

Oduor, Jacob; Ngoka, Kethi; Odongo, Maureen

Article

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Full length article

Capital requirement, bank competition and stability in Africa[☆]

Jacob Oduor^{a,*}, Kethi Ngoka^b, Maureen Odongo^b

^a Research Department, African Development Bank, Cote d'Ivoire

^b Research Department, Central Bank of Kenya (CBK), Kenya

Abstract

Monetary authorities around the world are implementing enhanced banking capital adequacy requirements under Basel III meant to improve financial stability. Critics however argue that increased capital requirements concentrate the banking industry reducing competition while not guaranteeing financial sector stability. Using data from 167 banks in 37 African countries, we find that increased capital beef-up significantly increases financial instability in Africa (except in big banks) implying that higher capital requirements did not make African banks safer. We also find that increased regulatory capital improves competitive pricing for foreign banks while it makes domestic banks less competitive mainly attributed to the high cost of sourcing and holding extra capital for domestic banks compared to foreign banks who can source cheaper capital from parent companies. The results put to question the effectiveness of enhanced regulatory capital on stability and competitiveness of the African financial system.

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Keywords: Financial stability; Banking competition; Capital requirements

1. Introduction

Following the global financial crisis of 2007–2009, stringent regulatory measures such as higher capital adequacy requirements have become more prominent as a move towards having a more stable banking sector. Most African countries have hastened their capital build up towards the levels outlined by the BASEL III. For example in 2007, commercial banks in Zambia were required to raise the minimum capital requirement from \$ 358,240 to \$2.2 million. In Algeria, amendments introduced in 2008 boosted minimum capital for banks from USD 39 million

to USD 155 million. In Kenya commercial banks were required to build up their capital base from \$3.3 million in 2008 to \$12.5 million by end of 2012. The push for capital build-up emanates from the view that better capitalized banks are likely to withstand financial turbulences and therefore will increase banking sector stability (see for instance Santos, 1999; Van Roy 2003).

However, there are two main counter arguments to the push for capital build-up. First, emerging evidence show that bigger banks perceive themselves to be “too big to fail” and therefore engage in more risky investments and are more vulnerable to shocks that smaller banks (Berger and Mester, 1997). The argument is that bigger is not necessarily safer. This view finds credence in the case of Nigeria for instance where, despite raising the minimum regulatory capital requirement, 8 out of 24 banks were declared insolvent in 2009, and it became clear that consolidating the sector was not enough (Sanusi, 2012).

The second counter argument is that capital build-up and concentration reduces competition in the banking sector and has the potential to drive up banking costs and stifle financial inclusion. The high initial capital stringency requirements can impose entry barriers for new entries and this would restrict competition and allow existing banks to accumulate market power (Berger et al., 1993). Opponents of consolidation have argued that the push for capital build-up is a ploy by the big banks to lock out new entrants to avoid competition.

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* Corresponding author.

E-mail address: j.oduor@afdb.org (J. Oduor).

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On the basis of the preceding discussions, the precise impact of regulatory capital beef-up on banking competition and stability is at best contentious (Hakenes and Schnabel, 2010; Van Roy, 2003). In this paper we explore two main questions with reference to Africa; first, whether regulatory capital beef-up improves financial sector stability and whether regulatory capital beef-up concentrates the banking industry reducing competition.

The importance of these two questions for the African banking sector cannot be overemphasized. World Bank (2015) shows that penetration of financial services in sub-Saharan Africa is still low and stands at 24% (measured by private sector credit to the private sector as a percentage of GDP) compared to 48.1% for North Africa, 45.2% for the Latin America & Caribbean and 134.3% for the OECD countries. Yet, sub-Saharan Africa has the lowest level of financial inclusion with only about 21% of adult population having a bank account compared to 34% in Latin American and the Caribbean and 90% in the OECD. Increased competition in the banking sector is known to drive down banking costs improving financial inclusion.

