Modern Economy, 2021, 12, 960-975
https://www.scirp.org/journal/me
ISSN Online: 2152-7261
ISSN Print: 2152-7245

Impact of Market Concentration on the Stability of the Banking Sector in the Central African Economic and Monetary Community (CEMAC)

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How to cite this paper: Batila Ngouala Kombo, P. G., Hakizimana, J., & Bouity, C. A. (2021). Impact of Market Concentration on the Stability of the Banking Sector in the Central African Economic and Monetary Community (CEMAC). *Modern Economy, 12,* 960-975.
https://doi.org/10.4236/me.2021.125049

Received: April 8, 2021
Accepted: May 23, 2021
Published: May 26, 2021

Abstract

The objective of this paper is to analyze the impact of banking market concentration on the stability of the banking sector in the Economic Community of Central African States (CEMAC). Using panel data from 2005 to 2015 and the system GMM technique, it is found that deposit and credit market concentration have a destabilizing effect on the banking system. Thus, it would be desirable to put in place mechanisms that can help reduce the market power of certain banks to guarantee banking stability.

Keywords

Banking Concentration, Financial Stability, GMM, CEMAC

1. Introduction

The subprime crisis of 2007-2008 has attracted renewed interest in the analysis of the factors that can influence the financial stability of a banking market. The magnitude of this crisis and its negative effects on some of the world's economies have highlighted the need for monetary authorities to strengthen financial system stability[1]. In this context, the structure of the banking market has been the subject of numerous analyses. The aim is to clarify its role in the occurrence

[1]Financial stability remains a complex concept, the definition of which remains elusive (Rouiessi, 2016). However, many authors (Mishkin, 1999; Allen & Wood, 2006, etc.) define it as the absence of instability. In this paper, we retain the definition advocated by the European Central Bank, which defines financial stability as a situation in which the financial system (which includes intermediaries, markets, and market infrastructures) is able to withstand shocks, without significantly disrupting the financial intermediation process and the optimal allocation of resources (Rouiessi, 2016).

of financial crises.

According to the OECD[2] (2010), during this crisis, countries with more concentrated banking sectors (Australia and Canada) or relatively concentrated banking sectors (France) were not severely affected, while countries with low banking sector concentration (Germany) were severely affected. These differences in the effects of the crisis also reflect the divergence in the literature on the effects of banking concentration on financial stability.

In the theoretical literature, two streams (concentration stability and concentration fragility) disagree about the role that banking market concentration plays in the stability of the banking system. For the first group, bank concentration is a guarantee of financial stability (Freixas & Rochet, 2006; Vives, 2010). In contrast to the first group, the second group believes that bank concentration is a source of financial instability (Allen & Gale, 2000; Beck et al., 2007; Uhde & Heimeshoff, 2009).

Empirically, Beck et al. (2006) showed that bank concentration has a positive effect on financial stability, which is contrary to the results of Schaeck, Cihak, and Wolfe (2009), who show that bank concentration has a negative effect on financial stability.

These divergences call for new research to shed more light on this debate, particularly by taking into account fields of investigation that have not yet been explored, such as that of the CEMAC, which may be a relevant field of research for several reasons.

Indeed, the various reports of the Central African Banking Commission (COBAC) highlight one fact: the predominance of short-term or sight deposits (more than 75%) compared to medium- or long-term deposits (between 15% and 25%). These deposits come mainly from the private sector (more than 70%), the public sector (10% to 25%) and nonresidents of the zone (less than 5%). In view of this reality, a recession affecting this zone is likely to have a negative impact on the revenues of the government, companies and individuals, forcing the individuals to make more withdrawals from their current accounts than usual. This situation can lead to a drying up of bank assets (liquidity risk) and even to cases of the nonrepayment of debts (insolvency risk).

The magnitude of these risks can weaken bank balance sheets and contribute to financial instability. The concentrated nature of the various deposit markets in the CEMAC reflects an obvious fact: the top three banks that hold the bulk of the market share in terms of deposits can be considered firms that are "too big to fail". Consequently, in the event of a "run on the windows", monetary authorities will try to rescue these firms, notably through the deposit guarantee fund implemented in 2011 (COBAC, 2016). The existence of this mechanism often encourages banks to take more risks insofar as they believe that they will be rescued in the event of difficulties.

