Bank Regulation and Efficiency: What Works for Africa?

Thouraya Triki[1], Imen Kouki[2], Mouna Ben Dhaou[1] and Pietro Calice[1]

Abstract

We use a new database on regulation and supervision in 46 countries to study the relationship between the regulatory framework and bank efficiency in Africa. Specifically, we examine how bank efficiency is influenced by requirements related to (i) Overall capital stringency, (ii) Restrictions on entry into banking, (iii) Restrictions on bank activities, (iv) Transparency requirements, (v) Restrictions on exit from banking, (vi) Liquidity and diversification requirements, (vii) Price controls (financial repression), (viii) Availability of financial safety nets and (ix) Quality of supervision. We find that tighter restrictions on exit and on permitted activities negatively affect bank efficiency while increased liquidity and diversification requirements and the availability of financial safety nets have efficiency-enhancing effects. These results hold for different bank size and risk groups we consider. We also find that more stringent restrictions on entry increase the efficiency of large banks while reducing the efficiency of small banks. Similarly, our results suggest that small banks are the main losers in terms of efficiency from increased transparency requirements, price controls and stringent capital requirements. Likewise, enhanced quality of supervision seems to hinder the efficiency of low risk banks regardless of their size. Overall, our findings support the argument that regulation should be adapted to the risk and size level of the institutions that are being regulated.

Keywords: bank regulation, bank efficiency, Africa

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[1] African Development Bank, 15 Avenue Du Ghana, BP 323, Belvedere, 1002 Tunis, Tunisia, Email of corresponding author: t.triki@afdb.org, Phone: +216 7110 3009.
[2] College of Business Administration, University of Dubai, Maktoum Road, Al Masaood Building, Dubai, P.O.Box 14143, United Arab Emirates, Phone: +971 4 2072 658.

1. Introduction

The recent global financial crisis which unfolded into a European sovereign debt crisis has prompted a renewed interest in banking regulation and supervision to safeguard global financial systems. As a result, a number of reforms of the financial regulatory framework have been agreed internationally, most notably the Basel committee on banking supervision's reform package known as Basel III (BCBS, 2010a; 2010b) While there is growing pressure to further strengthen regulation and supervision of financial institutions, there is still no consensus on the benefits from such approach. On the one hand, proponents argue that tighter regulation and supervision helps prevent market failures and promotes sound banking practices. Consequently, it enhances bank efficiency. On the other hand, opponents argue that tighter regulation and supervision cause banks to make sub-optimal capital allocation and lending decisions that mainly serve the interests of regulators and their entourage. Therefore, the debate over how regulation and supervision affects bank efficiency remains theoretically unsolved.

Available empirical studies use accounting ratios or frontier techniques to explore how regulation affects bank efficiency and performance [Chortareas et al. (2011), Ben Naceur et al. (2009, 2011), Pasiouras (2007, 2009), Barth et al. (2010), Demirguc-Kunt et al. (2003)]; Development and soundness of the banking sector [Boudrigua (2009), Barth et al. (2001, 2004)]; and Bank risk level [Bourgain et al. (2012), Klomp and de Haan (2011), Demirguc-Kunt et al. (2011)]. This growing literature uses measures for regulation that are based either on the level of adherence to the core principles for effective bank supervision published by the Basel committee[3], or data from the seminal survey conducted in 1999 by Barth, Caprio and Levine. The latter was updated 3 times in 2001 and 2006 and 2011, providing the most comprehensive snapshot of bank regulation and supervision around the world.[4] Overall, the existing empirical findings did not help reach a consensus on this debate.

Our paper builds on this existing literature by providing an empirical assessment of the relationship between bank efficiency, regulation and supervision practices in Africa. Our contribution to the literature is threefold. First, we use a new database on regulation and supervision developed by the African Development Bank in collaboration with the Making Finance Work for Africa Partnership to describe the regulatory and supervisory environment in Africa. The survey covers 46 African countries and provides a snapshot of existing regulation in Africa in 2010. It allows us to explore new aspects of regulation that were not studied before in the literature such as restrictions on exit from banking and price controls. Second, we provide the first detailed analysis that documents how the relationship between bank regulation and efficiency is affected by the size and risk of banks. Third, to the best of our knowledge, we provide the first cross country study on the relationship between bank efficiency and regulation dedicated to a developing region, i.e. Africa. Existing studies use either cross-country samples covering a mix of developed and developing countries, or samples covering well-established economies. Most of the research on developing countries consists of country case studies. Yet, available evidence suggests that the level of economic development and institutional settings influence the way regulation affects bank efficiency,

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[3] The Basel Committee on Banking Supervision developed a set of principles as a guide for best regulatory and supervisory practices in the banking sector also known as the Basel Core Principles (BCP). The BCP aspire to improve banks' efficiency and soundness along with preventing major crisis in the sector.

[4] The 4 round of surveys provide a snapshot of bank regulation and supervision respectively in 1999, 2002 and 2005/2006 and 2011/2012. They respectively cover 118, 151, 143, and 142 countries. Their coverage of African countries is as follow: 16, 35, 32, and 31. Hence, our survey offers a better coverage of African countries.

development and stability. For instance, Chortareas et al. (2011) find that tighter capital requirements and empowering supervisors lead to enhanced bank efficiency mainly in developed countries. The relationship is inverted when a sample of less developed countries is used.

Studying Africa is of particular interest for policy purposes. Following multiple episodes of bank crises during the 80's and the 90's, most African countries implemented reforms to align their practices with best industry standards hoping that this will enhance banking system efficiency and stability and consequently promote economic development. Largely as a result of these reforms, fragility in African banks subsided. But, African countries are increasingly criticized for preventing the continent from delivering greater financial development and inclusion because of their conservative approach to regulation. Beck et al. (2011) argue that Africa should adopt a different approach to regulation based on a "best fit" rather than a "best practices" approach. Therefore, it is important to empirically examine which regulation practices are associated to better efficiency outcomes in the African context to inform future reforms and help the continent reap off the growth enhancing effects stemming from well-functioning banking systems. The results could also be useful to inform policy makers in other developing regions facing similar challenges to Africa.

Our results show strong variations in the relationship between regulation and bank efficiency in Africa; and these variations are very often influenced by the risk level and size of banks. We find that the efficiency of African banks is hindered by tighter restrictions on exit and on permitted activities. Conversely, increased liquidity and diversification requirements and the availability of financial safety nets seem to have positive effects on bank efficiency. These results hold for different bank size and risk groups we consider. We also find that tighter restrictions on entry increase the efficiency of large banks and decrease the efficiency of small banks. Moreover, our results suggest that financial repression through price controls negatively affects the efficiency of small banks only regardless of their risk level. A similar conclusion is found for increased transparency requirements and stringent capital requirements. We also find that supervision quality is associated with lower efficiency for low risk banks regardless of their size. Overall our findings support the risk proportionality approach in regulation and a departure from the "one size fits all" approach that has been used so far in Africa.

The remainder of the paper is structured as follows. Section 2 summarizes the relevant literature for our work while section 3 describes our data and methodology. In section 4 we discuss the empirical findings of our basic model and our robustness tests while in section 5 we investigate how bank size and risk level affects the relationship between bank efficiency and regulation. Section 6 concludes the paper.

2. Literature Review

Available literature suggests that the relationship between bank regulation and efficiency is highly dependent on the type of regulation under study. This literature mainly focuses on regulation aspects that are related to the 3 pillars of the Basel capital framework namely capital adequacy, official supervisory power and market discipline.

2.1. Capital Requirements

Chortareas et al. (2011) and Ben Naceur et al. (2009) find that more stringent capital requirements lead to enhanced bank efficiency and performance. Likewise, Klomp and de Haan (2011) show that capital requirements reduce both capital and asset risk while Boudrigua et al. (2009) report that such requirements are associated with reduced levels of Non-Performing Loans (NPLs) in the banking sector. These findings support the view that capital requirements serve as a risk sharing channel whereby shareholders have a greater incentive to closely monitor banks because they have a larger investment at stake. This closer monitoring is expected to enhance bank performance and efficiency. Interestingly, Chortareas et al. (2011) find that the relationship between capital requirements and efficiency holds mainly for developed countries and is inverted when a sample of less developed countries is used. They argue that this result reflects excessive government interference in developing countries which translates into inefficient credit allocation. On the other hand, Pasiouras et al. (2009) show that, in terms of bank efficiency, there is a trade-off to be made when tightening capital requirements. They find that increased capital requirements are positively related to cost efficiency but negatively related to profit efficiency. This result supports, to a certain extent, the view that stringent capital requirements reduce banks' incentive to improve efficiency and performance by increasing barriers at entry and preventing active competition.

2.2. Supervision Quality and Independence

The Basel committee on banking supervision stresses the importance of supervision quality and independence in fostering a stable and well performing banking system. However, there are conflicting views about the benefits of stronger supervision. On the one hand, proponents argue that supervisors need significant resources and powers to prevent banks from engaging in undesirable activities and from taking excessive risks, especially in light of the growing complexity of banking activities. It is also paramount to ensure their independence. Under this view, better supervision fosters bank stability and efficiency. Chortareas et al. (2011) and Pasiouras et al. (2009) provide support to this view by showing that empowering supervisors leads to enhanced bank efficiency. But, Barth et al. (2010) conclude that this relationship holds only for independent supervisors. As a matter of fact, offering supervisors more power in itself has no significant effect on bank efficiency while the independence and experience of supervisors are positively associated with enhanced efficiency. On the other hand, opponents argue that giving supervisors more power and independence fosters corruption because supervisors are mainly interested in increasing their own welfare. Under this view, supervisors use their power to extract favors from banks in the form of donations, bribes or loans for their own benefit or their entourage rather than seeking to improve global welfare. By pushing banks to make sub-optimal lending decisions, powerful supervisors cause reduced bank performance and efficiency. This view is supported by results reported in Demirgüç-Kunt et al. (2011) who find that compliance with the BCP principle of official supervisory power leads to increased risk levels. Similarly, Barth et al. (2004) show that official supervisory power does not have a significant effect on bank development and performance. They also conclude that independent supervision has a rather weak effect on bank development and efficiency.

