0,81	0,64	0,73	0,72	0,76	0,69	0,72
2016	0,83	0,66	0,74	0,75	0,78	0,71	0,74
Averages	0,78	0,64	0,73	0,72	0,75	0,70	0,72

Results and discussion of impact of financial inclusion and market structure on allocative efficiency of banking system

Table 2 shows several results. Financial inclusion increases the allocative efficiency of the banking system (regressions 1 and 3). This result can be explained by the current changes in the financial services environment, the volume of transactions covered, as well as the product and process innovations that are emerging to allow greater use, accessibility and penetration of financial services. Thus, financial inclusion increases the supply of banks' financial services, which increases the accessibility of populations still excluded from financial services. This financial inclusion limits risks, contributes to the expansion of mobile payment platforms, encourages users to adopt technology and contributes to banking efficiency. This finding is consistent with those of Hussain et al., (2019), Owen and Pereira (2018). The market structure has a positive and statistically significant effect on the allocative efficiency of the banking system (regressions 2 and 3).

The initial explanations are based on the fact that bank concentration, in addition to reducing banking, avoids the competition possibilities of certain subsidiaries. As a result, banking firms support pricing, which creates a threat to entry, modifies their behaviour and contributes to increasing the allocative efficiency of the banking system. This leads to non-bank price competition, such as quality improvement services and technological innovation. Another explanation is based on the agency's theory that when the market is highly concentrated,

⁴ Central African Republic

managers seek to achieve objectives other than maximizing the bank's profits. Consequently, the cost of financial services is linked to the degree of competition between banks, influenced by the bank concentration. This is consistent with those obtained by Casu and Girardone (2009), Koetter and al. (2008).

Table 2: Effects of financial inclusion and concentration on allocative efficiency

	<i>Dependent variable: Allocative inefficiency</i>					
	<i>Estimation technique: Tobit Censored</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Financial Inclusion</i>	-0.012** (0.002)		-0.018** (0.011)	-0.023* (0.013)	-0.023* (0.013)	- 0.064*** (0.021)
<i>Bank concentration (IHH)</i>		- 0.011*** (0.003)	- 0.008*** (0.000)	- 0.063*** (0.000)	- 0.023*** (0.000)	-0.013** 0.020
<i>Public ownership structure</i>				0.019*** (0.001)		
<i>Private ownership structure</i>					-0.073** (0.021)	-0.069** (0.011)
<i>Structure of the economy</i>						- 0.005*** (0.006)
<i>Population density</i>						-0.126** (0.052)
<i>Financial Education</i>						-0.073** (0.033)
<i>Branches numbers</i>						0.004 (0.001)
<i>Number of banks</i>						-0.031* (0.018)
<i>Constant</i>	0.315*** (0.021)	0.237*** (0.016)	0.226*** (0.016)	0.235*** (0.022)	0.172** (0.086)	0.708*** (0.258)
<i>Observations</i>	78	78	78	78	78	78
<i>Number of countries</i>	6	6	6	6	6	6
<i>Number of observations censored on the left</i>	78	78	78	78	78	78
<i>Number of observations censored on the right</i>	0	0	0	0	0	0
<i>Number of uncensored observations</i>	0	0	0	0	0	0
<i>Prob >Chi2</i>	0.0093	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: * $p < 0,1$; ** $p < 0,05$; *** $p < 0,01$; () Student's P-values..

Taking into account the ownership structure of capital (regressions 4 and 5), it appears that the public shareholding structure has no statistically significant effect on the allocative efficiency of the banking system. This result finds its explanation on the one hand, in the theory

of Efficiency-X which explains inefficiency in public organizations by the quiet life, the immortality, the multiplicity of objectives. On the other hand, in the theory of public choices⁵ which explains the inefficiencies by interest groups and political games that characterize public administrations. The private shareholding structure has a positive and statistically significant effect on the allocative efficiency of the banking system. This result finds its explanation in the theory of private property rights which emphasizes that the structure of private property induces a rigorous managerial framework, fee and annuity controls that support the adoption of strategies that meet customer expectations and therefore increase the efficiency of banks.

In Table 3 we consider the disaggregated indices of financial inclusion. Taking these indices into account contributes to an accurate assessment of the differential effects of the indices. It is clear that the use, penetration and accessibility of financial services have positive and statistically significant effects on the allocative efficiency of the CEMAC banking system. These results are explained by the fact that the promotion of a digital approach to financial inclusion leads to a balance between risk management and innovations towards, which leads to the expansion of financial services infrastructures that improve the intermediation activities of banks and contribute positively to their efficiency. Banking concentration remains positively and significantly correlated with the efficiency of the banking system. Similarly, the private shareholding structure, the market structure, the population density, the geographical location of banks and financial education retain their effects on the allocative efficiency of the banking system, although the magnitude of the coefficients differs.

Table 3: Effects of disaggregated indices of financial inclusion
and bank concentration on allocative efficiency

	<i>Dependent variable: Allocative inefficiency</i>			
	<i>Estimation technique: Tobit Censored</i>			
	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>
<i>Use of financial services</i>	-0.089** (0.038)			-0.023*** (0.003)
<i>Penetration of financial services</i>		-0.065** (0.042)		-0.045* (0.068)
<i>Accessibility of financial services</i>			-0.037** (0.024)	0.022 (0.029)
<i>Bank concentration (IHH</i>	-0.022*** (0.003)	-0.021*** (0.003)	-0.031** (0.017)	-0.027** (0.031)
<i>Private ownership structure</i>	-0.073** (0.033)	0.069** (0.033)	0.000 (0.001)	-0.052* (0.029)

⁵ Developed by Buchanan and Tullock (1962).

