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Does Financial inclusion affect the African banking stability?

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Abstract

This paper offers an empirical investigation on the channels through which financial inclusion may influence the soundness of African banks. Using the dynamic panel approach, we construct a composite index of financial inclusion for 38 African countries over the period 2005 to 2014, and then investigate if the financial inclusion could influence directly or through the competition the banking stability. Our results indicate a strong relation between financial inclusion, and banking stability. In addition, the result suggests that the policy makers face tradeoffs between financial inclusion and bank competition to improve the financial stability.

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1. Introduction

A well-developed financial system is highly important for economic development. One key component of the financial system is financial inclusion.

Financial inclusion is the process that ensures the ease of access, availability and usage of the formal financial system to facilitate the "unbanked" population's entry into the formal financial system and access to financial services ranging from savings, payments, and transfers to credit and insurance"(Hannig and Jansen 2010). Financial inclusion is therefore necessary to ensure that economic growth performance is inclusive and sustained.

Over the last two decades, African countries have implemented many banking regulatory reforms to align their practices with international standards with the prospect of boosting the levels of financial inclusion and promoting the soundness of the banking system. African countries seek to promote financial inclusion through facilitating the access, availability and usage of financial services for low-income households, small firms and all members of their economies.

The African regulatory and supervisory bodies have taken many initiatives to enhance inclusive banking, such as encouraging the greater presence of foreign-owned banks. The reforms of privatization and deregulation in African banking industries have encouraged foreign banks to expand and domestic banks to search for new markets that were previously excluded. Indeed, with a supportive regulatory environment, large scale, skill and technological advancements, banks could easily extend their network to under banked and unbanked customers and therefore reduce risk and become more profitable.

Hence, the rapid change in the regulatory environment raises a major question regarding how financial inclusion impacts banking stability. From a theoretical perspective, there is still no consensus on the theoretical benefits of more stringent financial inclusion for banking stability. Empirically, scholars have suggested both positive (Khan, 2011; Hawkins, 2006; Hannig and Jansen, 2010) and negative (Khan, 2011) ways that rising financial inclusion could affect financial stability. Indeed, financial inclusion may enhance the stability of the financial system in several ways.

First, according to portfolio theory, a greater diversification of assets and liabilities resulting from the increase in financial transactions (lending to smaller firms, etc.) can contribute to reducing the volatility of a bank's income and improving its liquidity (khan, 2011). Hence, financial inclusion boosts geographic diversification. Indeed, by reaching out to unbanked regions, a bank can reduce the distance barrier and build a strong relationship with customers. Therefore, the problem of information asymmetry can be reduced (Hauswald and Marquez, 2006). For instance, moral hazard and adverse selection problems can be reduced by exploiting lending technology. Beck et al. (2014) study the effect of banks' lending techniques on SME funding over the business cycle. They find that relationship lending improves SMEs' credit constraints during an economic downturn. Deng and Elyasiani (2008) find that when banks invest in unbanked regions, geographic diversification is associated with higher stability and reduced risk. Moreover, financial inclusion enhances the funding diversification strategy, where the bank invests in retail deposits. Indeed, according to the literature (Song and Thakor, 2007; Demirgüç-Kunt and Huizinga, 2010; Huang

and Ratnovski, 2011), retail deposits are insensitive to risk and cheap, while wholesale funding is costly and volatile. For instance, Han and Melecky (2013) find that during times of financial stress or crises, the correlated deposit withdrawals can be mitigated if bank deposits are more diversified.

Second, greater financial inclusion can foster economic growth through socio-economic indicators, which in turn can enhance the soundness and performance of banking industries (Cull et al., 2012 ; Khan, 2011). Likewise, Dixit and Ghosh (2013) find that financial inclusion in India is one of the most crucial opportunities, and banks need to be equitably distributed across the country to attain comprehensive growth. Access to credit has a positive impact on mental well-being (Angelucci et al. 2013) and a positive impact on poverty alleviation (Bruhn and Love, 2014).

On the other hand, financial inclusion causes risks to financial stability (khan, 2011). This is because banking the poor involves high operating costs as financial intermediaries invest in new distribution channels, new products and new risk management systems.
The remainder of the paper is organized as follows. Section 2 presents the methodology and describes the variables of the empirical model. Section 3 describes the data and discusses the empirical results. Section 4 concludes with some policy implications.

