Banking capitalization and financial development in Chad: the comparative effects of the banking process

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Abstract:

Chadian government's decision to integrate officials in 2009 to banking sectors should promote financial development firstly and then give visibility to the government expenditures. The purpose of this article is to highlight the implications of capitalization and bank risk management on financial development in Chad before and after the banking (financial inclusion) of Chadian officials. To achieve this goal, we used Generalized Method of moment (GMM) and the Seemingly Unrelated Regression (SUR) estimators on truncate data from Chadian banks during the period 2000-2015. Results show, Chadian banks recapitalize to reduce bank risks, while risks negatively affect financial development before the start of the banking process. During the period of the mass banking and despite the risk inherent to Chadian customers, the recapitalization of the banks however improved in weak proportion the financial development in Chad.

Keywords: banking capitalization, financial development, banking risk, GMM, SUR

Codes JEL: G32; O10; O55

I. INTRODUCTION

Chad, among other CEMAC[1] countries (Cameroon and Gabon) have a low level of financial development. Resilience between the real and financial sector remains despite the international interconnections of financial systems absent in Chad. While the COBAC[2] reports

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[1] CEMAC: Economic Commission of Central African States uniting six countries (Cameroon, Central African Republic, Congo, Gabon, Equatorial Guinea and Chad).

[2] Banking Commission of Central African States created in 1992's to ensure banking prudential regulation individually and to grant agreement to banks (and all other financial institutions) for exercising in the community.

(2004 and 2008) held a low concentration and therefore a significant competitive situation. Studies on the SCP (Structure Behavior-Performance) model led to the conclusion that banking behavior is subject to or sensitive to prudential standards (Dietsch, 1992). Prudential norms that were once adopted after the plethora crises in financial systems around the world have enabled banks to devise appropriate strategies that can reduce post-crisis costs.

Nevertheless, the objective here is not to allow the banks to states as "pyromaniac firefighters" but to become aware of the harmful effects of crises on economic activity in general. Prudential standards adopted at the Basel meetings (I and II and its current extensions) revolve all around the recapitalization of banks and the respect of prudential ratios. For the CEMAC microprudential regulatory management authority, COBAC, the banks are required to comply with Basel's international prudential standards, to respect the holding of capital above at least 8% of their risk-weighted assets. Alongside to hold minimum regulatory capital of at least 10 billion francs, banks must accompany the proper monitoring of prudential standards prudential ratios (capital ratio, liquidity, transformation and immobilization). However, the change in capital is not without effect on the economy because it has already been judged by economists to follow economic trend or conjuncture. Capital banking evolution has been highlighted from several angles by previous works, linking it in most cases with bank risks and returns ((Ouédraogo R., 2011); (Ouédraogo, 2014); (Djimoudjiel, 2018)). Given the recapitalization channel, bank capital has a discretionary part evolving with bank profitability. Discretionary capital is that part conditioned by the annuities of the assets of the bank. Indeed, the vast majority of banks increase the level of their capitalization based on the margins generated on their liquid assets. An improvement in the capital of banks explains a favorable economic situation for sustained growth. From (Demirguc-Kunt & Detragiache, 1998) point of view, a period of recession (decline in GDP) leads to the deterioration of the quality of bank loans and the rise of banking risks or defaults. In other terms, bank capital conditions (is related to financial development process) the process of financial development.

Recently in 2016, Garba's work confirm in the case of sub-Saharan African countries, the effects of bank capitalization standards on reducing the risks of macroeconomic default. In the same case, WAEMU countries are also particularly exposed to the positive effects of bank

capital on mitigating the risk of default (Ouédraogo, 2014). Extensions of the same work also discussed the implications of these standards for financing economies. The countries of CEMAC, and in particular Chad, are those despite systemic risk tendencies (risk design according to Bordes (2013)), fewer studies are available to the public. In Chad, starting in 2009, the government's decision to fund Chadian officials has given banks new impetus in managing client risks and “bad debts”. In addition to the traditional activity of providing loanable funds, banks will increase their profits and create the attractiveness of the financial system in general through new banking products and services.