2.3. Private Monitoring

Private monitoring refers to the disclosure of information to officials, the public and specialized entities such as rating agencies and auditors. It is expected to complement

existing regulation and supervision to monitor and discipline banks. There are divergent views about the benefits of private monitoring. A first view argues that bank shareholders and creditors have a greater incentive to monitor banks than regulators because of their on-going ownership and lending relationships. This view is supported by findings reported in Pasiouras (2007, 2009) and Barth et al. (2010) who find that private monitoring is associated with enhanced bank efficiency. Similarly, Barth et al. (2004) show that private monitoring reduces the level of NPLs and cost of intermediation. Conversely, a dissenting view argues that private monitoring cannot effectively discipline banks because capital market stakeholders may not have the capacity or required financial resources or incentives to exercise effective monitoring. This view is supported by findings reported in Chortareas et al. (2011) who show that a higher degree of information disclosure to officials, the public, and audit and rating agencies is associated with lower bank efficiency and performance.

2.4. *Restrictions on Banking Activities*

The benefits of imposing restrictions on banking activities are far from being the subject of a consensus. Opponents argue that such restrictions prevent banks from achieving economies of scope and scale and from diversifying their income sources. Djankov et al. (2002) argue that such restrictions only lead to increased bargaining power of regulators which is not necessarily good for the sector. This view suggests that putting restrictions on banks' activities hinders their efficiency and performance and is supported by findings in Barth et al (2010) and Chortareas et al. (2011). Conversely, proponents argue that restrictions on banks' activities help prevent the creation of complex structures that are hard to monitor or banks that are too large to discipline. By obliging banks to do what they do best and to keep simple balance sheets, restrictions should lead to improved efficiency. In support of this view, Pasiouras et al. (2009) show that tighter restrictions on bank activities improve profit efficiency. Yet they show that such restrictions harm cost efficiency suggesting that by diversifying activities banks still bear the risk of not being able to manage the entire activities panel and thus incurring costs.

2.5. *Restrictions on Entry into Banking*

Banking regulatory frameworks commonly include conditions that institutions must comply with to be able to offer banking services. The rationale for using these conditions is to improve quality at entry and therefore bank stability and performance. Yet, opponents to the implementation of such conditions argue that they mainly result in greater barriers to entry which hinders competition and innovation in the banking sector. Demirguc-Kunt et al. (2003) and more recently Ben Naceur et al. (2011) find that lower barriers to entry into banking are associated with reduced cost of intermediation. Likewise, Barth et al. (2004) show that restricting entry into banking reduces performance as measured by overheads costs. The authors also find that limiting foreign banks' entries is negatively related to banking sector development and increases the likelihood of occurrence of a banking crisis. Conversely, Pasiouras et al. (2007) find that requirements on entry to banking have no impact on bank efficiency.

2.6. *Deposit Insurance Schemes*

Deposit insurance schemes are expected to prevent bank overruns by making necessary resources available to support failing banks. This should translate into improved banking sector performance and stability. Yet, deposit insurance schemes are also likely to reduce the

incentive for depositors and creditors to perform effective monitoring and to institutionalize the liability of the government (Beck et al, 2011). This would cause banks to take excessive risks which could hinder banking sector performance and stability. Ioannidou and Penas (2010) find evidence in support of the moral hazard associated with the presence of deposit insurance schemes in the case of Bolivia. Likewise, Barth et al. (2004) show that a generous deposit insurance scheme increases the likelihood of occurrence of a major banking crisis. Similarly, Barth et al. (2010) show that deposit insurance schemes have a negative effect on banks' efficiency. Yet, Klomp et al. (2011) show that deposit insurance schemes do not have any significant impact on banks' risk.

2.7.   *Regulation and Bank Efficiency in Africa*

There are two broad strands of literature that are related to our paper. The First strand uses cross country samples to estimate the level of bank efficiency and its basic determinants. For instance, Chen (2009) estimates the efficiency of 77 banks from 10 middle income countries in sub-Saharan Africa while Kablan (2007) studies how bank efficiency in the West African Economic Monetary Union is affected by its ownership structure. While these papers study determinants of observed efficiency, they did not include controls for regulation. [5]

The second strand uses country case studies to investigate the impact of regulatory reforms on bank performance and efficiency. These include Ben Naceur et al. (2009) who study the effect of change in capital adequacy regulation in Egypt, Hauner and Peiris (2005) who use a sample of 14 commercial banks from Uganda to assess changes in efficiency following the privatization of UCB to Stanbic and consolidation of the banking sector in 2002 and Abdelaziz et al. (2011) who assess the financial liberalization process in Tunisia.

Our paper fills a gap in the literature by providing what we believe is the first study of the relationship between bank efficiency and regulation and supervision covering 42 African countries.

3. Sample and Methodology

This section describes our variables, data sources and methodology.

3.1.   *Efficiency Scores*

We use the Data Envelopment Analysis (DEA) technique to estimate efficiency scores for African banks. The DEA is a non-parametric method that uses linear programming to develop production frontiers by enveloping multiple inputs/outputs data of a given sample. DEA is widely used in the literature to estimate efficiency scores. It is well adapted for small samples and does not require a specification of the functional form of the data to construct the production frontier nor assumptions on the distribution forms of errors (Bauer et al. 1998).

An efficiency score of 1 means that outputs cannot be expanded further without increasing inputs. Conversely, an efficiency score below 1 suggests that the output level could be managed with fewer inputs. The DEA method could be constructed using the input orientation (minimizing inputs) or the output orientation (maximizing outputs) approach. In our case, the first approach would capture the ability of a bank to produce a given level of output by

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[5] Chen (2009) finds that restrictions on alternative bank activities lead to lower cost efficiency levels. Yet the authors use this variable as a proxy for market structure.

utilizing minimum combination of inputs, while, the second approach captures a bank's ability to produce maximum level of output given the current level of inputs (Cooper et al. 2000). We use the input-oriented approach because banks often seek to control costs and have more influence over inputs than outputs. This is consistent with the existent literature (Chortareas (2011), Pasiouras (2007), Barth et al. (2010)). We use the input oriented approach with variable returns to scale to allow for the production technology of banks to exhibit increasing, constant or decreasing returns to scale.

Three inputs and three outputs are used to estimate efficiency scores. Inputs are: Total costs (sum of interest and non-interest expenses), total fixed assets and deposits and short term funding. The 3 outputs we use are total loans, other earning assets and non-interest income measured by the amount of net fees and commissions.

3.2.   Variables and Data Sources

In 2010, the African Development Bank (AfDB) in collaboration with the Making Finance Work for Africa partnership (MFW4A) conducted a 2-part survey on the state of financial systems and bank regulation in Africa for the purpose of a book discussing financial sector development in Africa.[6] The objective of the survey was to collect detailed information about the structure of financial systems and the state of bank regulation in the 53 African countries.[7] Forty six (46) countries completed the questionnaire.

The survey part covering bank regulation included 77 questions. For the purpose of this paper, we assigned these questions to 9 different categories of regulation namely, (i) Overall capital stringency, (ii) Restrictions on entry into banking, (iii) Restrictions on activities, (iv) Transparency requirements, (v) Restrictions on exit from banking, (vi) Liquidity and diversification requirements, (vii) Price controls (financial repression), (viii) Financial safety nets and (ix) Supervision quality. Given that the initial questionnaire did not include questions related to the quality of supervision, we sent a follow up questionnaire to African central banks to collect this information. Thirty seven (37) African countries out of the 46 we contacted completed the follow-up questionnaire.

For each of these 9 categories, we allocated a score ranging between 0 and 10 to the different questions that were assigned to it using the following methodology: Answers to simple qualitative questions (Yes/No) are assigned a score of 10 (if the regulation is stringent from a prudential perspective) or 0 (if the regulation is more liberal from a prudential point view). Answers to more complex questions are assigned scores on a scale from 0 to 10 based on the perceived degree of regulatory stringency, with higher values reflecting a more conservative approach to regulation. Annex 1 provides a detailed description of the questions included in each category and how these were coded. Scores of individual questions were then used to calculate category scores.

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[6] The book is entitled "*Financing Africa: Through the Crisis and Beyond*". It was jointly published by the African Development Bank, the World Bank and the German Federal Ministry for Economic Cooperation and Development (GIZ) with financial support from the MFW4A partnership. The main authors are Thorsten Beck, Samuel Munzele Maimbo, Issa Faye and Thouraya Triki. The survey questionnaire was designed by Thorsten Beck with financial support from GIZ. It was later revised to reflect comments provided by participating institutions. A copy of the questionnaire is available from the authors upon request.

[7] At the time the survey, South Sudan was still not established and therefore the country was not covered by the survey. For the purpose of this paper, South Sudan is captured under "Sudan".

Next, we related country-level data describing regulation and supervision to bank level data from Bankscope published by bureau van dijk. We focused on commercial banks operating in the 46 African countries for which we had data on regulation and supervision. Our initial sample included 1,592 observations relative to 298 banks operating in 45 countries.[8] Our panel covers the period 2005-2010 and is unbalanced. We then checked our data for errors and erroneous entries and removed countries for which data necessary to calculate efficiency scores were not available.[9] This exercise led to a final sample of 1,306 observations relative to 269 banks operating in 42 African countries. Balance sheet and income statement data from Bankscope were used to calculate the efficiency scores with the DEA method and our control variables describing bank characteristics: *Size* measured as the natural logarithm of the bank's total assets and *Capital Strength* measured by the ratio of the book value of equity to total assets.

To control for the quality of the institutional environment in our sample countries, we use 2 variables: *Business Freedom* measured by the Index of Economic Freedom published by the Heritage Foundation and *Government Policy Preference* available in Keefer (2010). We also control for *Inflation* measured by changes in the Consumer Price Index and *Country Income* measured as the natural logarithm of GDP per capita. Both variables correspond to controls for macroeconomic conditions. Finally, we include variables measuring *State Ownership* in the banking sector as well as *Bank Concentration* to control for the structure of the financial system in the country. Banking systems that are concentrated and dominated by state owned banks are more likely to be inefficient. Data about the state ownership in banking systems are collected from the AfDB/MFW4A survey part covering the structure of financial systems while data on concentration comes from the World Bank Development Indicators.