Similarly, the concentration of the various credit markets in the CEMAC region highlights at least two facts. The first is the evidence of high interest mar-

[2]Organization for Economic Cooperation and Development.

gins (9% to 15% on average), which reflects the absence of real competition, and the second is the short-term nature of loans (more than 60% of total credit volume). This means that CEMAC banks, by exploiting their market power, tend to set higher lending rates, thereby increasing their interest margins. Loans granted at high rates, which are mostly short-term, become risky, particularly in the event of shocks affecting customers. In other words, a deterioration in the economic situation in the CEMAC will reduce customer revenues and, then, the repayments expected by banks, resulting in successive losses related to bad or doubtful debts. These losses will gradually reduce banks' profits to the point of reducing their equity. This decrease in equity is a sign of the certain fragility of banks.

Therefore, the question that arises from the above developments is as follows: What is the impact of banking market concentration on the stability of the CEMAC banking system? In light of this concern, this article aims to analyze the impact of banking market concentration on the stability[3] of the CEMAC banking system. We postulate, based on the experience of Southeast Asian countries, countries in transition and the work of Minsky (1977), that the concentration of the banking market has a negative impact on the stability of the banking system in CEMAC countries.

In addition to the introduction, this article is structured as follows. In the second section, we review the related literature. The third section is devoted to the methodology. In the fourth section, we present and interpret the results. Conclusions and policy implications are presented in the fifth section.

2. Literature Review

The debate about the impact of banking market concentration on the stability of the banking system is organized around two theses: the concentration-stability thesis and the concentration-fragility thesis.

For concentration-stability advocates (Keeley, 1990; Carletti & Hartmann, 2003; Allen & Gale, 2004), low concentration is a source of fragility, and consequently undermines the stability of the banking system. Indeed, in an environment where the banking system is weakly concentrated, the market power of banks is limited. Thus, for to gain market share, banks develop strategies to attract or retain customers by offering low interest rates relative to competitors. Lower interest rates are likely to reduce banks' profit margins, making them more exposed to risk (Keeley, 1990; Carletti & Hartmann, 2003; Allen & Gale, 2004). Therefore, stronger market power limits excessive risk-taking by banks, provides high profits and brings stability to the system.

Empirical research has been carried out and has helped to confirm this thesis. For example, Beck et al. (2006) studied the relationship between bank concen-

[3]Because of the significant weight of the banking sector, which holds more than 75% of the assets of the entire financial system (Financial Stability Review of Central Africa, 2016, pp. 43-44), this study is limited solely to financial intermediaries, i.e., banks, and excludes from the analysis the other components of the financial system (markets and infrastructure).

tration, competition and fragility in 69 developed and developing countries during the period 1980-1997. Their results showed that bank concentration is negatively correlated with financial crises and will, therefore, have a positive effect on financial stability. Vives (2010) achieved the same results using European countries.

Similarly, Zomo Yobe (2017), using the generalized least squares technique, studied the relationship between the banking market structure and banking stability in the CEMAC over the period from 2006 to 2014. Their result showed that concentration has a positive influence on the stability of the CEMAC banking market.

The concentration-fragility thesis, conversely, is based on the assertion that the most concentrated banking systems have high default risks and that a low concentration system is a guarantee of financial stability. Following Mishkin (1999), proponents of this view (Boyd & De Nicoló, 2005; Boyd et al., 2006; De Nicoló et al., 2004) believe that as market power increases, banks can charge higher interest rates to borrowers, which only creates an antiselection effect and increases the likelihood that a loan will fail. In addition, the few large banks with complex structures, confident in the safeguards put in place by the government, take excessive risks and, as a result, contribute to the instability of the banking system.

Several empirical studies have confirmed this thesis, including the work of Schaeck, Cihak, and Wolfe (2006), who, using data from 38 countries over the period 1980-2003, measured bank concentration by the percentage of total assets held by the three largest banks and approximated the degree of competition with the H-stat[4]. Their results showed that the market power of banks has a negative effect on financial stability.