However, subject to recapitalization and standards, did Chadian banks really accompany the economic system after the banking system of Chadian officials and householders? Have the prudential norms still made it possible to contain default risks and drain financial flows towards access to credit and to influence the real sector of the Chadian economy? These are the preliminary questions that this article attempts to provide further clarification. In other terms, it is part of a dynamic to highlight the effects of bank capital on economic activity. It provides also a contribution in terms of literature on the Chadian financial system on the one hand and offers a framework for econometric analysis of the recapitalization of banks regarding financial development.

II. LITERATURE REVIEW

Prudential regulation policy aimed to ensure a financial structure not subject to moral hazard risks and excessive risk taking that could constitute an obstacle to the functioning of the financial system in general (Lacoue-labarthe, 2003). The goal is to allow banks in a financial system, in general to ensure the allocation of funds without harming productive investments and savings. It globally attracts management of macroeconomic shocks and financial instability (BCE, 2016). From a global and dynamic point of view, financial system restructuration must revive economic growth and thus promote financial development ((Simon, 2003) (Mishkin, 2010)).

The authorities in charge of regulating the banking system very quickly decided that bank capitalization was the cause of the systemic phenomena of the first financial crises. Banking regulation questions, before they became widespread at the international level, focused on

the issue of exchange rates and international bank failures ((Goodhart et al., 2011); (Gehrig, 2013)). The first Basel standards adopted after the restructuring of the 1980s conditioned the banks to own capital equal to at least 8% of risk-weighted assets. However, the current objective of the prudential regulation is more accentuated on a sustainable competition between banks while disciplining them by the obligation to maintain an adequate capitalization at any time ((Dewatripont & Tirole, 1993) (Lacoue-labarthe, 2003)) and financial stability (Bordes, 2013). Rochet (2003) proposes a competitive market and monopolistic competition to guarantee its efficiency. According to the models of the theory of industrial organizations, the SCP (Structure-Behavior-Performance) considers that market structure (particularly banks size, the concentration and the number of the offers) and banks behavior influence their performance (Dietsch, 1992). Equity was the target as it was intended to promote the financial stability and efficiency of banks (Pessarossi & Weill, 2015). In the United States already, the adoption of the "Glass Steagall Act" has protected the banks for almost 70 years from foreign competition. Banking concentration and banking competition evolve differently in a banking system, Nafisah et al., 2014), the rise in market shares (concentration) was accompanied by a proportional decline in competitive intensity, whatever the area. It can thus be a source of systemic risk or constraint to the financing of the economy (Allen, Beck, & Carletti, 2003). Stern & Feldman (2004) show that increased banking concentration leads to the birth of "too big to fail" and increases the difficulty and opacity of the banking system. Also, a somewhat concentrated banking market would reduce the regulator's work (Haldane & May, 2011). Indeed, the authority in charge of the regulation is obstinate only to control banks holding behaviors with the largest market shares, those likely to cause the banking system in a crisis (Dewatripont & Tirole, 1993). In the same vein, Berenger & Teiletche (2003), taking into account the second Basel agreement (Basle II), conclude a process of "creative destruction" due to the procyclical nature of regulatory capital ((Claessens, Dell'AAriccia, & Laevens , 2009) ; (Ouédraogo, 2014)) that banks can cope with (Allen, Beck, & Carletti, 2003). The procyclicality of bank capital arises as regulatory capital takes on a coexistent bearing on economic conjuncture. In the economic phase, whether favorable or not, banks in order to comply with banking regulations will be forced to restrict or ration credit or to increase the supply of credit and therefore to modify financial

development trend. Apart from Schumpeter's theoretical work (1911) and the inclusion of a monetary economy model in the real sector of the economy by Tobin (1965), several empirical studies had to follow to confirm the role of credit. Banking in economic recovery.