Annex 2 describes our variables and data sources, Annex 3 to 5 provide details about our estimated efficiency scores and sample composition by country and year while Table 1 and 2 provide, respectively, descriptive statistics and correlation matrix for our variables.

3.3.   Methodology

We use the following model to study the relationship between bank efficiency, regulation and supervision:

$$Y_{i,k,t} = \propto + \beta_1 A_i + \beta_2 B_{i,k,t} + \beta_3 C_{i,t} + year_t + \varepsilon_{i,k,t}$$

Where $Y_{i,k,t}$ describes the efficiency score of bank k in country i at year t, A_i is a vector measuring the stringency of bank regulation and quality of supervision in country i, $B_{i,k,t}$ and $C_{i,t}$ are vectors measuring respectively, bank-specific and country-specific characteristics. $Year_t$ is a yearly dummy while $\varepsilon_{i,k,t}$ is the error term.

Since efficiency scores are truncated below from zero and above from 1, we use the Simar and Wilson (2007) truncated estimator with bootstrapped confidence intervals. This method ensures consistent inferences and solves the issue of interdependence of the efficiency scores given that they represent a relative measure by construction. The Simar and Wilson (2007)

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[8] We lost Comoros because Bansckope does include information about banks operating in this country.
[9] Our initial sample from Bankscope included 1 bank from each of the following countries: Chad, Central African Republic and Sao Tome and Principe. These banks had missing data that prevented the calculation of their efficiency scores. Therefore, we lost these 3 countries in our final sample.

method consists in calculating estimated efficiency scores using a truncated regression and then regressing them on covariates using a bootstrapped truncated regression. We draw 1,500 samples from the empirical distribution of the estimated efficiency scores to compute unbiased estimates for dependent variables and their confidence intervals.[10] We use heteroskedastic-robust standard errors clustered for countries in the truncated regressions.[11]

4. Empirical Results

4.1. Basic Regressions

Columns (1) to (9) in Table 3 summarize our results for regressions of bank efficiency scores on individual regulation and supervision categories. Given that some regulatory variables are highly correlated, we were not able to include all of them in a single specification. Therefore, we run two separate models where we simultaneously incorporate several regulatory variables that exhibit acceptable correlation levels. Results of these 2 models are reported in columns (10) and (11).

Results reported in columns (1) to (11) of Table 3 suggest that tighter restrictions on exit reduce bank efficiency while tighter restrictions on entry improve efficiency. The finding for restrictions on exit supports the view that such regulation increases the liquidation cost for banks which reduces their incentive to enter the sector, deters competition and consequently efficiency. An alternative explanation is that stringent exit rules make it difficult for poorly performing banks to exit the banking sector. Coats and Liuksila (1999) argue that "*general insolvency proceedings are not adequate for the task of an expeditious, effective, and economic administration of insolvent banks or deployment of their assets*". For them allowing failing banks to keep operating leads to a reduction of resources productivity.

Our result on barriers to entry contrasts with this finding and suggests that higher barriers to entry have efficiency-enhancing effects. This result is consistent with the view that tighter restrictions on foreign banks and other entities to enter the banking sector helps improve quality at entry whereby only well performing and efficient players will be able to enter the market. Results in Table 3 also suggest that financial repression through price controls and liquidity and diversification requirements positively affect bank efficiency while supervision quality, financial safety nets and overall capital stringency do not have a statistically robust effect on bank efficiency in Africa. Moreover, our findings provide some support to the view that limiting bank activities reduces their income diversification opportunities which translates into reduced efficiency. This is consistent with findings reported in Barth et al. (2001, 2010), and Pasiouras et al. (2009). Similarly, we find that increased transparency requirements reduce the efficiency of African banks. This suggests that the cost of information disclosure in Africa outweighs the benefit of private monitoring performed by African capital market stakeholders.

Since our findings for restrictions on entry and price controls are not very intuitive, we investigate further whether they are driven by some bank or country characteristics. In column (12) we rerun model (10) while adding an interaction term between restrictions on entry and bank size. The interaction term has a negative and significant coefficient while the variable measuring restrictions on entry remains positive and significant. This result suggests that

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[10] For a detailed description of the estimation algorithm, readers could refer to Simar and Wilson (2007).

[11] Results remain unchanged when we use clustering by banks.

tighter restrictions on entry positively affect efficiency which is consistent with the improved quality at entry argument. But this effect becomes weaker as the bank becomes larger. We also rerun model (11) while adding an interaction term between price controls and level of concentration in the banking sector. Our results are reported in column (13) and show that price controls becomes negatively related to bank efficiency but that the effect of such regulation is positive in concentrated banking systems. Our conclusions for the other regulatory aspects remain unchanged.

Aside from regulation and supervision variables, we also find that bank size and capital strength are positively related to bank efficiency. Moreover, banks are more likely to be efficient in countries exhibiting high GDP per capita, low inflation rate and more business freedom. Our results also suggest that higher share of government ownership and more concentration in the banking sector have negative effects on bank efficiency but these results are not robust.

4.2.   Robustness Check Tests

Results discussed in the previous section on the relationship between bank efficiency, regulation and supervision could suffer from endogeneity problems. Indeed, efficient banks could lobby for certain type of regulation that fosters their growth making the regulatory framework endogenous to banking sector performance.

To address this issue, we use an instrumental variables approach to isolate the exogenous component in regulation and supervision. A good instrument must be correlated to the regulatory and supervisory framework in the country but not to banks' efficiency. As in Barth et al. (2004, 2010), we use the country *Legal origin* (English/French), *Latitude* (geography), *Ethnic fractionalization*, *Year of Independence*, and the dominant *Religion* in the country as instruments.[12] We also control for *Women Participation in Politics* measured by the percentage of women in parliament. Chattopadhya and Duflo (2004) show that the gender of policy makers influences policy decision and legislation in a country. On the other hand, female policy makers are unlikely to influence the efficiency of individual banks. We perform 3 tests to check the validity of our instruments: the instruments validity test, the weak instruments test and the over-identification test. Results are reported in Annex 6 and show that all selected instruments are valid and over-identified.

Result reported in columns (1) and (2) of Table 4 show that our conclusions describing a positive effect of liquidity and diversification requirements on bank efficiency is robust to control for endogeneity. These results also confirm our previous conclusions that restrictions on banking activities and on exit from banking, price controls and tighter transparency requirements negatively affect banks' efficiency in Africa. Interestingly, the variable measuring restrictions on entry is no longer significant while the one measuring availability of financial safety nets becomes significant and is positively related to bank efficiency. Finally, our results confirm that capital requirements and supervision quality do not significantly affect bank efficiency in Africa.

We further check the robustness of our findings by performing three additional tests. First, we rerun specifications (1) and (2) while adding 2 controls for the structure of bank ownership: *Foreign* a dummy variable that equals 1 if the majority of the bank's shares is owned by

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[12] For a discussion of the rationale of using these instruments, readers could refer to Barth et al. (2004, 2010).

foreign entities and *Government* a dummy variable that equals 1 if the bank is state-owned. It has been shown that ownership structure affects bank performance in developing countries. For instance, Micco et al. (2004) find that foreign ownership is associated with higher bank performance while government ownership is associated with lower bank performance. Results for this test are reported in columns (3) and (4) of Table 4 and show that our conclusions pertaining to the regulation variables remain unchanged. These results also suggest that the efficiency of African banks is not significantly affected by their ownership structure as both *Foreign* and *Government* have non-significant coefficients.

Second, we rerun specifications (1) and (2) of Table 4 while excluding from the sample African countries using the Basel II capital framework.[13] This test allows us to test whether our results are driven by some well-established African banking systems such as South Africa, Mauritius and Morocco which have already moved to the Basel II capital framework. Results of this test are reported in columns (5) and (6) of Table 4. Our conclusions pertaining to the regulation variables remain unchanged with the exception of *Restriction on Entry* (which becomes significant) and *Price Controls* (which loses its significance).

Third, we rerun specifications (1) and (2) of Table 4 while controlling for the effect of the financial crisis to identify variations in the efficiency scores of African banks resulting from the 2008 financial crisis. *Crisis* is a dummy variable equals 1 for the years starting 2008 onward. Results for this last test are reported in columns (7) and (8) of Table 4 and support our previous conclusions.

5. Are All Banks Affected the Same Way by Regulation?

Results reported in Table 3 and 4 suggest that bank characteristics influence the way regulation affects bank efficiency. In this section, we investigate in details how 2 bank characteristics affect the relationship between bank regulation, supervision and efficiency, namely size and risk. We therefore rerun models (1) and (2) of Table 4 for 2 risk groups: low risk banks and high risk banks as well as 2 size groups: small banks and large banks. We measure bank risk by banks' Z-score while size is measured by the natural logarithm of total assets. The high risk (small) group comprises banks whose Z-score (total assets variable) is below the sample median while the low risk (large) group corresponds to banks with Z-scores (total assets variable) above the sample median . Our results are reported in Table 5.

We find that higher barriers to entry increase the efficiency of large banks and decrease the efficiency of small banks. The interaction term between size and restrictions on entry in specification (1) has a negative and significant coefficient as well. These 2 results suggest that large banks benefit from higher barriers to entry because the latter prevent the entry of new competitors in the market and consequently allow large banks to improve their performance and efficiency, through economies of scale and scope, among others. Yet, the benefits that large banks receive from such regulatory barriers to entry seem to decrease as the bank becomes larger. In other words, as banks become larger part of the efficiency benefits drawn from lower competition are reduced by inefficiencies resulting from a larger size. Restrictions on entry seem also to improve the efficiency of high risk banks. In unreported results[14], we split the sample by combining the 2 criteria of size and risk and find that this finding is mainly driven by large banks. Our analysis reveals also that financial repression through price controls affects negatively the efficiency of small banks only. Additional tests we perform

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[13] This exercise led to the elimination of banks operating in South Africa, Morocco and Mauritius.
[14] These results are available from the authors upon request.

show that this result holds regardless of the bank risk level. This result reflects the fact that small banks are often more sensitive to price variations and limitations on interest rates they could charge to clients.