<i>Structure of the economy</i>	0.558** (0.049)	0.0011 (0.273)	0.090** (0.036)	0.073** (0.036)
<i>Population density</i>	-0.131** (0.060)	-0.140** (0.058)	-0.142** (0.059)	-0.144** (0.058)
<i>Financial Education</i>	-0.056* (0.041)	-0.044* (0.041)	-0.052* (0.040)	-0.045* (0.040)
<i>Number of banks</i>	0.037* (0.021)	0.029 (0.021)	0.035* (0.020)	0.031 (0.020)
<i>Constant</i>	0.679** (0.299)	0.826*** (0.303)	0.731** (0.290)	0.814*** (0.299)
<i>Nombre d'observations</i>	78	78	78	78
<i>Number of countries</i>	6	6	6	6
<i>Number of observations censored on the left</i>	78	78	78	78
<i>Number of observations censored on the right</i>	0	0	0	0
<i>Number of uncensored observations</i>	0	0	0	0
<i>Prob >Chi2</i>	0.0093	0.0000	0.0000	0.0000

Notes : * $p < 0,1$; ** $p < 0,05$; *** $p < 0,01$; () les P-values de Student.

CONCLUSION AND POLICY IMPLICATIONS

This article proposed an investigation of the impact of financial inclusion and concentration on the efficiency of CEMAC banks. Since the restructuring, the efficiency of the banking system has not been analysed through the prism of market structure and financial inclusion, let alone through complementary indices (penetration, accessibility and use of financial services). We investigated it economically on a panel of six countries of the Central African Economic and Monetary Community for the period 2004-2016, using the Stochastic Frontier Analysis and Tobit Censored methods. Our results show that financial inclusion and market structure positively and significantly impact the allocative efficiency of the banking system. The results are robust with the use of complementary indices as a proxy for financial inclusion.

Three main recommendations can be formulated with a view to achieving an efficient banking system: (i) the effective involvement of banks in strengthening financial education; (ii) the promotion of significant banking to enable banks through economies of scale to effectively incorporate technological change; (iii) the consolidation of financial inclusion strategies to strengthen competition, the use of technological innovation to overcome inefficiencies in the banking system.

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APPENDICES

Appendix 1. List of countries

Cameroon, Gabon, Equatorial Guinea, Republic of Congo, Central African Republic, Congo

Appendix 2. Descriptive statistics and source of variables

<i>Variables</i>	<i>Observations</i>	<i>Averages</i>	<i>SD</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Sources</i>
<i>Credits</i>	78	764774.7	724482.8	61188	3078827	BEAC (2018)
<i>Securities</i>	78	52923.29	83979.99	124	386378	BEAC (2018)
<i>Deposits</i>	78	1081629	922660.3	33945	3537216	BEAC (2018)
<i>Human Capital</i>	78	1103.859	1050.721	229	3337	BEAC (2018)
<i>Physical Capital</i>	78	778194.6	1438811	3316	8884151	BEAC (2018)
<i>Financial capital</i>	78	1252.923	1820.323	1	6107	BEAC (2018)
<i>Total costs</i>	78	33893.56	37462.66	99	163513	BEAC (2018)
<i>Price of financial capital</i>	78	1.658846	.8449698	.32	3.58	BEAC (2018)
<i>Human Capital Award</i>	78	11.44627	4.51525	4.372671	22.55383	BEAC (2018)
<i>Price of physical capital</i>	78	1.115718	.0081891	1.11	1.18	BEAC (2018)
<i>Public Ownership</i>						
<i>Structure</i>	78	17.18654	7.151833	1.8	28.99	BEAC (2018)

<i>Structure of private property</i>	78	82.81385	7.152103	71.01	98.2	BEAC (2018)
<i>Bank concentration</i>	78	2539.962	925.2477	900	4660	BEAC (2018)
<i>Number of banks</i>	78	7.192308	3.235588	3	14	BEAC (2018)
<i>Number of counters</i>	78	58.46154	61.41951	6	285	BEAC (2018)
<i>Number of agencies</i>	78	53.30769	50.38122	6	200	BEAC (2018)
<i>Population density</i>	78	18.64043	15.13008	5.216638	41.46094	WDI (2018)
<i>Structure of the economy</i>	78	5348.378	3193.382	688.6	11920.1	WDI (2018)
<i>Financial Inclusion</i>	78	9.067235	20.71095	.0996206	87.83616	GFID (2019)
<i>Financial Education</i>	78	292.0755	1056.438	0	5192.603	GFID (2019)
<i>Use of financial services</i>	78	17.85828	31.83399	.0330892	137.7834	GFID (2019)
<i>Penetration of financial services</i>	78	2.430889	2.254834	.2888108	9.233666	GFID (2019)
<i>Accessibility of financial services</i>	78	3.126145	3.567376	.0754076	12.7718	GFID (2019)

Notes: SD stands for Standard Deviation