Already, Bagehot (1873) empirically confirms the idea that the performance of British banks remains conditional on bank credits. The evolution of credit for Kaminsky & Reinhart (1999) makes it possible to implement a scenery of the cyclical trend of the economic conjuncture whether it is favorable or not. Trends in financial crises are accompanied by a slowdown in financial development followed by an upsurge in financial risks. For Simon (2003), the adoption of prudential norms alone reduced the level of economic growth to 13 points during the 1990s, thus significantly reducing the proportion of loanable funds to enterprises. Indeed, in return for the significant reduction of banking risks via the cyclical variation of banks capital, the primary sector of the economy in France has deteriorated considerably. Recent studies are examining the effects of new standards given in view of the appearance of new risks[3] on the financing of economies and/or financial development. The results obtained from the Generalized Method of Moments (GMM[4]) and two (2sls) as three (3sls) stage least squares estimators relate to the effects of the probabilistic methods of determining capital and/ or regulatory capital. The constraint on the respect of prudential ratios (taking into account the internal and standard methods of determination of own funds to hold) modified the adjustment behavior of 27 banks in India and adversely affect the financial contribution to growth ((Nag & Das, 2002) ; (Das, 2002)).

However, thanks to the estimators of the two stage least squares, they conclude a double causality between taking risks and prudential norms. Qualified as "prophetic" standards by Nitsure (2005), thanks to the low level of financial development (around 40% of bank liquid assets finance growth), they have been able to contain trends in financial crises and their imported influences. Yellen (2011) and Reza (2011) propose for this state of affairs, a holding of the capital buffer or cousin of capital security to accompany financial development even in times of recession.

[3] During the recent ratio adoption (McDonough ratio), authorities in charge of banking regulation of Basel judged necessary to add to the old ratio (Cooke) established in 1988's, credit risk operational and market risks. The aim was to conduct banks to include in their managing functions the evolution of financial system and all inherent risks

[4] Allerano and Bond's (1991) Generalized Method of Moments.

According to Goodhart & al. (2004), unlike the standard weighting method, the internal or probabilistic weighting of risks by rating agencies[5] negatively influences the financing of emerging economies (United States, Norway, Great Britain, France, Mexico, Germany, Italy, Spain). Indeed, they analyze the behavior of banks from 1982 to 2003, and conclude that, despite the positive effect of risk management under the internal weighting (increase in regulatory capital), asphyxiation of the supply of credit to the economy. Indeed, periods of recession suggest a high level of risk for economic agents. Banks, on the other hand, are likely to refinance the economy in the event of low risk or expansion period ((Goodhart C., 2005) (Garabiol, 2006)). The financial contribution to the process of economic growth or financial development is a constraint on the behavior of the authority in charge of financial stability or prudential regulation.

III. BRIEF OVERVIEW OF CHADIAN FINANCIAL SYSTEM

A. Chadian banking system facing prudential standards

For the Bank of Central African States (BEAC), less than half of the banks in the sub-region are out of line with prudential standards as a whole (BEAC, 2016). In fact, out of the 52 banks operating in overall the region, the latest reports states that 25 banks approximated legal situation with prudential standards and 12 banks considered less risky against the other 40 considered at risk. Unlike other countries, however, Chadian banks can be considered as "good" students of the authority in charge of prudential regulation. The revaluation of bank capital in 2009 to 10 billion, was not a significant constraint for Chadian banks. Like other countries, the increase in capital is a function of the strong presence of international banks with a large foreign shareholding (Holdings). Also, the risky climate of the Chadian banking system leaves an increase in provisions for risk to 52% to reach 26 billion francs (COBAC, 2010). In the same dynamic, compliance with the risk coverage ratio (capital ratio) has constantly been evolving for banks. The decline in profits or net banking income (GNP) observed (21%) by COBAC during this period, explains the reluctance of banks to raise the

[5] standard and Poor's, Moody's et Fitch

level of lendable funds given the risky dynamics of the banking system. Most banks in the sub region, and particularly in Chad, account for a large proportion or are generally generated receivables (credits) granted to customers (at least 57%) and other types of transactions in their GNP.