Using annual bank level data for the period 2000–2011 from 162 commercial banks in 37 countries in Africa, the study makes several findings; first, increased regulatory capital increases financial instability in Africa except for big banks. Secondly, regulatory capital has no impact on competition in the banking industry as a whole but improves competitive pricing among the foreign banks while making domestic banks less competitive.

The rest of the paper is organized as follows; in section two, we review related literature, section three presents the methodology while sections four and five present the results and policy issues respectively.

2. Review of related literature

There is wide support of the role of capital regulation on financial sector soundness and stability in the literature. Van Roy (2003) finds that stringent capital requirements in the early 1990's promoted financial stability and reduced credit risk in the G10 countries. Furlong and Keeley (1989) and Keeley (1990) show that higher capital requirements reduce the incentives for risk taking by a value-maximizing bank and this helps increase bank stability. Bolt and Tieman (2004) argue that more stringent capital adequacy requirements lead banks to set stricter acceptance criteria for granting new loans thereby reducing their exposure to default risk. Other studies have found that higher capital reduces banks' exposure to systemic risk (De Jonghe, 2010; Martinez-Miera and Suarez, 2014) and reduces the chance of banking crises (Miles et al., 2012).

We are not aware of any empirical study on the effects of increased capital requirement on stability that specifically focuses on Africa. A few studies though, have looked at the issue for developing and transitional countries in general. Hussain and Hassan (2005) in a study of 11 commercial banks in developing countries, shows that capital regulations reduced portfolio risk in those countries. Agoraki et al. (2009) on the other hand finds that capital requirements are effective in monitoring risk-taking as they increase equity to capital ratios and decrease credit risk but this effect weakens for banks with sufficient market power.

There are also other studies that have found destabilizing effects of increased capital requirements. Besanko and Kanatas (1993) and Boot and Greenbaum (1993) for instance find that capital requirements reduce monitoring incentives, which reduces the quality of banks' portfolios increasing the risk of instability. Berger and Mester (1997) finds that beyond certain thresholds, banks become inefficient and unstable. Hakenes and Schnabel (2010) on the other hand show that tighter capital requirements increase the risk of individual loans and may also increase a bank's probability of default because they relax the competition for loans and thus destabilizing the banking sector. According to these studies, increased capital requirement does not necessarily lead to stability.

On capital requirement and competition, Amel et al. (2004) finds that commercial banks operating beyond a certain size (measured by total assets) have higher operating costs and operating beyond lowest average cost introduce inefficiencies and instability that reduce competition in the market. Tying the findings of Berger and Mester (1997) and Amel et al. (2004) that too big banks (beyond a certain threshold) are more inefficient and unstable and the findings of Berger et al. (1993) that most efficient banks have substantial cost and competitive advantages over those with average or below average efficiency, it can be inferred that too big banks may not only be unstable but also uncompetitive. Bikker and Groeneveld (1998) assessed competitive structure in the banking industry in the EU and finds that concentration impairs competitiveness. Similar findings were obtained by (Salas and Saurina, 2003; Claessens and Laeven, 2004).

3. Methodology

3.1. Model specification and theoretical priors

This study estimates two equations to capture the effects of capital requirements on bank competition and secondly to capture the impacts of capital requirements on stability. Formally the model is given as;

$$comp_{it} = \alpha + \beta cap_{it} + \eta X_{it} + \lambda(cap * X)_{it} + \varepsilon_{it} \quad (3.1)$$

The conditioning variables X include both country-specific macroeconomic variables and bank-specific variables including inflation, money supply among other variables. $comp_{it}$ is the measure of competition while cap_{it} is the regulatory capital requirement ratio for bank i in time t . We estimate this equation for different segments of the banking industry including among the foreign banks, domestic, listed and non-listed, efficient and inefficient and banks in economies with a small (and big) banking sector relative to the size of the economy. The impact of capital requirement on financial stability is analyzed using a similar model given as:

$$stab_{it} = \delta + \phi cap_{it} + \rho Z_{it} + \xi(cap * Z)_{it} + \mu_{it} \quad (3.2)$$

where $stab_{it}$ is the stability indicator for bank i in time t . Z is a vector of control variables (both macro and bank-specific) that are expected to affect financial sector stability and includes

GDP per capita growth rate as an indicator of macroeconomic stability, the ratio of non-performing loans to gross loans as the indicator of financial sector stability among other variables to capture the doing-business environment.