Across bank groups, better supervision quality seems to lead to lower efficiency for low risk banks and large banks in Africa. Further analysis suggests that the result for large banks is mainly driven by low risk banks and that enhanced quality of supervision reduces efficiency of low risk banks regardless of their size. This result suggests that supervision requirements are costly for low risk banks which have to comply with the same requirements than risky banks. Results in Table 5 also suggest that more stringent capital requirements reduce efficiency of small banks. A possible interpretation for this result is that stringent capital requirements could translate into unexploited resources for small banks because they do not have a strong network to deploy these resources. This ends up hurting their efficiency. Interestingly, our finding is consistent with the view that African regulators may have been focusing too much on stability causing small banks to hold sub-optimal levels of capital.

Restrictions on exit and on permitted activities seem to negatively affect bank efficiency while liquidity and diversification requirements and availability of financial safety nets are associated with improved bank efficiency. These results hold for all size and risk groups we consider. Interestingly, our results show that although both restrictions on entry and on exit are considered as barriers to active competition, they do not have the same effect on bank efficiency. The distinction made in this paper shows the negative effect of restrictions on exit for all bank groups which is not the case for restrictions on entry.

Transparency requirements significantly decrease the efficiency of all bank groups with the exception of large banks. This result holds regardless of the risk level we consider for large banks. In other words, small banks are the main losers from increased transparency requirements which could reflect the high cost that such requirements impose on these institutions compared to their limited resources.

Finally, our results show some interesting relations between bank efficiency and our control variables: the GDP per capita has a positive and significant coefficient hinting to a positive relation between economic development and bank efficiency; government ownership of banks' assets increases efficiency of small banks and decreases efficiency of large banks; business freedom is positively and significantly associated to efficiency for high risk banks and has no significant effect for low risk banks while capital strength increases the efficiency of all banks except for low risk banks.

Results reported in Table 5 could be driven by the ownership structure of the banks included in our sample. Indeed, when looking at the different bank categories used earlier, especially the large and small bank groups, we noticed that several large banks in our sample are foreign or state-owned. To check the robustness of our findings, we rerun all specifications in Table 5 while adding 2 controls for ownership: *Foreign* and *Government*. Results are reported in Table 6 and show that the results pertaining to the regulation and supervision variables remain stable with the exception of restrictions on activity for the low risk banks (which becomes non-significant).

6. **Conclusion**

The objective of this paper is to study the relationship between bank efficiency and regulation in Africa. We use a new survey implemented by the African Development Bank (AfDB) in collaboration with the Making Finance Work for Africa partnership (MFW4A) on bank regulation in 46 African countries to perform our analysis. We expand the existing literature by investigating new aspects of bank regulation that were not explored before in the literature, namely restrictions on exit and price controls. We also offer what we believe is the first study on the subject dedicated to a developing region. As shown by Chortareas et al. (2011), among others, the relationship between bank efficiency and regulation varies between developed and developing countries. Moreover, we provide the first detailed analysis that assesses how the relationship between regulation and efficiency is affected by the size and risk of banks.

Our results show that restrictions on exit and on permitted activities negatively affect bank efficiency while liquidity and diversification requirements and availability of financial safety nets are associated with improved bank efficiency. Those result hold regardless of the bank size and risk group we consider. We also find that the effect of some bank regulation in Africa is highly dependent on the size and risk level of the bank. For instance, we find that tighter restrictions on entry to banking increase the efficiency of large banks and decrease the efficiency of small banks. Hence, while both restrictions on entry and exit are considered as barriers to competition, the distinction made in this paper shows that they have different effects on bank efficiency, at least in Africa. Similarly, we find that small banks are the main losers from increased transparency requirements, financial repression through price controls and stringent capital requirements. On the other hand, enhanced quality of supervision reduces the efficiency of low risk banks regardless of their size.

Our findings have strong policy implications as they underscore the need to adapt some aspects of bank regulation to the size and risk level of the banks being regulated. This is particularly true for transparency requirements, financial repression through price controls and capital requirements which seem to be detrimental to small banks. In a continent where the total assets of an average bank do not exceed USD 220 million compared to USD 1 billion for non-African banks (Beck et al., 2011), it is critical that existing bank regulation does not hinder the efficiency of small banks. Our findings support the argument that regulation should not be based on a "size fits all" approach but rather adapted to the risks associated with the institution that is being regulated and the resources at stake.

Table 1. Descriptive Statistics

Variable Name	Mean	Median	STDEV	Min	Max	N
Regulation and Supervision Variables						
Restrictions on Entry	4,04	3,56	1,60	1,31	7,50	1'306
Restrictions on Activities	4,24	3,89	1,41	1,94	8,33	1'306
Transparency Requirements	8,31	8,54	0,96	5,63	9,72	1'306
Restrictions on Exit	5,59	5,00	2,48	1,67	10,00	1'306
Overall Capital Stringency	6,05	7,00	1,98	2,00	9,00	1'306
Liquidity and Diversification Requirements	5,03	5,31	1,43	2,50	8,44	1'306
Price Controls	1,40	0,00	1,77	0,00	7,50	1'306
Financial Safety Nets	2,10	0,00	2,83	0,00	8,75	1'306
Supervision Quality	4,20	3,75	1,38	1,88	7,50	1'195
Bank-Level Variables						
Efficiency Score	0,41	0,33	0,24	0,01	1,00	1'306
Inputs Variables						
Deposits and Short Term Funding	1936,88	233,32	8 016,14	0,01	84 125,03	1'306
Fixed Assets	44,06	7,54	120,35	0,00	1 126,32	1'306
Interest Expenses	95,64	6,14	548,58	-	7 508,09	1'306
Non-Interest Expenses	79,62	12,31	297,39	0,00	3 004,01	1'306
Outputs Variables						
Loans	1470,62	137,62	6 962,62	0,00	67 428,50	1'306
Net Fees and Commissions Income	38,30	4,58	174,54	-5,74	1 938,47	1'306
Other Earning Assets	759,95	93,12	3 221,79	0,00	48 988,27	1'306
Bank-Characteristics						
Size	5,65	5,72	2,30	-4,62	11,65	1'306
Capital Strength	0,12	0,11	0,10	-0,97	0,87	1'306
Z-Score	22,95	15,84	27,84	-6,68	256,04	1'306
Foreign	0,58	1,00	0,49	0,00	1,00	1'306
Government	0,13	0,00	0,34	0,00	1,00	1'306
Country-Level Variables						
Country Income	7,15	6,95	1,05	5,11	9,40	1'306
Inflation	0,08	0,07	0,06	-0,02	0,44	1'296
State Ownership	0,17	0,06	0,23	0,00	0,92	1'146
Bank Concentration	0,62	0,62	0,18	0,31	1,00	1'272
Business Freedom	59,75	58,70	12,98	23,40	85,00	1'229
Government Policy Preference	1,41	1,00	1,42	0,00	3,00	1'293

STDEV and N describe respectively the standard deviation and number of observations for each variable. Refer to Annex 2 for the definition of variables included in this Table.

Table 2. Correlation Matrix of Regulation and Supervision Variables

	Restrictions on Entry		Restrictions on Activities		Transparency Requirements		Restrictions on Exit		Overall Capital Stringency		Liquidity and Diversification Requirements		Price Controls		Financial Safety Nets		Supervision Quality
Restrictions on Entry	1,000																
Restrictions on Activities	0,109	***	1,000														
	(0,000)																
Transparency Requirements	-0,244	***	0,028		1,000												
	(0,000)		(0,275)														
Restrictions on Exit	-0,206	***	0,047	*	0,233	***	1,000										
	(0,000)		(0,063)		(0,000)												
Overall Capital Stringency	0,247	***	0,298	***	0,037		0,459	***	1,000								
	(0,000)		(0,000)		(0,146)		(0,000)										
Liquidity and Diversification Requirements	-0,174	***	0,046	*	0,251	***	0,036		0,288	***	1,000						
	(0,000)		(0,068)		(0,000)		(0,156)		(0,000)								
Price Controls	0,429	***	-0,034		0,179	***	-0,479	***	-0,128	***	-0,034		1,000				
	(0,000)		(0,179)		(0,000)		(0,000)		(0,000)		(0,182)						
Financial Safety Nets	0,354	***	-0,260	***	0,034		0,108	***	0,210	***	0,077	***	0,093	***	1,000		
	(0,000)		(0,000)		(0,184)		(0,000)		(0,000)		(0,003)		(0,000)				
Supervision Quality	-0,049	*	-0,153	***	0,289	***	0,142	***	0,029		0,082	***	0,288	***	0,302	***	1,000
	(0,072)		(0,000)		(0,000)		(0,000)		(0,293)		(0,003)		(0,000)		(0,000)		

*, **, *** describe statistical significance at the 10%, 5% and 1% level, respectively. P-values are reported in the parentheses. Refer to Annex 2 for the definition of variables included in this Table.

Table 3. Regulation, Supervision and Bank Efficiency: Basic Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Restrictions on Entry	0,025 ***									0,028 ***		0,076 ***	
Restrictions on Activities		-0,009								-0,018 ***		-0,019 ***	
Supervision Quality			0,004							0,001		0,003	
Restrictions on Exit				-0,018 ***						-0,011 ***		-0,009 ***	
Liquidity and Diversification Requirements					0,019 ***					0,026 ***		0,021 ***	
Price Controls						0,013 ***					0,017 ***		-0,034 *
Financial Safety Nets							0,004				0,003		0,001
Transparency Requirements								-0,045 ***			-0,045 ***		-0,042 ***
Overall Capital Stringency									0,000		0,004		0,005
Size	0,048 ***	0,047 ***	0,047 ***	0,048 ***	0,046 ***	0,046 ***	0,046 ***	0,051 ***	0,047 ***	0,047 ***	0,050 ***	0,097 ***	0,051 ***
Capital Strength	0,237 ***	0,240 ***	0,238 ***	0,237 ***	0,208 ***	0,221 ***	0,227 ***	0,238 ***	0,231 ***	0,238 ***	0,221 ***	0,249 ***	0,248 ***
Bank Concentration	-0,029	-0,082 **	-0,067 *	-0,146 ***	-0,062 *	-0,063 *	-0,052	-0,170 ***	-0,076 **	-0,059	-0,129 ***	-0,060	-0,237 ***
State Ownership	-0,075 **	0,027	0,014	-0,021	0,047 *	0,025	-0,001	-0,102 ***	0,013	-0,030	-0,110 ***	0,008	-0,078 **
Inflation	-0,424 ***	-0,426 **	-0,449 ***	-0,111	-0,516 ***	-0,279 *	-0,420 ***	-0,449 ***	-0,428 **	-0,351 *	-0,296 *	-0,477 ***	-0,209
Country Income	0,022 **	0,030 ***	0,033 ***	0,056 ***	0,041 ***	0,035 ***	0,036 ***	0,030 ***	0,033 ***	0,037 ***	0,033 ***	0,028 ***	0,025 **
Government Policy Preference	0,014 ***	0,014 ***	0,015 ***	0,010 **	0,007	0,016 ***	0,015 ***	0,020 ***	0,014 ***	0,004	0,024 ***	0,006	0,026 ***
Business Freedom	0,005 ***	0,005 ***	0,005 ***	0,004 ***	0,005 ***	0,005	0,005	0,006	0,005	0,006 ***	0,005 ***	0,006 ***	0,006 ***
Restrictions on Entry x Size												-0,010 ***	
Price Controls x Bank Concentration													0,080 ***
N	1,032	1,032	996	1,032	1,032	1,032	1,032	1,032	1,032	996	1,032	996	1,032
Banks	218	218	211	218	218	218	218	218	218	211	218	211	218
Countries	29	29	28	29	29	29	29	29	29	28	29	28	29