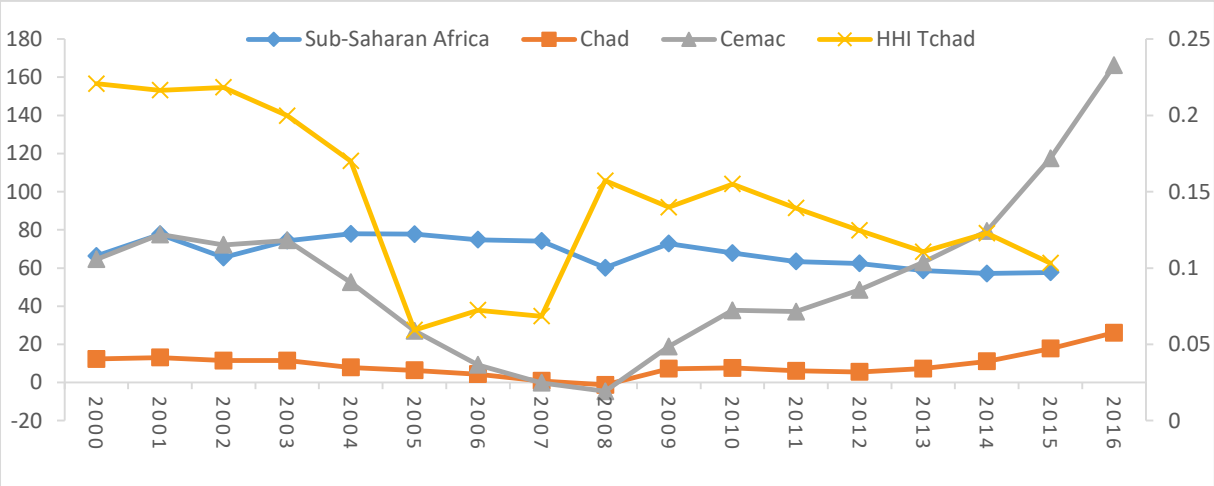
B. Financial Development and Banking Market Structure in Chad

Noted that the CEMAC countries include in their financial systems specifically liquid banks with a marginal share of the economy. Despite the multitude of reasons given for this state of affairs, the riskiness of the clientele and the financial environment remains a constraint. The already disturbing evolution of the Herfindhal-Hirshman index regarding credit granted by the three (3) first banks shows (Figure 1) that banking activity in Chad is facing increasing volatility regarding the quest for market share. Over the period in question, and particularly before the banking of Chadian officials or householders, the competitive situation of the banking industry has improved considerably (trend decline of the HHI on the chart). Indeed, this downward trend of this index (at 18%) has evolved since 2005, was accompanied by a 23% drop in the level of financial development and therefore the supply of credit to the economy before to stabilize somehow in 2007. Also, at the same time the economy was significantly slower, with a very low threshold of development and the random tendency of the level of concentration in the banking sector because of the warring rebel. However, the dynamism of this economy has allowed recovery from mid-2008.

The year 2009 was marked by a prosperous development of macroeconomic aggregates in Chad and banking activities in general (raising banks' capital). We can easily see an upsurge of bank credit in growth and combined with an increase (from 0.15 point to 0.12 of the HHI) in the structure of the banking market (competitive market). The plausible explanation to bring outside the banking activity blast is thus related to the decision of the Chadian government to starts the process of banking all Chadian officials. Other exogenous facts, such as the degree of openness of the economy and the regulatory constraints already mentioned above, can contribute to these stylized facts intrinsic to the Chadian banking system. The increase of bank capital and the customer risks (credit losses and other) during the banking period marginally improved credit conditions. By accordance with the literature mentioned,

recapitalization should adopt a causal risk-capital sense and under the same conditions curb the real sector of the economy.

Fig 1: Evolution of Chad HHI and Financial development in sub-Saharan and CEMAC



Source: author from WDI and Central Bank data

IV. METHODOLOGY

The objective will be to test the implications of banking capital adjustment on financial development in Chad during two different periods consider as transitory. Specifically, it a way to make use of econometric robustness tests in order to understand if the prudential banking recapitalization norm is to manage bank risks or to accompany the financing of the Chadian economy. To guarantee the reliability of our results, we will use several estimates in panel data to estimate the link.

A. Model specification

Several pioneering works on financial development has highlighted the various implications of this concept for growth. Several variables of financial development made it possible to understand the sense of causality existing between macroeconomic aggregates (growth in particular) and financial development. Also, from the methodological point of view, most of the work has used a known Cobb-Douglas function, which is mainly justified by the presence of the GDP aggregate and the inherent explanatory variables of interest (Aka Brou, 2010).