A priori, it is expected that increased capital requirement will increase stability while it reduces competition. When the coefficient β in Eq. (3.1) is positive, it means that increased capital increases the value of the Lerner Index (reduces competition). We explain this in the next sub-section when discussing the construction of the Lerner Index. A negative coefficient means that increased capital requirements reduces the value of the Lerner Index (increases competition). On the other hand, the coefficient φ in Eq. (3.2) is expected to be positive a priori. We use non-performing loans to represent financial sector in(stability) and therefore a positive coefficient φ implies that increased capital requirements increases non-performing loans (increases financial sector instability).

3.2. Data and measurement of variables

We use annual bank level data obtained from Bank Scope covering the period 2000–2011 from 167 banks across 37 African countries as well as for the period 2007–2013 for 145 banks across 23 African countries. Additional macro data is obtained from the World Development indicators (WDI).

In deriving total revenues we follow the approach in Fernandez De Guevara et al. (2005), Berger et al. (2009) and Demirguc-Kunt and Peria (2010) and proxy banking production (TQ in Eq. (3.2) above) by total assets. Price (P) is calculated as the ratio of total bank revenues to total assets. Total bank costs (TC) are calculated as the sum of total interest expenses and total non-interest expenses. We measure banking sector stability using the ratio of non-performing loans to gross loans.

Even though there are several measures of competition used in the literature, we measure competition using the Lerner Index. It is a more direct measure of competition because it focuses on the pricing power apparent in the difference between price and marginal cost thereby capturing the degree to which a firm can increase its price beyond marginal cost (Berger et al., 2009). It is directly linked with the long-run equilibrium conditions in a competitive market where price equals marginal cost. It takes the value of 0 in the case of perfect competition, 1 under absolute monopoly, and negative values when the price is less than the marginal cost as a result of non-optimizing behavior by banks. The Lerner index is 1 when marginal cost equals to zero (the cost of producing additional output is zero). The equilibrium of the monopolist is still attained at the point where marginal cost equals to marginal revenue implying that at equilibrium, marginal revenue will also equal to zero and the elasticity of demand is unitary.

The Lerner Index calculated as:

$$LI_{it} = \frac{P_{it} - MC_{it}}{P_{it}} = -\frac{1}{\varepsilon_d} \quad (3.3)$$

where P_{it} is the price of banking outputs for bank i at time t and MC_{it} is the marginal costs for bank i at time t and ε_d is the elasticity of demand. For simplicity and given the nature of our

dataset which is cross country and unbalanced panel, we do not calculate the MC from a trans-log cost function as is commonly done in the literature but calculate it simply as the change in total cost over the change in total output.

$$MC_{it} = \frac{\Delta TC_{it}}{\Delta TQ_{it}} \quad (3.4)$$

where ΔTQ_{it} is the change in total output. Once marginal cost is estimated and price of output computed, we can calculate Lerner index for each bank and obtain a direct measure of bank competition. When $P = MC$, the Lerner index is zero and the firm has no pricing power.

4. Results

4.1. Impact of capital requirement on competition

The Table 1 report the results of the impact of increased capital requirements on competition as measured by the Lerner Index.

We use robust standard errors in the estimations to cure for the problem of heteroskedasticity. As shown in Table 1 model (1), regulatory capital has no impact on competition in the banking industry as a whole but increases competition among the foreign banks (model 2) while it marginally reduces competition among the domestic banks (model 3). It is important to remember that the dependent variable in this estimation is the Lerner Index and a negative coefficient implies an improvement in competition. Since increased capital requirements entail increased costs of generating and holding capital, domestic banks may be faced with higher costs of generating and holding capital and which they pass on to customers in form of higher prices. Foreign banks are more likely to get additional capital from their parent companies helping them generate the extra capital at lower cost enabling them to offer more competitive prices compared to the domestic banks. This view is consistent with recent findings of Levine et al. (2016) who find that banks foreign ownership (geographic expansion to other US states) reduces the parent company's funding costs and the cost reduction is greater when the parent company is headquartered in a state that has an economy with a lower correlation with the overall US economy (in general where the subsidiary is located). The reduced funding cost of the parent company may then be transferred to the subsidiaries. This is consistent with the risk-reducing view of how geographic diversification lowers funding costs. A plot of the ratio of regulatory capital for foreign and domestic banks show that foreign banks had lower average regulatory capital ratio compared to the domestic banks.