This Table summarizes results from our basic regressions. "Efficiency scores" is the dependent variable and is calculated using the DEA method with 3 output and 3 input variables and variable returns to scale. Specifications are estimated using the algorithm of Simar and Wilson (2007) with 1,500 bootstrapped truncated regressions. We also use heteroskedastic-robust standard errors clustered for countries. The sample is a 6-period panel of African banks covering the period 2005- 2010. Year dummies are included but not reported for sake of brevity. *, **, *** describe statistical significance at the 10%, 5% and 1% level, respectively. Refer to Annex 2 for the definition of variables included in this Table.

Table 4. Regulation, Supervision and Bank Efficiency: Robustness Check Tests using Two Stage Least Squares

	Basic Model		Control for Ownership Structure		Control for Basel II-Compliant Countries		Control for 2008 Crisis Effect	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Restrictions on Entry	0,056		0,058		0,069 **		0,056	
Restrictions on Activities	-0,172 ***		-0,171 ***		-0,205 ***		-0,172 ***	
Supervision Quality	-0,012		-0,014		-0,002		-0,012	
Restrictions on Exit	-0,092 ***		-0,090 ***		-0,078 ***		-0,092 ***	
Liquidity and Diversification Requirements	0,121 ***		0,120 ***		0,109 ***		0,121 ***	
Price Controls		-0,144 **		-0,106 **		-0,084		-0,144 **
Financial Safety Nets		0,089 ***		0,088 ***		0,059 ***		0,089 ***
Transparency Requirements		-0,241 ***		-0,375 ***		-0,156 ***		-0,241 ***
Overall Capital Stringency		0,008		-0,024		0,028		0,008
Size	0,106 ***	0,044 ***	0,106 ***	0,043 ***	0,104 ***	0,037 ***	0,106 ***	0,044 ***
Capital Strength	0,223 ***	0,198 ***	0,226 ***	0,198 ***	0,166 ***	0,137 ***	0,223 ***	0,198 ***
Bank Concentration	0,105 **	-0,088	0,109 **	0,025	0,108 **	-0,104	0,105 **	-0,088
State Ownership	-0,020	-0,060 *	-0,017	-0,029	-0,043	-0,008	-0,020	-0,060 *
Inflation	-0,157	-0,187	-0,161	-0,184	-0,187	-0,235	-0,157	-0,187
Country Income	0,076 ***	0,053 ***	0,075 ***	0,055 ***	0,077 ***	0,052 ***	0,076 ***	0,053 ***
Government Policy Preference	-0,007	-0,004	-0,007	-0,008	-0,005	-0,008	-0,007	-0,004
Business Freedom	0,003 ***	0,002 **	0,003 ***	0,002 **	0,003 ***	0,002 ***	0,003 ***	0,002 **
Foreign			-0,012	-0,012				
Government			-0,014	-0,016				
Restrictions on Entry x Size	-0,014 ***		-0,014 ***		-0,015 ***		-0,014 ***	
Price Controls x Bank Concentration		0,049		-0,019		0,031		0,049
Crisis							-0,050 **	-0,032
N	979	979	979	979	867	867	979	979
Banks	217	217	217	217	188	188	217	217
Countries	29	29	29	29	26	26	26	26

This Table summarizes results from different robustness check tests we perform. "Efficiency scores" is the dependent variable and is calculated using the DEA method with 3 output and 3 input variables and variable returns to scale. 2SLS is used to estimate all specifications reported in this table. In the first step, we regress each regulation and supervision variable on valid instruments such as ethnic fractionalization, religion, legal origin, latitude, independence year and percentage of women in parliaments. Next, we use the predicted values from step 1 for the regulation and supervision variables to estimate specifications reported in this Table. Specifications in this second step are estimated using the algorithm of Simar and Wilson (2007) with 1,500 bootstrapped truncated regressions. We also use heteroskedastic-robust standard errors clustered for countries. The sample is a 6-period panel of African banks covering the period 2005- 2010. Year dummies are included but not reported for sake of brevity. *, **, *** describe statistical significance at the 10%, 5% and 1% level, respectively. Refer to Annex 2 for the definition of variables included in this Table.

Table 5. Regulation, Supervision and Bank Efficiency: Sample Split in Different Size and Risk groups

	Large Banks		Small Banks		High Risk Banks		Low Risk Banks	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Restrictions on Entry	0,210 ***		-0,163 ***		0,154 ***		-0,034	
Restrictions on Activities	-0,096 **		-0,248 ***		-0,597 ***		-0,055 *	
Supervision Quality	-0,094 ***		0,028		-0,017		-0,056 **	
Restrictions on Exit	-0,052 **		-0,081 ***		-0,067 **		-0,102 ***	
Liquidity and Diversification Requirements	0,208 ***		0,075 ***		0,059 **		0,179 ***	
Price Controls		0,081		-0,214 ***		-0,190		-0,071
Financial Safety Nets		0,032 ***		0,076 ***		0,053 ***		0,180 ***
Transparency Requirements		-0,062		-0,308 ***		-0,131 *		-0,333 ***
Overall Capital Stringency		0,014		-0,062 **		0,012		-0,042
Size	0,214 ***	0,082 ***	-0,049	0,007 **	0,145 ***	0,043 ***	0,046 *	0,041 ***
Capital Strength	0,392 ***	0,464 ***	0,171 ***	0,127 **	0,265 ***	0,159 **	0,023	0,020
Bank Concentration	0,088 *	0,234	0,091 *	-0,266 **	0,070	-0,146	-0,027	0,233
State Ownership	-0,113 **	-0,161 ***	0,189 ***	0,131 ***	0,002	-0,015	0,011	-0,017
Inflation	-0,325	-0,115	-0,181	-0,363 *	0,023	-0,241	-0,076	0,022
Country Income	0,037 ***	0,029 **	0,089 ***	0,047 ***	0,039 ***	0,044 ***	0,101 ***	0,077 ***
Government Policy Preference	-0,003	0,003	-0,011	-0,004	0,019 **	0,001	-0,023 **	-0,021 **
Business Freedom	0,005 ***	0,006 ***	-0,002	-0,002 *	0,002 **	0,003 **	0,001	0,000
Restrictions on Entry x Size	-0,028 ***		0,013		-0,022 ***		0,000	
Price Controls x Bank Concentration		-0,137		0,163 **		0,120		-0,171 *
N	489	489	490	490	475	475	504	504
Banks	126	126	139	139	125	125	135	135
Countries	27	27	28	28	27	27	27	27

This Table summarizes results from our basic regressions for different bank size and risk groups. "Efficiency scores" is the dependent variable and is calculated using the DEA method with 3 output and 3 input variables and variable returns to scale. 2SLS is used to estimate all specifications reported in this Table. In the first step, we regress each regulation and supervision variable on valid instruments such as ethnic fractionalization, religion, legal origin, latitude, independence year and percentage of women in parliaments. Next, we use the predicted values from step 1 for the regulation and supervision variables to estimate specifications reported in this Table. Specifications in this second step are estimated using the algorithm of Simar and Wilson (2007) with 1,500 bootstrapped truncated regressions. We also use heteroskedastic-robust standard errors clustered for countries. The sample is a 6-period panel of African banks covering the period 2005- 2010. Year dummies are included but not reported for sake of brevity. *, **, *** describe statistical significance at the 10%, 5% and 1% level, respectively. The high risk (small) group corresponds to banks which Z-score is below the median of the Z-score variable (total assets variable) while low risk (large) group corresponds to banks which Z-score is above the median of the Z-score variable (total assets variable). Refer to Annex 2 for the definition of variables included in this Table.