Given the research hypotheses to be tested in this article, we will use simultaneous equations as Shrieves & Dahl (1992) to highlight the implications of the procyclical capital of US banks on banking risks. This model formalizes in a certain dimension the behavior of banks in situation of revaluation of capital under the constraint of the structure of the market (quest for market share) or the obligations of the authority in charge of the prudential regulation.
In the context of this article, the meaning of causality is justified by the effects of discretionary capital on financial development. This causality can be double under certain tests (causality test). Therefore, the objective of this article is to update the trend of the implication of the revaluation of bank capital on the access to bank credit by sectors of the economy (household, businesses etc.). In other words, it is part of an approach to illustrate whether the behavior of Chadian banks in the period of revaluation of their equity facing banking risks or to promote access to credit. To do this, the empirical model for estimating the effects of the bank capital revaluation standard on the economy can be specified as follows:

$$\Delta devf = f(\Delta capital; \mathrm{Z}_{it}) + \varepsilon_{1,it} \quad (1)$$
$$\Delta risk = f(\Delta capital; devf; Z_{it}) + \varepsilon_{2,it} \quad (2)$$

With ***Devf*** the variable measuring financial development and $\mathbf{Z_{i,t}}$ control variables influencing financial development. The control variables consist of the inflation rate ***(Infl),*** the logarithm of Gross Domestic Product ***(GDP),*** the degree of trade openness ***(Ouv)*** ((Berthélemy & Varoudakis, 1998); (Aka Brou, 2010)) and finally the Herfindhal-Hirshman concentration index ***(HHI)*** and own funds reported to total assets of banks ***(RF).*** At this important level, it is important to reiterate, given the theoretical and empirical review of the variables of financial development, that the proxy variable for financial development chosen is the ratio of gross credit to GDP ***(CRE / GDP)*** (Mohamed, 2008). The variable ***Actif*** is given by the logarithm of the total asset. The banking capital ***(CAP)*** evolves in a discretionary way (banking capital adjusted according to the profitability of the bank considered) while under a constraint of a rule (social capital or minimum required). It will be taken into account for this variable the sum of equity and other assets reported in total assets. In the end, for this paper we consider as risk proxy, bad debts and outstanding debts of banks reported to their assets (Djimoudjiel, 2018). The model to be estimated is therefore defined:

$$\Delta devf_{it} = \alpha_0 + \alpha_1 \Delta CAP_{it} + \alpha_2 \Delta risk_{it} + \alpha_3 GDP_{it} + \alpha_4 devf_{it-1} + \alpha_5 HHI_{it} + \alpha_6 Ouv_{it} + \alpha_7 RF_{it} + \alpha_8 Infl_{it} + \varepsilon_{1,it} \quad (3)$$

$$\Delta risk_{it} = \beta_0 + \beta_1 \Delta CAP_{it} + \beta_2 \Delta devf_{it} + \beta_3 risk_{it-1} + \beta_4 RF_{it} + \beta_5 GDP_{it} + \beta_6 Infl_{it} + \beta_7 HHI_{it} + \beta_8 Actif_{it} + \varepsilon_{2,it} \quad (4)$$

$\varepsilon_{1,it}$ et $\varepsilon_{2,it}$ are errors terms associated respectively to equations (3) et (4).

B. Descriptive statistics and estimation technique

Our study is based on BEAC database which includes data on active banks in Chad from 2000 to 2015. The determination of the concentration variable (HHI) will be done by simple calculation according to the formula proposed in the literature (definition above). Also, for macroeconomic variables such as GDP, inflation rate and opening rate, they are collected on the WDI (World Development Indicators).

The table 1 below, sort the statistics description of variables used in the model. It is show hence on 16 years (111 observations on Chadian banks), the mean level of financial development still weak while banking capitalization and defaults risks have increased significantly. Chadian banking market despite his concentration mean at 0.17 support or conduct unfortunately to a higher risked costumer behavior. (0.09) whereas banking capital raised discretionary or none (0.20). the substantial increasing of GDP (22.7) and inflation rates (3.34) means are more in our case explain by petroleum incomes which have extensively supported others economy sectors than financial.