Similarly, Boyd et al. (2006) study of 134 developed and developing countries over the period 1993-2004 used the Z-score, a measure of each bank's proximity to failure, in contrast to the previous two studies (which used a dummy) to approach financial stability. They measured concentration by the Hirschmann-Herfindahl index and approximated the effect of market power by the components of the Z-score (return on assets (ROA)) to examine whether market power grants extra income to banks and the standard deviation of the ROA to observe the quality of the loan portfolio (higher volatility corresponds to higher risk). Their results showed that the market power that emerges from bank concentration has a deleterious effect on financial stability.

The results of Uhde and Heimeshoff (2009), who used data from the 25 countries of the European Union over the period 1997-2005, confirmed those of Boyd et al. Finally, Shehzad, Scholtens and De Haan (2009) studied 1,800 banks from OECD and non-OECD countries over the period 1998-2008. Using panel data, they concluded that banks in a concentrated system have more volatile revenues.

This overview of the literature reveals evidence of persistent controversy re-

[4]This is a measure of the degree of competition developed by Panzar and Rosse (1987).

garding the impact of banking market concentration on the stability of the banking system. It is useful for shedding empirical light on the debate in the context of the CEMAC zone, especially since there is little work of this type involving this zone. This is the essential contribution of this study.

3. Methodology

The literature presented above allows us to establish a link between banking market concentration and financial stability. In the case of the CEMAC zone, this link is analyzed by drawing on the work of Uhde and Heimeshoff (2009). According to these authors, financial stability is a function of banking market concentration and other factors that can explain the stability of the banking system. Let us take the following implicit form:

$$Zscore_t = f\left(C_t, X_t\right) \tag{1}$$

$Zscore_t$ [5] represents the stability index of the banking system in period *t*, C_t illustrates the level of concentration of the banking market, and X_t is a vector of explanatory variables for the stability of the banking system.

Assuming that the stability process of the banking system is dynamic, our first equation can be written as follows:

$$Zscore_t = f\left(Zcore_{t-1}, C_t, X_t\right) \tag{2}$$

where $Zcore_{t-1}$ is the banking stability index for the previous period.

Let the following form be explicit:

$$Zscore_{it} = \alpha_0 + \alpha_1 Zcore_{it-1} + \alpha_2 C_{it} + \sum_{i=0}^{l} \varphi_i X_{it} + u_{it} \tag{3}$$

where i = country, with $i = 1, \cdots, 6$; t = year, with t = 2005 to 2015; $Zscore_{it}$ is the banking stability indicator; $Zcore_{it-1}$ is the banking stability indicator for the previous period; C_{it} is the level of bank concentration; X_{it} the vector of control variables; and u_{it} is random disturbance. α_0, α_1, and α_2 are parameters to be estimated.

By positing $u_{it} = U_i + \varepsilon_{it}$,

Equation (3) becomes

$$Zscore_{it} = \alpha_0 + \alpha_1 Zcore_{it-1} + \alpha_2 C_{it} + \sum_{i=0}^{l} \varphi_i X_{it} + U_i + \varepsilon_{it} \tag{4}$$

where U_i expresses the fixes of individual or unobservable effects by country, and ε_{it} is the term error.

To the extent that banks act as intermediaries between lenders and borrowers, they are forced to compete in both the deposit and loan markets. To this end, Berger et al. (2008) suggested distinguishing between the two types of bank concentration (concentration in the deposit market and concentration in the loan market) to better understand their respective impacts on banking stability. As a

[5]This index has the following expression: Zscore = (ROA + E/A)/σROA, where ROA is the net result for total assets (return on assets), E/A is the ratio of equity to total assets, and σROA is the standard deviation of ROA.

result, Model (4) becomes

$$Zscore_{it} = \alpha_0 + \alpha_1 Zcore_{it-1} + \alpha_2 cd_{it} + \alpha_3 X_{it} + U_i + \varepsilon_{it} \quad (5) \text{ deposit market}$$

where cd_{it} is the level of concentration in the deposit market.

$$Zscore_{it} = \alpha_0 + \alpha_1 Zcore_{it-1} + \alpha_2 cc_{it} + \alpha_3 X_{it} + U_i + \varepsilon_{it} \quad (6) \text{ credit market}$$

where cc_{it} represents the level of concentration in the credit market.

The estimation of the study of the relationship between banking market concentration and banking stability poses a problem of simultaneity bias. Ordinary least squares estimation can lead to biased estimators. Thus, we will use the generalized method of moments (GMM). It should be noted that there are two variants of GMM estimators in dynamic panels: the difference GMM estimator and the system GMM estimator.