Table 6. Regulation, Supervision and Bank Efficiency: Sample Split in Different Size and Risk groups with Control for Ownership Structure

	Large Banks		Small Banks		High Risk Banks		Low Risk Banks	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Restrictions on Entry	0,199 ***		-0,155 ***		0,150 ***		-0,040	
Restrictions on Activities	-0,096 **		-0,242 ***		-0,601 ***		-0,048	
Supervision Quality	-0,092 ***		0,026		-0,013		-0,059 **	
Restrictions on Exit	-0,057 **		-0,081 ***		-0,070 **		-0,101 ***	
Liquidity and Diversification Requirements	0,212 ***		0,073 ***		0,060 **		0,182 ***	
Price Controls		0,072		-0,230 ***		-0,176		-0,036
Financial Safety Nets		0,033 ***		0,076 ***		0,053 ***		0,179 ***
Transparency Requirements		-0,072		-0,314 ***		-0,137 **		-0,322 ***
Overall Capital Stringency		0,012		-0,057 *		0,010		-0,043
Size	0,213 ***	0,084 ***	-0,039	0,006 *	0,145 ***	0,043 ***	0,043 *	0,040 ***
Capital Strength	0,378 ***	0,452 ***	0,176 ***	0,135 **	0,261 ***	0,162 **	0,037	0,038
Bank Concentration	0,066	0,199	0,098 *	-0,278 **	0,062	-0,127	-0,025	0,357 *
State Ownership	-0,114 **	-0,170 ***	0,196 ***	0,137 ***	0,010	0,002	0,019	-0,006
Inflation	-0,346	-0,128	-0,246	-0,447 **	0,014	-0,235	-0,114	-0,001
Country Income	0,038 ***	0,030 **	0,084 ***	0,039 ***	0,042 ***	0,048 ***	0,100 ***	0,079 ***
Government Policy Preference	-0,005	0,002	-0,010	-0,001	0,017 *	-0,001	-0,022 **	-0,022 **
Business Freedom	0,005 ***	0,006 ***	-0,001	-0,002 *	0,002 *	0,003 **	0,001	0,000
Foreign	0,031	0,028	-0,037 **	-0,049 ***	0,019	0,022	-0,028	-0,033 *
Government	0,027	0,027	-0,057 **	-0,068 ***	0,006	-0,014	0,005	0,012
Restrictions on Entry x Size	-0,027 ***		0,011		-0,022 ***		0,000	
Price Controls x Bank Concentration		-0,123		0,179 **		0,100		-0,226 **
N	489	489	490	490	475	475	504	504
Banks	126	126	139	139	125	125	135	135
Countries	27	27	28	28	27	27	27	27

This Table summarizes results from our basic regressions for different bank size and risk groups while controlling for the ownership structure of banks. "Efficiency scores" is the dependent variable and is calculated using the DEA method with 3 output and 3 input variables and variable returns to scale. 2SLS is used to estimate all specifications reported in this Table. In the first step, we regress each regulation and supervision variable on valid instruments such as ethnic fractionalization, religion, legal origin, latitude, independence year and percentage of women in parliaments. Next, we use the predicted values from step 1 for the regulation and supervision variables to estimate specifications reported in this Table. Specifications in this second step are estimated using the algorithm of Simar and Wilson (2007) with 1,500 bootstrapped truncated regressions. We also use heteroskedastic-robust standard errors clustered for countries. The sample is a 6-period panel of African banks covering the period 2005- 2010. Year dummies are included but not reported for sake of brevity. *, **, *** describe statistical significance at the 10%, 5% and 1% level, respectively. The high risk (small) group corresponds to banks which Z-score (total assets) below the sample median while the low risk (large) group corresponds to banks which Z-score(total assets) above sample. Refer to Annex 2 for the definition of variables included in this Table.

Annex 1: Coding of the Regulation and Supervision Variables

	Question	Weight	Coding
1. Overall Capital Stringency: This category captures information about capital requirements and rules for loan classification and provisioning. Higher values indicate more stringent requirements.			
	In case Basel I framework is used by banks primarily or partially, what is the minimum capital adequacy ratio?	3	>0.12=10; >0.08 and <0.12=7.5; 0.08=5
	How many categories does the regulatory loan and advances classification system have (including both performing and non-performing)?	2	2=10; >2 and <5=5; >5=0
	Which criteria are taken into account to classify loans and advances as non performing?	2	The highest of below
	(i) Non-payment for a certain number of days (Yes/No)		Yes=10
	(ii) Significant financial difficulty of the issuer or obligor (Yes/No)		Yes=7.5
	(iii) Breach of contract (e.g. default or delinquency in interest or principal payments) (Yes/No)		Yes=5
	(iv) Borrower's restructuring or bankruptcy (Yes/No)		Yes=2.5
	Is the existence of collateral taken into account when deciding whether to classify a loan or advance as non-performing (e.g. a fully guaranteed exposure is not classified)? (Yes/No)	1	No=10; Yes=0
	Are there any minimum levels of provisioning based on regulatory classification of non-performing loans as defined above? (Yes/No)	1	Yes=10; No=0
2. Restrictions on Entry: This category captures information about restrictions on foreign banks or non-bank financial institutions to obtain a bank license or own a local bank. Higher values indicate higher barriers to entry.			
	Are foreign entities allowed to enter through	1	Sum of below
	(i) Acquisition (Yes/No)		Yes=0; No=2.5
	(ii) Subsidiary (Yes/No)		Yes=2.5; No=2.5
	(iii) Branch (Yes/No)		Yes=0; No=2.5
	(iv) Joint venture (Yes/No)		Yes=2.5; No=2.5
	Can non-financial firms own shares in a bank and – if yes – is there a limit? Please choose one of the following options; elaborate where necessary.	2	Unrestricted=0; Permitted=2.5; Restricted=see below; Prohibited=10
	If restricted: Limits are placed on ownership share; please detail limits		>0.66=2.5; >0.33 and <0.66=5; <0.33=7.5
	Can non-bank financial institutions (NBFI, such as insurance companies, pension funds, finance companies etc.) own shares in a bank and – if yes – is there a limit? Please choose one of the following options; elaborate where necessary.	1	Unrestricted=0; Permitted=2.5; Restricted=see below; Prohibited=10
	If restricted: Limits are placed on ownership share; please detail limits		>0.66=2.5; >0.33 and <0.66=5; <0.33=7.5
	Are there any restrictions in place for the licensing of new banks, domestic or foreign-owned? (Yes/No)	2	Yes=see below; No=0

	If yes, specify the restrictions		If the restriction is related to prudential guidelines normally in use=7.5; additional requirements=10
	Are there any restrictions in place for foreign banks that do not apply to domestic banks, such as on:	1	Yes=sum of below; No=0
	(i) Deposit-taking? (Yes/No)		Yes=2
	(ii) Lending? (Yes/No)		Yes=2
	(iii) Access to funding from Central Bank? (Yes/No)		Yes=2
	(iv) Access to funding from partial guarantee schemes? (Yes/No)		Yes=2
	(v) Access to deposit insurance? (Yes/No)		Yes=2
	What is the minimum capital entry requirement for commercial bank operations? (in US$ and/or domestic currency, state which)?		The score is equal to the normalized minimum capital capped at the 75th percentile of the distribution
	(i) Domestic commercial bank	3	
	(ii) Foreign bank subsidiary	1	
	(iii) Foreign bank branch	1	

3. Restrictions on activities: This category captures information about banks' ability to own and control non-bank financial institutions and for non-bank financial institutions to conduct non-core bank activities or offer electronic banking. Higher values indicate more restrictions on banks to offer non-core banking services.

	Can banks own shares in non-financial firms and – if yes – is there a limit? Please choose one of the following options; elaborate where necessary.	3	Unrestricted=0; Permitted=2.5; Restricted=see below; Prohibited=10
	If restricted: Limits are placed on ownership share; please detail limits		<=10% of bank's equity=7.5; >10% and <25% of bank's equity=5; >25% of bank's equity=2.5
	Can banks own shares in non-bank financial institutions (NBFI, such as insurance companies, pension funds, finance companies etc.) and – if yes – is there a limit?	1	Unrestricted=0; Permitted=2.5; Restricted=see below; Prohibited=10
	If restricted: Limits are placed on ownership share; please detail limits		<=10% of bank's equity=7.5; >10% and <25% of bank's equity=5; >25% of bank's equity=2.5
	What are the conditions under which banks can engage in securities activities?	2	Unrestricted=0; Permitted=2.5; Restricted=5; Prohibited=10
	What are the conditions under which banks can engage in insurance activities?	2	Unrestricted=0; Permitted=2.5; Restricted=5; Prohibited=10
	What are the conditions under which banks can engage in real estate activities?	2	Unrestricted=0; Permitted=2.5; Restricted=5; Prohibited=10
	What are the conditions under which banks can engage in nonfinancial businesses except those businesses that are auxiliary to banking business (e.g. IT company, debt collection company, etc.)?	1	Unrestricted=0; Permitted=2.5; Restricted=5; Prohibited=10
	Banks' cross-border banking activities (such as making loans or taking deposits abroad) are, if host supervisor's approval or license or registration is acquired,	1	Unrestricted=0; Permitted=2.5; Restricted=5; Prohibited=10
	Are mobile bank branches allowed, such as vehicles equipped to provide banking services? (Yes/No)	1	Yes=0; No=10
	Does regulation allow banks to formally contract companies to act as banking agents to provide financial services? (Yes/No)	1	Yes=0; No=10

4. Transparency Requirements: This category captures information on requirements to disclose information to the public, customers and shareholders; and the relationship between the external auditor and the supervisory authority. Higher values indicate more stringent disclosure requirements.		
Are banks required to disclose related parties? (Yes/No)	3	Yes=10; No=0
Are directors and controlling shareholders required to disclose their business interests that represent related party relationships or potential conflicts of interest with the bank? (Yes/No)	3	Yes=10; No=0
Are banks required by law to	1	Sum of below
(i) Inform a government authority about their fees? (Yes/No)		Yes=1.67; No=0
(ii) Publish fees for their different services in a newspaper? (Yes/No)		Yes=1.67; No=0
(iii) Web? (Yes/No)		Yes=1.67; No=0
(iv) Email notification? (Yes/No)		Yes=1.67; No=0
(v) Posted at branches? (Yes/No)		Yes=1.67; No=0
(vi) Brochure when opening an account? (Yes/No)		Yes=1.67; No=0
Are banks required by law to inform new and existing customers about the fees and changes in fees? (Yes/No)	2	Yes=10; No=0
Is an audit by a professional external auditor required? (Yes/No)	3	Yes=10; No=0
If yes, does this external auditor have to:	2	Yes=Sum of below; No=0
(i) Obtain a professional certification or pass a specific exam to qualify as such? (Yes/No)		Yes=5; No=0
(ii) Register with an appropriate public and/or professional body? (Yes/No)		Yes=5; No=0
Do laws or regulations require auditors to conduct their audits in compliance with International Standards on Auditing (ISA)? (Yes/No)	3	Yes=10; No=0
Are auditors required by law to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? (Yes/No)	2	Yes=10; No=0
Does the bank supervisor have the right to meet with external auditors to discuss their report without the approval of the bank? (Yes/No)	2	Yes=see below; No=0
Does it happen on a regular Basis or in exceptional circumstances?	1	Regular=10; Exceptional=5
Are external auditors subject to oversight by an independent public entity? (Yes/No)	3	Yes=10; No=0
Does the Central Bank have any authority to engage or remove a bank auditor (internal or external)? (Yes/No)	2	Yes=10; No=0
Do banks have to publish their annual financial statements in:	2	Sum of below
Annual report? (Yes/No)		Yes=5; No=0
Major newspapers? (Yes/No)		Yes=2.5; No=0
Others? (Yes/No)		Yes=2.5; No=0
5. Restrictions on Exit: This category captures information about rules that govern Bank insolvency and the role of supervisory authorities. Higher values indicate higher barriers to exit from the banking activity.		
Is there a specific law for bank insolvency? (Yes/No)	3	Yes=10; No=0
According to the relevant legislation, who has authority to intervene, that is, suspend some or all ownership	1	See below. At least two Yes=10; One Yes=5;