Table 1: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
DevF	111	5.19e-06	3.72e-06	0[6]	0.0000172
CAP	111	0.2033487	0.1755688	-0.1198276	0.9567186
Risk	111	0.0926802	0.0857159	0	0.4230641
GDP	111	22.69992	0.6983167	21.04901	23.35675
Ouv	111	1.636328	1.699083	0.789321	8.956769
RF	111	0.1924286	0.1672768	0.0483651	1.033271
Infl	111	3.34412	6.597881	-8.97474	14.01821
HHI	111	0.1756808	0.0408473	0.0539626	0.2380734

Source: author from Central Bank data (2000 to 2015)

[6] The value of this min due to lack of Union Bank of Africa's (UBA) data on gross credit in 2009.

The estimation model deduced above (Equation 3 and 4) takes into account two simultaneous equations relating financial development and bank risk to choose the best estimator and to obtain robust results. Different equations depending on whether they are identified at the right level or over-identified is essential. The conditions of identification without any restriction on the coefficients bring out a sur-identify model consider our specification (Annex 1). The presence of autocorrelation and heteroskedasticity of the errors justified by the various tests thus leads to the use of the Generalized Moment Method (GMM) of Blundel and Bond to correct this state of affairs in the empirical model. In the same way, the identification of our model gives the possibility of the use of Triple Least Squares and the estimators of SUR (Seemingly Unrelated Regression) develop by Zellner.

The purpose of this article is to test the implications of banks' behavior in responding to regulatory constraints on financial development. Chad is one of the countries of Central Africa with a low level of financial integration and a low contribution of the financial sector to sectors of the economy. About Basel's prudential standards based on bank recapitalization for risk management, the increasing leveling of capital must promote competition in the market and finance the economy for this purpose. However, it is important to note that the Chadian financial system has experienced a transition phase influencing the level of financial development. The decision of the Chadian government in 2009 to bank the functionary is a significant effect on the process of financial development. For this fact, the estimation periods will be truncated to analyze the implications of the prudential norms before (2000-2008) and after the banking period (2009-2015).

V. RESULTS BEFORE OFFICIALS FINANCIAL INCLUSION PERIODS

The process of financial development in Chad has took off since 2011 (Fig 1), whereas in previous years it was at its lowest level. This fact, this descriptive result, as seen from the statistics, confirms and explains the non-significance of the bank recapitalization variable concerning financial development in the pre-banking period. Unfortunately, bank capital adjustment is not intended to boost economic activity before the pre-banking period for Chadian officials. Also, it has largely been used to reduce the increase in the risk of doubtful debts and therefore bank failures. As other banks in CEMAC, Chadian banks are indeed taking

more risks, and recapitalize in the same sense as the increase in losses likely to receivables on customers (Djimoudjiel, 2018). For 1% change in bank capital corresponds to 10% risk of credit losses to be covered by the banks during the relevant year range. The results also indicate that the riskiness of the Chadian client conditions the behavior of banks to finance economic activity. Credence risks on customers affect therefore the financial development processes at 5% level of significance. Despite the absence of robustness of this result, the coefficient related to the losses credence risks is very higher and important, just for 1% of risk increasing. While the banking commission ruled on a low concentration of the Chadian banking market already from 2002, the fall in the level of risks has slightly improved financial development. The constraint of owning capital about risk-weighted assets, despite being one of the key prerogatives of the regulatory authority, adversely affects financial development. Raising equity for the sole purpose of containing risks, however, reduces the chances of economic recovery via bank financing. An increase in the ratio can be explained by a bank assets growth or by a reduction in the risks related to receivables to the private sectors, to the government or customers. While banks must hold a level of capital based on the credit risks granted to customers, the risk aversion of bankers slows down financial development. This result however not robust, has been obtained in studies as Ouédraogao S. (2014), Garba (2016), and Djimoudjiel (2018) analyzing empirically relationship between prudential standards and banking risks in developing countries and some sub-Saharan countries. While the inflationary process would favor the improvement of the bank's ability to promote financial development, the domestic product negatively affects the latter. The results are robust regarding significance, then considering the same effects on financial development obtain through the GMM and SUR estimators. As a result, the added value of the Chadian economy would be explained to a large extent by non-financial aggregates or from other sectors of the economy. A situation of oligopolistic competition due to an improvement in the Herfindhal-Hirshman Index (HHI) has a negative impact on the contribution of the banking sector to the economic growth process. In other terms, in the pre-banking period a strong hold of the market shares of some banks (top 3 or 5) can restrict the supply of credit to the economy. Would an allocation of the customer base or the officials based on the choice of the latter (to be banked for this first case) impact the level of market shares to create competition? This interrogation

comes in the sense that the Chadian officials are free to choose the bank where their account will be domiciled. It should be understood that financial development was not significant between 2000 and 2008, given the risk that customers were showing in Chad, and the contribution regarding added value to other sectors of the economy.