The difference GMM estimator of Arellano and Bond (1991) is based on the first difference of the variables and thus eliminates country-specific effects while taking appropriate levels of lagged values (in level) for all potentially endogenous variables as instruments. This model provides a consistent estimator, especially for sufficiently large N and relatively small T. One of the limitations of this estimator is the asymptotic weakness of its precision and that of the instruments, which lead to considerable biases in finite samples.

Blundell and Blond (1998), following Arellano and Bover (1995), proposed as a solution the system GMM estimator, which deals with the simultaneous estimation of the first difference equation associated with the level equation. Their model makes it possible to generate efficient estimators in a dynamic panel for analyses involving coefficients of short periods (T is small). The system GMM estimator is much more efficient than the difference GMM estimator.

Additionally, the relevance of this instrumentation method requires ensuring the validity of the Sargan/Hansen overidentification tests and the absence of the autocorrelation of the second-order errors. Unlike the Sargan test, the Hansen test is robust to the heteroscedasticity of the error terms.

In line with Hurlin and Mignon (2006), stationarity tests are not necessary since the temporal dimension of our panel is less than 24. Additionally, specification tests (**Tables A3-A6**) in Appendix are performed, allowing us to conclude with dynamic fixed effects models.

4. Data Source and Presentation of Variables

Annual data covering the period 2005 to 2015 are used in this study. These data, except for those related to deposit insurance (a binary variable), are extracted from the World Bank's World Development Indicators (WDI 2016) database and the various COBAC annual reports. The choice of this period is essentially dictated by the availability of data on the "bank concentration" variable. The data concern the six CEMAC countries: Cameroon, CAR, Congo, Gabon, Equatorial Guinea and Chad. The panel analysis is thus justified by the lack of data over a long period in each country.

For the purposes of this study, we selected the following variables: bank concentration (Icd and Icc), real per capita gross domestic product (GDP), inflation rate (inf), bank deposits (depban), bank credits to the private sector (cbsp), budget balance (sbg), current account balance (scc), rate of outstanding debts (rcredsou), deposit insurance (asdep), and interest margin (marint). These variables are summarized in Table 1.

Table A1 in the Appendix shows that the total average variation in bank concentration for the entire sample is 7.824772 in the credit market and 7.8013 in the deposit market (which means that during the period under review, the banking markets remain concentrated). In the credit market, the interindividual (Between) variance is equal to 0.4590396, while its intraindividual (temporal) variance is equal to 0.1335832, out of a total variance of 0.4428812, i.e., 0.05659989 of its total variance. Similarly, in the deposit market, the interindividual (between) variance is equal to 0.4303208, while its intraindividual (temporal) variance is equal to 0.143384, out of a total variance of 0.4210064, i.e., 0.05396619 of its total variance. In the CEMAC, from an overall and country perspective, the banking system is characterized by high concentration.

Table A2 in the appendix indicates that there is no correlation between banking stability, credit market concentration and deposit market concentration. Indeed, the correlation coefficient between banking stability and credit market concentration (0.149) and that between banking stability and deposit market concentration (0.055) are not significant at the 5% level.

5. Analysis and Discussion of Results

Table 2 and Table 3 provide the results of the four (4) estimated models. The diagnostic tests are conclusive for some estimates: the related Wald tests show that only Model 4 for the deposit market and the last three for the credit market are significant at the 5% level. Indeed, the probabilities associated with these tests are 0.000 for Model 4 (deposit market) and 0.002; 0.002 and 0.045 respectively

Table 1. Variables, authors and expected signs.

	Variable	Authors	Expected sign
Variable to be explained	Banking stability		
Explanatory variables	Bank concentration	Uhde & Heimeshoff (2009)	-
	Real per capita GDP	Soedarmono et al. (2011)	+
	Inflation	Akram & Eitrheim (2008)	-
	Bank deposits	Zaghdoudi (2015)	+
	Bank lending to the private	FMI (2006)	-
	Fiscal balance	Zomo (2017)	+
	Current account balance	Zomo (2017)	-
	Rate of outstanding receivables	Boyd & De Nicolò (2005)	-
	Deposit insurance	Gropp & Vesala (2004)	+
	Interest margin	Vives (2010)	-

Source: Author, from the literature.