We find no evidence of the impact of increased capital requirement on competition when the banks are categorized according to size and efficiency levels (models 4–8).

The mean regulatory capital ratio is shown by the dotted line next to the box. We include a reference line at 20% to aid in comparing the means. The median regulatory capital is shown by the black center line in the box while the thickness of the box shows the level of variability away from the median. The Fig. 1 shows a lower mean and variability (of regulatory capital

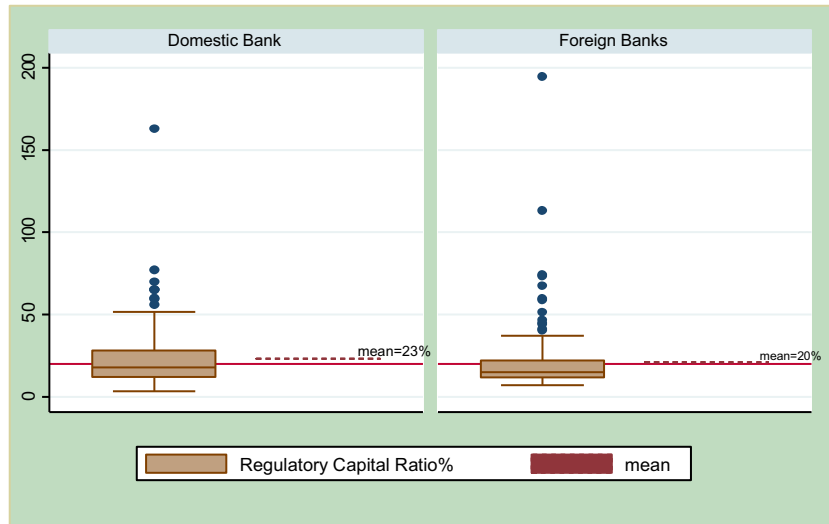


Fig. 1. Differences in regulatory capital ratio between foreign and domestic banks.

ratio) among the foreign banks compared to the domestic banks. From the Fig. 1, it is expected that the domestic banks would incur higher funding and holding costs for their high regulatory capital ratio compared to the foreign banks.

4.2. Impact of capital requirement on stability

The results of the impact of regulatory capital beef-up on financial stability are reported in Table 2.

The results show that increased regulatory capital increases financial instability in African banking as a whole and both the big and the small banking sector countries. As shown in Table 2, only big banks (model 16) do not experience instability with increased capital requirements. Instability is manifested across the banking industry including among foreign banks, domestic, listed and non-listed.

This finding is not surprising. A recent review by the Basel Committee shows significant variation in the outputs of internal models used to assess market risk and calculate regulatory capital in most banks. The review looked at 17 major banks in nine jurisdictions, including HSBC Holdings Plc, Deutsche Bank AG and JP Morgan Chase & Co, and found differences in implied capital requirements of between 24 and 30% for the two most diversified portfolios looked at. The review found wide variations in the way lenders conduct risk assessments enabling lenders to “cheat” the system by using models that understate their risks and allow them to hold less capital, potentially giving them a trading advantage. In addition, the review showed that variability typically increases for more complex trading positions. The results reported in Table 2 could imply that capital beef-up requirements force banks to hold more risky assets by understating their risks through the use of complex in-house risk assessment models. As a result banks hold less regulatory capital than they are legally supposed to hold exposing the entire financial sector to instability. Some critics of the Basel capital regime argue that Basel III is too complicated and allows banks to use

in-house models to hold less capital than they should against risky assets.