VI. RESULTS AFTER OFFICIALS FINANCIAL INCLUSION IN CHAD

The post-2009 period, marked by a strong inclusion of Chadian households, naturally raised the level of financial development as anticipated by the expected effects. According to our two estimators, the difference in the capital variation is correspondingly and positively aligned with the economic recovery via the banking sector and therefore the supply of loanable funds at 10% of significance. This recapitalization is not inherent in the risks banks face. Unlike the previous cases, the change in capital improves the conditions for access to credit rather than reducing the harmful effects of bad debts. In spite of these results, the first question to which it is imperative to answer whether the choice made by officials or civil servants to choose their banks would restructure the structure of the banking market, the answer seems to be positive. The decision of the Chadian government to banking officials positively promoted financial development and improved bank shares. The inflationary process, the role of which is to boost or boost GDP, can lead to a marginally weak competition situation insofar as it is maintained. Unlike the previous conclusion, the HHI index improves in the same direction as the financial development process. Given the two estimators used to obtain these results, Chadian banks are more incentivized in return for the management of the credit risks or receivables losses, to attract the customers following the policy of bankability of officials. In the same conception of banking behavior, compliance with the standard of holding capital against risks is more akin to risk taking. In the same vision, banking revival activities created a financial moderated risky environment. An increase in equity of 1%, although it does not condition the supply of credit to the financing of the economy, is explained by the upsurge in customer loan losses (by 5%).

VII. CONCLUSION

The purpose of this article is to provide an explanatory framework for the contribution of the Chadian officials (civil servants) banking process to financial development in comparison with a pre-banking period. In other words, the main idea is to ask if, about theories, Chadian banks are adjusting their capital in the management of banking risks and the financing of the economy. It is focused on the assumption that the government's decision to include civil servants in the financial system promotes financial development. Indeed, using data from Chadian banks over a period from 2000 to 2015, truncated in two periods (2000-2008 and 2009-2015) allowed us to test this hypothesis. Hence, the results obtained showed an accentuation of the effects of the cyclical variation of the capital of the Chadian banks in the management of the risks before the banking period. While the post-financial inclusion period resulted in risk management reduction under the constraint of own funds according to bank rents. Also, during this period, the recapitalization of banks has significantly improved financial development. The rise in bad and bad debt losses is counteracting banks' efforts to finance the Chadian economy. The low concentration of the banking system despite its low coefficient explains significantly the improvement of the level of financial development. Also, the process of banking has led to an upsurge in risks and conditioning the financing of the economy via a less concentrated banking market.

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IX. ANNEX

Annex 1: identification methods of the model and estimators

- If $(g - g') + (k - k') < g - 1$, equation is under-identify (OLS estimators)
- If $(g - g') + (k - k') = g - 1$, equation is just-identify (Two least squares)
- If $(g - g') + (k - k') > g - 1$, equation is over-identify (required Three and two least square, Seemingly unrelated regression (SUR) estimators)

With

- g : number of endogenous variables in the model (equation number)
- k : exogenous variables in the model ;
- g' : endogenous variables in the identify equation ;
- k' : exogenous variables in the equation to identify.

Determination of our estimation model identification:

	g	***g'***	***k***	***k'***	***(g – g') + (k – k')***	***g – 1***	***Type***
Equation (3)	*2*	*1*	*8*	*7*	*2*	*1*	*Over-identify.*
Equation (4)	*2*	*1*	*8*	*7*	*2*	*1*	*Over-identify*