Table 2. Model estimation results (5).

Endogenous variable: Bank stability (*Zscore*)				
VARIABLES	Model 1	Model 2	Model 3	Model 4
L.Zscore	1.143***	1.143***	1.164***	1.178***
	(19.71)	(19.71)	(32.74)	(39.80)
lcd	−9.585	−9.585	−13.34	−9.353*
	(−1.57)	(−1.57)	(−1.96)	(−1.75)
lpibh	4.499***	4.499***	6.108**	6.209***
	(3.39)	(3.39)	(3.08)	(3.85)
inf	−0.104	−0.104	−0.167*	−0.124
	(−1.30)	(−1.30)	(−2.06)	(−1.49)
sbg	−0.298	−0.298	−0.439**	−0.438**
	(−1.18)	(−1.18)	(−2.59)	(−2.88)
scc	−0.522***	−0.522***	−0.556**	−0.495**
	(−5.49)	(−5.49)	(−2.99)	(−2.67)
cbsp	2.580***	2.580***	2.387**	2.620***
	(3.30)	(3.30)	(3.18)	(4.42)
depban	−0.008**	−0.008**	−0.012**	−0.013***
	(−2.70)	(−2.70)	(−2.87)	(−3.96)
asdep		−1.510	−21.680*	
		(−0.41)	(−2.45)	
marint			−2.699*	−2.436*
			(−2.37)	(−2.37)
lcd*asdep				−9.272***
				(−5.10)
Constant	4.314	−7.124	47.860	10.480
	(0.14)	(−0.25)	(1.42)	(0.30)
Observations	60	60	60	60
Number of ids	6	6	6	6
AR(1)	0.069	0.069	0.018	0.017
AR(2)	0.677	0.677	0.687	0.885
Sargan	0.138	0.112	0.554	0.346
Hansen	1.000	1.000	1.000	1.000
Probability (Wald)	0.434	0.556	0.702	0.000
Number d'inst	50	50	50	50

Source: author, based on estimation results from Stata 14. Student's t-test values are in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Table 3. Model estimation results (6).

Endogenous variable: Bank stability (*Zscore*)				
VARIABLES	**Model 1**	**Model 2**	**Model e 3**	**Model 4**
L.Zscore	1.148***	1.140***	1.156***	1.158***
	(23.38)	(26.25)	(25.61)	(25.80)
lcc	−14.65**	−13.28**	−14.69**	−12.077**
	(−2.83)	(−3.14)	(−2.86)	(−2.38)
lpibh	6.985***	6.026***	7.227**	7.160***
	(4.17)	(4.30)	(3.01)	(2.99)
inf	−0.0611	−0.034	−0.033	−0.026
	(−0.82)	(−0.54)	(−0.51)	(−0.45)
sbg	−0.486	−0.752*	−0.935***	−0.942***
	(−1.18)	(−1.18)	(−2.59)	(−2.88)
scc	−0.5548***	−0.453***	−0.491**	−0.487**
	(−5.77)	(−5.86)	(−2.80)	(−2.84)
cbsp	2.705***	2.726***	2.451***	2.458***
	(3.30)	(3.30)	(3.18)	(4.42)
depban	−0.009***	−0.009***	−0.012***	−0.012***
	(−3.63)	(−4.22)	(−4.64)	(−4.60)
tcredsou		−0.458	−0.518*	−0.514**
		(−1.86)	(−2.36)	(−2.36)
marint			−2.570**	
			(−2.73)	
lcd*marint				−0.315***
				(−2.75)
Constant	15.68	25.55	51.75***	30.965
	(0.88)	(1.21)	(3.78)	(2.01)
Observations	60	60	60	60
Number of ids	6	6	6	6
AR(1)	0.058	0.041	0.034	0.036
AR(2)	0.391	0.414	0.192	0.196
Sargan	0.269	0.285	0.856	0.865
Hansen	1.000	1.000	1.000	1.000
Probabilité (Wald)	0.388	0.002	0.002	0.045
Number d'inst	50	50	50	50

Source: author, based on estimation results from Stata 14. Student's t-test values in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

for models 2, 3 and 4 (credit market). Similarly, the Sargan/Hansen tests do not reject the validity hypothesis of the instruments used. It is also worth noting that the Arellano-Bond tests accept the presence (1) and absence (2) of AR effects. This leads to the conclusion that the results obtained are valid and can be interpreted.