4.3. Simultaneity between capital adequacy and stability

At this stage, a relevant question arises regarding the possibility of reverse causality between capital adequacy and financial stability. The potential for reverse causality emanates from the fact that banks that are viewed by the regulators to be less stable are likely to be asked to keep higher capital ratios compared to more stable banks. Instability may therefore be a cause of higher capital requirements for banks as much as higher capital requirements may be a source of instability.

We test and correct for simultaneity between capital requirement and instability using instrumental variables approach to check for robustness of the results reported in the preceding section. We start by estimating an equation where capital adequacy is a function of the level of instability and other controls given as;

$$cap_{it} = \rho + \vartheta stab_{it} + \pi X_{it} \varepsilon_{it} \quad (4.1)$$

We then generate the residuals from the above regression (cap_resid) and use in the second regression where financial stability depends on capital requirements and test whether the coefficient of the cap_resid are significantly different zero (testing whether capital requirement is exogenous and therefore we do not need an instrument). We find that the coefficient of cap_resid is significantly different from zero implying that capital requirement is endogenous in the model. We use the second lags of regulatory capital ratio as instruments for regulatory capital ratio. The second lag of the explanatory variable is appropriate since we expect temporal dynamics in the capital requirement variable only up to the first lag but we do not expect the same temporal dynamics to characterize the unobservables two periods before. We report the results in Table 3.

Table 1
Impact of capital requirement on competition in Africa.

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: Lerner Index	Whole banking sector	Foreign	Domestic	Big	Medium	Small	Efficient <60	Inefficient >60
Regulatory capital ratio	−0.004 (0.823)	−0.145 (0.048)	0.25553 (0.118)	−0.0029 (0.973)	0.033 (0.203)	−0.028 (0.508)	0.021659 (0.269)	−0.135 (0.226)
Time to enforce a contract					−0.01 (0.106)			
Strength of legal rights								
procedures to register a buss								
Procedures to enforce a contract								
M2 to GDP								
GDP per capita growth		−1.48 (0.084)			−0.42 (0.029)		−0.81067 (0.014)	
Cap*contract			−0.00481 (0.11)					
Cap*legalrights								
Cap*startupprocedure								
_cons	−1.137 (0.006)	6.1132 (0.172)	−1.99822 (0.086)	−0.43729 (0.739)	4.735 (0.103)	−2.171 (0.091)	8.031662 (0.023)	0.71774 (0.763)
sigma_u	7.61	12.691	4.16734	1.90964	1.455	12.562	105.0635	10.7037
sigma_e	18.2	27.215	3.66656	6.13126	3.181	34.858	6.021867	25.8584
rho	0.149	0.1786	0.56366	0.08843	0.173	0.1149	0.996726	0.14628

p-Values are given in parenthesis. We only report coefficients that are significant at either 5% or 10%. The exact level of significance is given by the p-values.

Table 2
Impact of capital requirement on (in)stability by category of bank.

Impact on financial (in)stability										
Model	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	Whole sector	Small sector banking countries	Big sector banking countries	Foreign	Domestic	Listed	Non-listed	Big banks	Medium sized banks	Small sized countries
Regulatory capital ratio	0.89 (0.00)	0.79 (0.00)	4.28 (0.11)	1.68 (0.02)	1.03 (0.02)	1.47 (0.002)	0.85 (0.002)	0.19 (0.41)	1.22 (0.04)	0.17 (0.06)
Strength of legal rights	−0.10 (0.00)	−	−					−0.2 (0.00)		
Inflation	0.15 (0.10)	−	−							
Time required to enforce contract	−0.01 (0.05)	−	0.02 (0.02)						−0.03 (0.04)	
Procedures to enforce a contract	−1.68 (0.10)	−	−	−3.19 (0.05)	−0.6 (0.5)					
M2 to GDP	−	0.41 (0.05)	−							
Procedures to register buss	−	0.94 (0.05)	−1.69 (0.04)							
Cap*contract	−0.02 (0.00)	−0.02 (0.00)	−0.16 (0.02)	−0.04 (0.02)	−0.00 (0.01)	−0.04 (0.003)	−0.02 (0.001)		−0.03 (0.03)	
Cap*startupprocedure	−	−	0.15 (0.00)							
GDP per capita growthannual	−	−	−0.36 (0.04)							
constant	69.59 (0.06)	−17.69 (0.00)	−0.36 (0.98)	123 (0.04)	22.5 (0.49)	4.98 (0.015)	3.51 (0.049)	4.63 (0.22)	16.7 (0.01)	4.81 (0.06)
sigma_u	14.27	10.06	10.60	18.74	9.53	7.69	7.54	5.14	9.03	8.71
sigma_e	6.09	6.26	2.42	7.19	5.12	5.84	6.31	5.1	5.96	7.67
rho	0.85	0.72	0.95	0.87	0.78	0.63	0.59	0.5	0.7	0.56