Source : author

Annex 2: GMM and SUR estimation results *(2000-2008))*

	GMM		***SUR***	
	ΔDevF	***ΔRisk***	***ΔDevF***	***ΔRisk***
D.DevF		*-4762.853*		*-7149.44**
		(0.270)		*(0.068)*
D.CAP	*4.67e-06*	*0.109983**	*3.41e-06*	*0.11674*
	(0.210)	*(0.050)*	*(0.181)*	*(0.123)*
D.Risk	*-3.63e-06***		*-5.46e-06*	
	(0.022)		*(0.202)*	
GDP	*-3.90e-06**	*-0.030119*	*-3.16e-06 **	*-0.034160*
	(0.051)	*(0.600)*	*(0.036)*	*(0.324)*
HHI	*-0.000157***	*-1.41850*	*-0.00015****	*-1.823088*
	(0.019)	*(0.632)*	*(0.006)*	*(0.261)*
Ouv	*-7.93e-08*		*-5.89e-08*	
	(0.395)		*(0.680)*	
RF	*-6.62e-06**	*0.041121*	*-4.37e-06*	*0.01605*
	(0.074)	*(0.845)*	*(0.156)*	*(0.915)*
Infl	*2.27e-07****	*0.0013026*	*2.21e-07****	*0.001923*
	(0.006)	*(0.482)*	*(0.000)*	*(0.201)*
Actif		*-0.00690*		*-0.009673*
		(0.776)		*(0.531)*
L.DevF	*-0.3874**		*-0.28133 ****	
	(0.091)		*(0.002)*	

L.Risk		*- 0.33665****		*-0.33474****
		(0.001)		*(0.000)*
Constante	*0.0001208***	*0.8216382*	*0.0001022***	*1.241072*
	(0.037)	*(0.599)*	*(0.021)*	*(0.274)*
Test AR (2)	*(0.146)*	*(0.141)*		
Hansen test	*(1.000)*	*(1.000)*		
Sargan test	*(0.006)*	*(0.101)*		
Observations	*48*	*48*	*48*	*48*
Banks	*7*	*7*	*8*	*8*
RMSE			*1.53e-06*	*0.04394*
R-sq.			*0.5257*	*0.3635*
Chi2			*55.68*	*22.67*

Source: author

Annex 3: GMM and SUR estimation results after financial inclusion of Chadian official's (*2009-2015)*

	GMM		***SUR***	
	ΔDevF	***ΔRisk***	***ΔDevF***	***ΔRisk***
D.DevF		*-6829.982*		*-10817.33***
		(0.200)		*(0.038)*
D.CAP	*2.10e-06**	*-0.02698*	*2.07e-06**	*-0.019757*
	(0.093)	*(0.444)*	*(0.084)*	*(0.653)*
D.Risk	*-2.11e-06*		*-4.43e-06*	
	(0.572)		*(0.218)*	
GDP	*-1.42e-06*	*-0.028352*	*-1.41e-06*	*-0.05243*
	(0.307)	*(0.356)*	*(0.419)*	*(0.420)*
HHI	*0.0000372****	*0.13745*	*0.0004****	*0.3034*
	(0.001)	*(0.659)*	*(0.000)*	*(0.281)*
Ouv	*-2.17e-06*		*-2.08e-06*	
	(0.366)		*(0.352)*	
RF	*-1.28e-07*	*0.2029431***	*-1.45e-08*	*0.20410***
	(0.941)	*(0.028)*	*(0.993)*	*(0.016)*
Infl	*1.04e-07***	*0.0009535*	*1.06e-1****	*0 .0012051*
	(0.010)	*(0.332)*	*(0.003)*	*(0.342)*
Actif		*0.0335032**		*0.03600***
		(0.071)		*(0.035)*
L.DevF	*0.0685621*		*0.07151*	

	(0.603)		*(0.494)*	
L.Risk		*-0.11616*		*-0.091885*
		(0.578)		*(0.378)*
Constante	*0.0000297*	*0.241807*	*0.0003*	*0.7463091*
	(0.331)	*(0.738)*	*(0.456)*	*(0.598)*
Test AR (2)	*(0.239)*	*(0.147)*		
Hansen test	*(1.000)*	*(1.000)*		
Sargan test	*(0.043)*	*(0.071)*		
Observation	*62*	*62*	*62*	*62*
Banks	*7*	*7*	*8*	*8*
RMSE			*1.39e-06*	*0.0495096*
R-sq.			*0.4721*	*0.1124*
Chi2			*57.62*	*9.72*

Source : author