Overall, these results lead to one lesson: *deposit market concentration and credit market concentration are destabilizing factors in the banking system.*

The present situation is justified by the fact that according to the results, the coefficients assigned to the "banking market concentration" variables ("lcd" and "lcc") are negative and significant at the 10% and 5% thresholds, respectively. These variables therefore have a negative effect on the stability of the banking system. Thus, an improvement of one percentage point in the deposit and credit market shares of the top three banks, with all other things being equal, is likely to reduce the value of the banking stability index by 9.35% and 12.077%, respectively. This result obtained in the CEMAC framework reinforces those of Berger et al. (2008), for whom concentration may be a factor of financial instability, both in terms of the asset and liability sides of banks. Nevertheless, these results are in conflict with those of Zomo Yobe (2017), for whom banking concentration is a source of banking stability.

Although consistent with the hypothesis and theoretical predictions mentioned (Boyd et al., 2006), these results are explained by certain economic and banking realities in the CEMAC subregion. We can list the presence of three banks that alone account for no less than 60% of the market share in terms of deposits and credit (COBAC, 2016). This results in insufficient competition in the zone's banking centers.

Similarly, this result can also be explained by the existence in the subregion of a deposit guarantee fund, an important tool for dealing with systemic risks and protecting small savers (COBAC, 2016). The existence of this mechanism is likely to lead banks to take more risks insofar as they believe that they will be rescued in case of difficulty.

6. Conclusion and Policy Implication

The stability of the banking system is currently a matter of concern. Knowledge of the factors that explain this stability is necessary. Therefore, the objective of this research was to analyze the impact of bank concentration on the stability of the banking system in the CEMAC zone. To do so, we used panel data for the period 2005-2015 (for all CEMAC countries) and the system GMM method. The results show that overall, the concentration of deposit and credit markets is a destabilizing factor in the banking system of CEMAC countries.

The hypothesis defended by this research is verified in the sense that the results found attest to the fact that banking concentration has a negative impact on the stability of the banking system in CEMAC countries.

It would be desirable to put in place mechanisms that can help reduce the market power of certain banks (A fril and Bank and Société Générale de Banque du Cameroun (SGBC), Banque Gabonaise Française Internationale (BGFI) and Banque Internationale pour le Commerce et l'Industrie du Gabon (BICIG) in Gabon and BGFI in Congo) to guarantee banking stability. It would also be useful to control the pace of credit growth to limit its impact in the event of shocks. However, this overall situation can hide disparities within the zone. This is a limitation for this study. Hence, there is a need for country-specific research to identify any particularities in terms of banking stability.

Conflicts of Interest

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

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Appendices

Table A1. Descriptive statistics of the model variables.

Variables		Moyenne	Ecart-type	Minimum	Maximum	Observations
	Overall		31.20241	3.510379	166.0547	N = 66
Zscore	Within	30.69114	30.70633	5.845604	82.0533	n = 6
	Between		13.25782	7.164059	114.6925	T = 11
	Overall		0.4428812	7.009409	8.71029	N = 66
lcc	Within	7.824772	0.4590396	7.18521	8.47103	n = 6
	Between		0.1335832	7.297525	8.066415	T = 11
	Overall		0.4210064	6.827629	8.651375	N = 66
lcd	Within	7.8013	0.4303208	7.117571	8.219693	n = 6
	Between		0.143384	7.405652	8.232981	T = 11
	Overall		1.401681	11.97831	16.50833	N = 66
lpibh	Within	14.00843	1.513055	12.19643	16.1925	n = 6
	Between		0.1660762	13.56664	14.32426	T = 11
	Overall		5.987837	−8.97474	37.14222	N = 66
infl	Within	4.344537	2.286784	2.328393	8.708422	n = 6
	Between		5.606187	−8.351434	32.77833	T = 11
	Overall		8.76581	−11.7	26.3	N = 66
sbg	Within	1.856061	5.661269	−5.772727	10.2	n = 6
	Between		7.051257	−20.04394	22.12879	T = 11
	Overall		12.53652	−42.6	24.8	N = 66
scc	Within	−.7333333	7.140583	−6.263636	12.02727	n = 6
	Between		10.67805	−37.0697	21.1303	T = 11
	Overall		4.472342	2.097239	22.05634	N = 66
cbsp	Within	8.704419	2.959716	4.812307	12.63864	n = 6
	Between		3.548183	2.965197	22.9243	T = 11
	Overall		1.173688	3.774897	8.171095	N = 66
depban	Within	6.496438	1.15734	4.478082	7.744921	n = 6
	Between		0.4941397	5.314759	7.317957	T = 11
	Ensemble		8.110491	1.38628	34.20341	N = 66
rcredsou	Interindividual	12.23462	7.371894	2.72566	24.83088	n = 6
	Intraindividual		4.449267	−1.26694	21.60715	T = 11
	Overall		1.917387	5.64	14.51	N = 66
marint	Within	8.579343	1.001289	6.726061	9.78303	n = 6
	Between		1.681677	5.086313	14.47995	T = 11
	Overall		0.5017452	0	1	N = 66
asdep	Within	0.4545455	0	0.4545455	0.4545455	n = 6
	Between		0.5017452	0	1	T = 11