	rights in the case of problem bank?		otherwise=0
	(i) Bank supervisor (Yes/No)		
	(ii) Court (Yes/No)		
	(iii) Deposit insurance agency (Yes/No)		
	(iv) Ministry of Finance (Yes/No)		
	(v) Other (Yes/No)		
	Are there specific institutional communication channels between lender of last resort window and supervisory departments? (Yes/No)	2	Yes=10; No=0
6. Liquidity and Diversification Requirements: This category captures information about rules governing liquidity of assets as well as geographical diversification. Higher values indicate more stringent rules on bank holdings of liquid assets and geographical diversification.			
	Are there explicit, verifiable, and quantifiable guidelines regarding asset diversification? (Yes/No)	1	Yes=10; No=0
	What is the single borrower limit in relation to	3	See below
	(ii) Total capital		< or =0.25=10; >0.25 and < or =0.35=5; >0.35=0
	Are banks required to hold some minimum level of liquid assets over liquid liabilities or total assets, etc.? (Yes/No)	3	Yes=see below; No=0
	If yes, please specify		
	(i) Liquid assets over liquid liabilities		> or =0.75=10; <0.75 and >0.50=7.5; <0.50 and >0.25=5; <0.25=2.5
	If so, these rules or requirements are applied	1	Sum of below
	(i) For local currency (Yes/No)		Yes=5; No=0
	(ii) For foreign currency? (Yes/No)		Yes=5; No=0
	Are banks required to meet geographical diversification requirements (by region within the country, or some minimum international diversification)? (Yes/No)	1	Yes=10; No=0
	Are banks limited in their sectorial concentration? (Yes/No)	1	Yes=10; No=0
	Are both local currency and foreign currency deposits/liabilities subject to liquid holding? (Yes/No)	1	Yes=10; No=0
	What instruments are eligible for liquidity holding at Central Bank?	1	The highest of below
	(i) Cash (Yes/No)		Yes=10
	(ii) Government Bonds (Yes/No)		Yes=7.5
	(iii) Other (Yes/No)		Yes=5
7. Price controls (financial repression): This category captures information about restrictions on prices and fees. Higher values indicate higher level of financial repression.			
	Is there a legal limit on interest rates banks can charge borrowers? (Yes/No)	3	Yes=10; No=0
	Is there a legal minimum on deposit interest rates banks have to offer depositors on certain financial products? (Yes/No)	3	Yes=see 4.3.2. below; No=0
	Please state products to which it applies		The highest of below
	(i) Checking (Yes/No)		Yes=2.5
	(ii) Saving (Yes/No)		Yes=2.5

	(iii) Time (Yes/No)		Yes=2.5
	(iv) Others (Yes/No)		Yes=2.5
	Is there a legal maximum on fees that banks can charge its clients? (Yes/No)	1	Yes=10; No=0
	Do changes in interest rates or fees have to be approved by a government authority? (Yes/No)	2	Yes=10; No=0

8. Financial Safety Nets: This category captures information about the availability and type of deposit insurance regime available in the country and other safety nets. Higher values indicate higher level of security.

	Is there an explicit deposit insurance scheme in place? (Yes/No)	3	Yes=10; No=0
	Are specific accounts excluded?	1	See below
	Foreign currency accounts (Yes/No)		Yes=10; No=0
	Inter-bank accounts (Yes/No)		Yes=10; No=0
	Insider accounts (Yes/No)		Yes=10; No=0
	How is the deposit insurance scheme financed? (i) through premiums from banks (ii) through government funding (iii) through a mix of both	1	Premiums=10; Mix=5; Govt funding=0
	If financed by premiums, do they vary by risk of banks? (Yes/No)	2	Yes=10; No=0

9. Supervision Quality: This category captures information about the independence, power and resources of bank supervisors in the country. Higher values indicate better supervision quality.

	Is there more than one supervisory body? (Yes/No)	1	Yes=0; No=10
	To whom are the supervisory bodies responsible or accountable?	3	=10 if responsible to a legislative body such as the Parliament; =0 otherwise
	How is the head of the supervisory body (and other directors) appointed?	2	=10 if appointed by a legislative body such as the Parliament; =0 otherwise
	On average, how many onsite examinations per bank were performed in the last five years?	3	> or = 2 per bank (10 in total in 5 years) = 10; < 2 and > 1 per bank (between 6 and 9 in total) = 5; < 1 per bank (< 5 in total) = 0
	If an infraction of any prudential regulation is found by a supervisor, must it be reported? (Yes/No)	1	Yes=5; No=0
	Are there mandatory actions in this case (Yes/No)	1	Yes=5; No=0
	Are supervisors legally liable for their actions (e.g. if a supervisor takes actions against a bank can he/she be sued?) (Yes/No)	2	Yes=0; No=10
	Are required accounting rules based on IFRS (Yes/No)	1	Yes=0; No=0

Annex 2 : Definition of Variables and data sources

Variable Name	Definition	Source
Bank-level Variables		
Efficiency Score	This variable ranges between 0 and 1 and captures a bank's ability to minimize the level of input given the current level of outputs. A fully efficient bank has an efficiency score of 1. Efficiency score values below 1 reflect a waste of resources that could be optimized. It is measured using DEA with variable returns to scale, 3 input variables (Total costs, Fixed Assets and Deposits and short term funding) and 3 output variables (loans, other earning assets and net fees and commission).	Authors' calculation
Deposits and Short Term Funding	Sum of customer deposits, deposits from Banks and other deposits and short-term borrowings (mil USD)	Bankscope
Capital Strength	Total equity divided by total assets	Bankscope
Fixed Assets	Total fixed assets (mil USD)	Bankscope
Loans	Total value of the loan portfolio after the deduction of specific loan-loss provisions (mil USD)	Bankscope
Net Fees and Commissions Income	Value of the net fees and commission income earned by the bank (mil USD)	Bankscope
Size	Natural logarithm of the value of total assets (mil USD)	Bankscope
Interest Expenses	Total interest expenses (mil USD)	Bankscope
Non-Interest Expenses	Total non-interest expenses (mil USD)	Bankscope
Other Earning Assets	Total earning assets other than loans to customers(mil USD)	Bankscope
Z-Score	Measures the bank's distance from insolvency. The Z-Score indicates whether the bank has enough capital to meet its liabilities. It measures the number of the ROAA's standard deviations by which a bank is far from its solvency value (capital strength and ROAA). Higher Z-score values correspond to lower insolvency risk.	Bankscope
Foreign	Dummy equals to 1 if 50%+ of the bank's shares are owned by foreign entities ; 0 otherwise	Bankscope, Claessens and Van Horen (2013)
Government	Dummy equal 1 if 50%+ or more of the bank's shares are owned by the government; 0 otherwise	Bankscope
Country-Level Variables		
Country Income	Natural logarithm of GDP per Capita	WDI
Inflation	Change in Consumer Price Index	WDI
Crisis	Dummy equal 1 for year starting in 2008; 0 otherwise	

Restrictions on Entry	Captures information about restriction on foreign banks or non-bank financial institutions to receive a bank license or own a local bank. Higher values indicate higher barrier to entry.	MFW4A
Restrictions on Activities	Captures information about banks' ability to own and control non-bank financial institutions and for non-bank financial institutions to conduct non-core bank activities or offer electronic banking. Higher values indicate more restrictions on banks to offer non-core banking services.	MFW4A
Transparency Requirements	Captures information about requirements for information disclosure to the public, customers and shareholders; and the relationship between the external auditor and the supervisory authority. Higher values indicate more stringent disclosure requirements.	MFW4A
Restrictions on Exit	Captures information about rules that govern bank insolvency and the role of supervisory authorities. Higher values indicate higher barriers to exit from the banking activity.	MFW4A
Overall Capital Stringency	Captures information about capital requirements and rules for loan classification and provisioning. Higher values indicate more stringent requirements.	MFW4A
Liquidity and Diversification Requirements	Captures information about rules governing liquidity of assets as well as geographical diversification. Higher values indicate more stringent rules on bank holdings of liquid assets and geographical diversification.	MFW4A
Price Controls	Captures information about restrictions on prices and fees earned by banks. Higher values indicate higher level of financial repression.	MFW4A
Financial Safety Nets	Captures information about the availability and type of deposit insurance regime available in the country and other safety nets. Higher values indicate higher level of security.	MFW4A
Supervision Quality	Captures information about supervisory independence, power and resources in the country. Higher values indicate better supervision quality.	AfDB Survey

State Ownership	Percentage of banking system assets held by the government in the country	MFW4A
Bank Concentration	Percentage of banking system assets held by the three largest banks in the country	WDI
Business Freedom	A quantitative measure of the ability to start, operate and close a business. It captures overall burden of regulation as well as the efficiency of government in the regulatory process. The business freedom score for each country is a number ranging between 0 and 100, with 100 equaling the best business environment.	Heritage Foundation Index of Economic Freedom
Government Policy preference	Dummy variable equals to 1 if the policy preference of the government is right oriented; 3 if it is left oriented; 2 if it is center oriented and; 0 otherwise	Keefer(2010)

Instrumental Variables

Ethnic Fractionalization	Index measuring the degree of ethnic fragmentation in the country.	Shleifer (2002)
Latitude	Measure geographical latitude of the country	La porta et al (2008)
Legal Origin	Dummy that equals 1 if the legal origin of the country is English; 0 otherwise	La porta et al. (1999)
Women Participation in Politics	Percentage of women in parliaments	http://www.ipu.org/wmn-e/classif-arc.htm
Religion	Categorical variable that take the value of 1 if the dominant religion is Islam; 2 if it is Christianity; 3 if it is Protestantism; 4 if it is indigenous and 5 if other	Triki and Gajigo (2012)
Independence	Year in which the country became independent	http://www.ipoaa.com/african_independence.htm