Table 3
Impact on financial stability using instrumental variables method.

(19)	(20)	(21)
First stage (OLS)	Second stage (OLS)	IV
Dependent variable regulatory capital ratio	NPLs Gross Loans	NPLs Gross Loans
Coef.	Coef.	
NPLs Gross Loans	Regulatory capital ratio	Regulatory capital ratio
Strength of legal rights	95.18 (0.00)	2.26 (0.01)
Startup procedures to register a business	321.52 (0.00)	Strength of legal rights
Procedures to enforce a contract	–17.59 (0.00)	Startup procedures to register a business
M2 to GDP	66.83 (0.00)	Procedures to enforce a contract
GDP per capita growth	–2.80 (0.00)	M2 to GDP
Cap*contract	5.51 (0.00)	GDP per capita growth
Cap*legalrights	–1.45 (0.00)	Cap*contract
constant	–5.15 (0.00)	Cap*legalrights
	0.00 (0.00)	Cap*start up procedure
	–95.18 (0.00)	Cap_res
	–4694.50 (0.00)	constant
sigma_u	492.17	sigma_u
sigma_e	0.00	sigma_e
rho	1.00	rho

Note: The figures in parenthesis are the p-values.

The results reported in model 21 above confirm the earlier findings that increased capital ratio increases instability in the banking sector.

5. Summary, conclusions and policy issues

This paper examines whether increased capital requirements increases competition and banking sector stability. The agitation for increased capital beef-up to improve banking sector stability especially after the 2007–2010 global financial crisis has been strong. However critics argue that other than creating big inefficient entities that do not guarantee stability of the sector, increased capital requirements reduces competition by making it harder for smaller entrants to join the market.

Using unbalanced bank-specific panel data from 167 banks across 37 countries in Africa, we arrive at several findings. First, increased regulatory capital increases financial instability in African banking. This is attributed to the use of varied internal models that allow banks to understate their risks in order to maintain less regulatory capital which exposes the whole sector to risks. To remedy such situation, it is important to ensure banks calculate their risk weightings and capital requirements on the basis of a common standardized approach. In-house models could be used to supplement but not substitute standard models. To reduce the ability of banks to hide risky assets there is need for reduced discretion of banks in calculating their risk weightings by narrowing the range of modeling choices for banks and improving public disclosure by banks. There is also need to explore regulation with varying standards based on complexity and risk. The results from this section show that capital beef-up alone is clearly not sufficient to counter financial instability in developing countries but must be supplemented with other measures including strict supervision on compliance. The findings show that instability is manifest across the banking industry including foreign banks, domestic, listed and non-listed except in big banks. This implies that bigger banks are likely more cushioned from the shocks irrespective of their listing and ownership status.

We also find that, regulatory capital has no impact on competition in the banking industry as a whole but increases competition among the foreign banks while marginally reducing competition among domestic banks. This is attributed to the high cost of sourcing and holding extra capital facing the domestic banks compared to the foreign banks who are able to source the extra capital more cheaply from parent companies. This puts the foreign banks at a competitive advantage compared to the domestic banks since they can price their products more cheaply. The results here show that type of ownership and bank size matters for regulatory capital impacts on competition.

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