Source: Author, based on panel data.

Table A2. Correlations between model variables.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Zscore	1.000											
(2) lcc	0.149	1.000										
(3) lcd	0.055	0.908*	1.000									
(4) lpibh	0.370*	0.550*	0.344*	1.000								
(5) infl	−0.042	0.085	0.184	−0.181	1.000							
(6) sbg	0.249*	0.117	0.183	0.362*	−0.146	1.000						
(7) scc	−0.320*	0.219	0.267*	0.376*	−0.063	0.580*	1.000					
(8) cbsp	0.039	−0.265*	−0.276*	−0.063	0.027	−0.432*	−0.310*	1.000				
(9) depban	0.316*	−0.290*	−0.471*	0.561*	−0.275*	0.142	0.057	0.440*	1.000			
(10) rcredsou	−0.425*	0.109	0.176	−0.437*	0.301*	−0.493*	−0.133	0.147	−0.539*	1.000		
(11) marint	0.051	0.416*	0.392*	0.196	−0.008	0.256*	0.148	−0.532*	−0.333*	−0.085	1.000	
(12) asdep	0.084	−0.090	−0.088	0.071	0.069	−0.405*	−0.248*	0.596*	0.343*	0.014	−0.344*	1.000

Source: Author, based on panel data; *indicates significance at 5%.

Table A3. Credit market fixed effects.

Fixed-effects (within) regression	Number of obs = 66
Group variable: code	Number of groups = 6
R−sq:	Obs per group:
within = 0.6314	min = 11
between = 0.3682	avg = 11.0
overall = 0.0746	max = 11
	F(7,53) = 12.97
corr(u_i, Xb) = −0.6915	Prob> F = 0.0000

zscore	Coef.	St Error	t	P>|t|	[95% Conf.	Interval]
lccred	−7.065565	9.336572	−0.76	0.453	−25.79236	11.66123
lpibh	−2.120311	10.7615	−0.20	0.845	−23.70515	19.46452
inf	−0.2781103	0.2065026	−1.35	0.184	−0.692302	0.1360814
sbg	−0.9088682	0.2880987	−3.15	0.003	−1.486721	−0.3310154
scc	−0.1023287	0.1654198	−0.62	0.539	−0.4341187	0.2294613
cbsp	2.722806	0.6018246	4.52	0.000	1.515699	3.929913
depban	−0.0183315	0.0055926	−3.28	0.002	−0.0295488	−0.0071141
_cons	114.8378	157.9669	0.73	0.470	−202.0037	431.6794

sigma_u = 43.518098
sigma_e = 8.9141608

rho = 0.95973102 (fraction of variance due to u_i)

F test that all u_i=0: F(5, 53) = 55.32; Prob > F = 0.0000.

Table A4. Random effects in the credit market.