MFW4A Making Finance Work for Africa
WDI Worldwide Development Indicators
WGI Worldwide Governance Indicators

Annex 3 : Efficiency Scores by Country (2005-2010)

Country	Average efficiency score
Algeria	0,60
Angola	0,26
Benin	0,32
Botswana	0,44
Burkina Faso	0,24
Burundi	0,15
Cameroun	0,47
Cape Verde	0,29
Congo	0,39
Côte-d'Ivoire	0,38
Eritrea	0,61
Ethiopia	0,51
Gabon	0,29
Gambia	0,24
Ghana	0,25
Guinée	0,31
Guinée Bissau	0,20
Equatorial Guinée	0,40
Kenya	0,33
Lesotho	0,19
Madagascar	0,27
Malawi	0,22
Mali	0,27
Mauritania	0,38
Mauritius	0,43
Morocco	0,76
Mozambique	0,22
Namibia	0,61
Niger	0,25
Nigeria	0,43
Rwanda	0,21
Senegal	0,28
Seychelles	0,49
Sierra Leone	0,33
South Africa	0,72
Sudan	0,27
Swaziland	0,54
Tanzania	0,34
Togo	0,26
Tunisia	0,65
Uganda	0,30
Zambia	0,43
Total	**0,41**

Annex 4 : Sample Distribution Across Countries and Years

Country	2005	2006	2007	2008	2009	2010	Total
Algeria	8	9	10	11	12	12	62
Angola	7	9	9	9	9	9	52
Benin	4	4	3	4	4	3	22
Botswana	3	5	6	7	7	5	33
Burkina	5	5	5	4	4	3	26
Burundi			1	2	2	2	7
Cameroun	2	2	2	4	4	4	18
Cape Verde				2	3	3	8
Congo			1	2	2	1	6
Côte-d'Ivoire	6	7	7	7	7	3	37
Eritrea	1	1	1				3
Ethiopia	5	5	5	5	5	5	30
Gabon			1	1	1	1	4
Gambia	3	3	3	3	2	3	17
Ghana	2	3	12	12	12	11	52
Guinée	1	1	2	2	2	2	10
Guinée Bissau				1	1	1	3
Guinée Equatoriale			1				1
Kenya	17	18	22	23	23	23	126
Lesotho					1	1	2
Madagascar			1	3	3	2	9
Malawi	3	3	3	3	3	2	17
Mali	3	3	3	4	4	4	21
Mauritania	3	3	3	3	4	4	20
Mauritius	9	10	10	10	10	10	59
Morocco	1	2	6	6	6	6	27
Mozambique	3	3	6	8	8	8	36
Namibia	4	4	4	5	5	5	27
Niger	3	3	3	3	3	3	18
Nigeria	6	9	9	9	10	9	52
Rwanda	2	3	3	3	3	2	16
Senegal	4	6	6	6	6	4	32
Seychelles	2	2	2	2	2	3	13
Sierra Leone	3	4	5	5	5	5	27
South Africa	6	11	14	14	13	13	71
Sudan	3	3	6	7	8	9	36
Swaziland	4	4	4	4	4	4	24
Tanzania	13	15	16	17	17	17	95
Togo	2	2	2	2	2	2	12
Tunisia	13	14	15	15	15	15	87
Uganda			8	14	14	12	48
Zambia	7	7	7	7	7	5	40
Total	**158**	**183**	**227**	**249**	**253**	**236**	**1,306**

Annex 5 : Regulation and Supervision Variables across Countries (2010)

Country	Restrictions on Entry	Restrictions on Activities	Transparency Requirements	Restrictions on Exit	Overall Capital Stringency	Liquidity and Diversification Requirements	Price Controls	Financial Safety Nets	Supervision Quality
Algeria	7,50	5,00	5,90	5,00	8,00	2,50	-	6,25	3,13
Angola	3,69	3,61	7,99	8,33	5,50	6,25	-	-	3,75
Benin	3,13	3,89	7,85	1,67	2,00	3,13	3,13	-	3,75
Botswana	3,06	3,61	9,72	10,00	9,00	4,06	0,63	-	5,00
Burkina	3,13	3,89	7,85	1,67	2,00	3,13	3,13	-	5,00
Burundi	5,00	4,44	7,29	6,67	7,00	5,63	-	-	3,75
Cameroun	6,13	5,00	8,82	5,00	7,50	5,63	1,67	6,25	-
Cape Verde	2,31	4,72	9,03	6,67	5,50	5,94	2,50	-	4,38
Congo	6,13	5,00	8,82	5,00	7,50	5,63	1,67	6,25	3,75
Côte-d'Ivoire	3,13	3,89	7,85	1,67	2,00	3,13	-	-	3,75
Eritrea	6,56	5,56	6,81	6,67	8,00	4,69	5,00	-	2,50
Ethiopia	5,19	8,33	9,03	6,67	7,00	5,31	1,25	-	2,50
Gabon	6,13	5,00	8,82	5,00	7,50	5,63	1,67	6,25	-
Gambia	4,88	7,22	8,13	10,00	7,00	5,63	-	-	3,75
Ghana	6,56	4,17	6,60	5,00	7,50	6,56	-	-	3,75
Guinée Bissau	3,13	3,89	7,85	1,67	2,00	3,13	3,13	-	-
Guinée Equatoriale	5,88	5,00	8,82	5,00	7,50	5,63	1,67	6,25	-
Guinée	2,75	4,72	8,13	3,33	6,50	5,63	1,25	-	-
Kenya	3,56	5,00	9,03	6,67	7,00	5,31	2,50	3,75	7,50
Lesotho	1,31	5,56	7,29	5,00	7,00	4,69	-	-	3,75
Madagascar	5,94	5,00	7,50	1,67	7,00	4,38	2,50	-	5,00
Malawi	4,69	3,61	7,29	3,33	5,00	5,63	-	-	3,75
Mali	3,13	3,89	7,85	1,67	2,00	3,13	3,13	-	3,75
Mauritania	5,63	3,44	8,26	1,67	8,00	5,94	5,63	4,58	4,38
Mauritius	3,00	3,33	9,31	8,33	7,50	3,75	-	-	2,50

Morocco	5,00	3,13	7,43	1,67	7,50	7,50	3,13	5,42	3,13
Mozambique	1,63	4,17	8,54	6,67	5,00	5,31	-	-	2,50
Namibia	2,56	4,44	9,24	3,33	2,50	8,44	-	-	3,75
Niger	3,13	3,89	7,85	1,67	2,00	3,13	3,13	-	3,75
Nigeria	5,31	2,78	9,10	10,00	4,50	3,44	-	8,75	5,00
Rwanda	3,38	6,11	9,45	6,67	8,00	5,31	-	-	1,88
Senegal	3,13	3,89	7,85	1,67	2,00	3,13	3,13	-	3,75
Seychelles	1,63	3,61	7,50	10,00	6,00	5,31	-	-	3,75
Sierra Leone	2,56	4,44	8,89	5,00	7,00	5,00	-	-	2,50
South Africa	5,00	3,06	8,13	6,67	6,00	3,44	2,50	-	5,00
Sudan	7,19	2,78	8,82	3,33	6,00	5,63	7,50	5,42	-
Swaziland	1,63	3,33	5,63	8,33	6,00	5,31	-	-	3,75
Tanzania	2,94	1,94	8,82	5,00	5,50	6,56	-	5,42	5,00
Togo	3,13	3,89	7,85	1,67	2,00	3,13	3,13	-	3,75
Tunisia	5,13	7,22	9,17	5,00	7,00	5,63	3,13	-	3,75
Uganda	1,63	4,72	8,20	8,33	8,00	6,56	-	6,25	3,75
Zambia	2,88	4,44	8,54	5,00	8,50	6,56	-	-	-
Average	**4,19**	**4,22**	**8,31**	**5,57**	**6,16**	**5,05**	**1,57**	**2,42**	**3,62**

Annex 6. Instruments Validity Tests

Endogenous Variable	Restrictions on Entry		Restrictions on Activities		Supervision Quality		Restrictions on Exit		Liquidity and Diversification Requirements		Price Controls		Financial Safety Nets		Transparency Requirements		Overall Capital Stringency	
Women Partcipation in Politics	-2,964	***			-3,057	***					0,623						-0,070	
	(0,389)				(0,312)						(0,479)						(0,453)	
Religion	-0,384	***	-0,175	***			0,676	***			-0,476	***	-0,852	***				
	(0,032)		(0,027)				(0,044)				(0,039)		(0,053)					
Independence	-0,044	***	0,045	***														
	(0,006)		(0,005)															
Ethnic fractionlization					1,222	***									0,386	***	-2,025	***
					(0,116)										(0,090)		(0,167)	
Latitude							-4,363	***	-1,524	***					-2,036	***		
							(0,508)		(0,307)						(0,229)			
Legal Origin									0,922	***			1,455	***				
									(0,069)				(0,134)					
Constant	91,940	***	-83,660	***	3,965	***	4,738	***	4,823	***	2,544	***	3,558	***	8,388	***	7,421	***
	(10,90)		(9,077)		(0,097)		(0,141)		(0,074)		(0,129)		(0,151)		(0,081)		(0,141)	
Observations	1'510		1'556		1'300		1'556		1'536		1'510		1'536		1'548		1'502	
R-squared	0,208		0,065		0,137		0,180		0,143		0,092		0,205		0,095		0,089	
F-test	131,500		54,060		103,300		171,000		128,100		76,590		197,200		80,720		73,180	
Prob>F	0,000		0,000		0,000		0,000		0,000		0,000		0,000		0,000		0,000	
Wald test of exogeneity Prob > chi2	0,000		0,000		0,664		0,000		0,000		0,000		0,000		0,000		0,757	
Test of overidentifying restrictions: P-value of Amemiya-Lee-Newey minimum chi-sq statistic	0,065		0,108		0,452		0,135		0,592		0,938		0,443		0,213		0,458	

*, **, *** describe statistical significance at the 10%, 5% and 1% level, respectively. Standard deviations are presented in parentheses. Refer to Annex 2 for the definition of variables included in this Table.

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