Random effects GLS regression	Number of obs = 66
Group variable: code	Number of groups = 6
R-sq:	Obs per group:
within = 0.1147	min = 11
between = 0.9307	avg = 11.0
overall = 0.5861	max = 11
	Wald chi2(7) = 82.15
corr(u_i, X) = 0 (assumed)	Prob> chi2 = 0.0000

zscore	Coef.	St Error	z	P > |z|	[95% Conf. Interval]	
lccred	1.626469	11.2086	0.15	0.885	−20.34199	23.59493
lpibh	10.25716	3.866431	2.65	0.008	2.679098	17.83523
inf	0.4072033	0.4704778	0.87	0.387	−0.5149163	1.329323
sbg	2.109747	0.417203	5.06	0.000	1.292044	2.92745
scc	−2.036125	0.2671071	−7.62	0.000	−2.559645	−1.512605
cbsp	0.416574	0.9690129	0.43	0.667	−1.482656	2.315804
depban	0.0008002	0.0064869	0.12	0.902	−0.0119139	0.0135142
_cons	−137.4011	56.61218	−2.43	0.015	−248.359	−26.44329
	sigma_u = 0					
	sigma_e = 8.9141608					
	rho = 0 (fraction of variance due to u_i)					

Breusch and Pagan Lagrangian multiplier test for random effects
zscore[code,t] = Xb + u[code] + e[code,t]
Estimated results:

	Var	sd = sqrt (Var)
zscore	973.5905	31.20241
e	79.46226	8.914161
u	0	0

Test: Var(u) = 0
chibar2(01) = 0.00
Prob> chibar2 = 1.0000

Table A5. Deposit market fixed effects.

Fixed-effects (within) regression	Number of obs = 66
Group variable: code	Number of groups = 6
R-sq:	Obs per group:
within = 0.6641	min = 11
between = 0.4122	avg = 11.0
overall = 0.0807	max = 11
	F(7,53) = 14.97
corr(u_i, Xb) = -0.6915	Prob> F = 0.0000

zscore	Coef.	St Error	t	P > |t|	[95% Conf. Interval]	
lccred	−21.3069	8.855093	−2.41	0.020	−39.06796	−3.545828
lpibh	−2.772859	10.20252	−0.27	0.787	−23.23651	17.6908
inf	−0.2496174	0.1948563	−1.28	0.206	−0.6404497	0.1412149

Continued

sbg	−0.7466422	0.2804721	−2.66	0.010	−1.309198	−0.1840864
scc	−0.0445778	0.1585105	−0.28	0.780	−0.3625095	0.2733539
cbsp	2.73305	0.5538258	4.93	0.000	1.622216	3.843884
depban	−.0180137	0.0053264	−3.38	0.001	−0.0286971	−0.0073303
_cons	234.095	155.9151	1.50	0.139	−78.63111	546.8211
	sigma_u = 43.752138					
	sigma_e = 8.5094533					
	rho =.9635515 (fraction of variance due to u_i)					

F test that all u_i=0: F(5, 53) = 61.75 Prob > F = 0.0000.

Table A6. Random effects at the deposit market level.

Random effects GLS regression	Number of obs = 66
Group variable: code	Number of groups = 6
R-sq:	Obs per group:
within = 0.1146	min = 11
between = 0.9305	avg = 11.0
overall = 0.5861	max = 11
	Wald chi2(7) = 82.13
corr(u_i, X) = 0 (assumed)	Prob> chi2 = 0.0000

zscore	Coef.	St Error	z	P > |z|	[95% Conf. Interval]	
lccred	1.279828	11.1308	0.11	0.908	−20.53614	23.09579
lpibh	10.45743	3.167493	3.30	0.001	4.249255	16.6656
inf	0.4040102	0.471955	0.86	0.392	−0.5210047	1.329025
sbg	2.095647	0.4043238	5.18	0.000	1.303187	2.888108
scc	−2.039311	0.2713009	−7.52	0.000	−2.571051	−1.507571
cbsp	0.4042753	1.038674	0.39	0.697	−1.631488	2.440039
depban	0.00074	0.0069903	0.11	0.916	−0.0129607	0.0144408
_cons	−137.2536	65.89923	−2.08	0.037	−266.4137	−8.093448
	sigma_u = 0					
	sigma_e = 8.5094533					
	rho = 0 (fraction of variance due to u_i)					

Breusch and Pagan Lagrangian multiplier test for random effects
zscore[code,t] = Xb + u[code] + e[code,t]
Estimated results:

	Var	sd = sqrt(Var)
zscore	973.5905	31.20241
e	79. 4108	8.914161
u	0	0

Test: Var(u) = 0
chibar2(01) = 0.00
Prob> chibar2 = 1.0000