2. Methodology

Our main objective is to examine the two followings hypothesis. First, we hypothesize that the access of all economic agents to formal financial services – financial inclusion –has a great impact on banking stability. The second hypothesis refers to the impact of competition on the level of bank stability. To achieve the objective of this study, we estimate the following model:

$$Y_{i,k,t} = \beta_0 + \beta_1 Y_{i,k,t-1} + \beta_2 FI_i + \beta_3 MS_{i,k,t} + \beta_4 X_{i,t} + \varepsilon_{i,k,t} \quad (1)$$
$$\text{For } i = 1, \dots, \text{n} \,; t = 1, \dots, \text{T}$$

where $Y_{i,k,t}$ describes the stability of bank k in country *i* at year *t*. Stability is measured by the CAMEL index.
FI_i is a proxy of financial inclusion, and $MS_{i,k,t}$ is a measure of bank competition. We construct the Lerner index and use it as a proxy for the bank market structure.
$X_{i,t}$ are vectors measuring bank-specific and country-specific characteristics. $\varepsilon_{i,k,t}$is the error term.

2.1 Banking Stability

Since the 2007 global financial crisis, the importance of maintaining the financial stability of banks has attracted the attention of academics, policymakers, and practitioners. The evaluation of the stability and soundness of banks is a complex task that involves a significant number of multidimensional criteria. In recent years, researchers have tried to identify conditions that would ensure banking stability. For this purpose, various statistical indicators were used to characterize the vulnerability of the banking system. We take CAMELS as a measure of banking stability because the CAMELS rating system is widely used in the literature, and the relevant data are available for the African banking industry.

The CAMELS index, which is also a measure of financial soundness, incorporates 6 sub-indices: C-Capital adequacy, A-Asset quality, M-Management soundness, E-Earnings, L-Liquidity, S-Sensitivity to market risk.
The capital adequacy indicators measure the banking sector´s ability to absorb sudden losses. The most commonly used indicator for capital adequacy is the ratio of capital to risk-adjusted assets. A declining trend in this ratio may signal increased risk exposure and possible capital adequacy problems and, in turn, less stability. A proxy of this ratio is the ratio of capital to loans. The asset quality indicators are associated with banks´ solvency. The asset quality includes indicators at the level of the lending institutions and indicators at the level of the borrowing institutions[1]. At the level of lending institutions, asset quality is measured by nonperforming ratios (non-performing loans/total loans or non-performing loans/equity). These ratios identify problems with loan portfolio quality. Additionally, asset quality can be assessed by the fixed assets to total assets ratio. Management soundness refers to the quality of bank management. The management soundness indicators include expense ratios, such as non-interest expenses/total income or the cost-to-income ratio. The profitability (earning) indicators measure the ability to absorb losses without any impact on capital. The ratios that are used as indicators of earnings are return on assets, return on equity and net interest margin. They assess the efficiency of deposits in using capital and assets (ROA, ROE). The liquidity indicators measure banks´ resilience to cash flow shocks. The most common indicators of liquidity include liquid assets to total assets or liquid assets to short-term liabilities. The first indicator reflects the maturity structure of asset portfolios, while the second measures the ability of banks to mobilize short-term resources to meet short-term liabilities. Finally, foreign currency exposure (sensitivity) is an indicator measuring a bank´s risk exposure with regard to movements in asset prices on financial markets. The sensitivity to market risk involves the ratio of different risks, such as interest risk and equity price. In most of the literature, this indicator is assessed by credit risk. Hence, there are two indicators of credit risk: the *exante* measure of credit risk given by the ratio of total loans to total assets and a measure of *expost* asset risk represented by the ratio of loan loss provisions to net interest income.

For the African banking system, we construct an index of stability taking into account two dimensions: the financial strength of banks (profitability, capital adequacy and asset quality) and the major risks (credit risk, liquidity risk and management soundness). Table 1 presents the six categories and their selected indicators for African banks.

[1]We exclude the indicators at the level of the borrowing entity.

Table 1. The indicators of African Banking stability

Sub index	**Measure**
Capital adequacy	Equity to total loans
Asset quality	Fixed assets/ assets
Management soundness	Cost to income ratio, Non-interest expenses/Gross income.
Earnings	ROA, ROE
Liquidity	Liquid assets/asset, liquid assets to short-term deposits
Credit risk	Total loans to total assets, Loan loss provisions to net interest income.

Source: International Monetary Fund

To calculate a global index of banking stability, we follow two steps. First, for each sub index, we standardize the variables to the same scale to prevent some of them from exerting greater influence. Therefore, we normalise the variables to a common scale with a mean of zero and a standard deviation of one. Then, for each sub-index, we calculate a weighted sum of its indicators. The formula is given as:

$$I_{it} = \sum_{i=1}^{k} w_i \frac{X_{i,t} - \mu_i}{\sigma_i} \qquad (2)$$

where I_{it} is the normalized value of indicator i in period t; $X_{i,t}$ represents the value of indicator X with μ as the mean and σ as the standard deviation. w_i is the weight of each indicator. We use the method of equal weights for the indicators. Through the process of so-called empirical normalization, all indicators are placed on the same scale in the interval from zero to one [01].
In the second step, the banking stability index (BSI) is calculated as the arithmetic mean of the six sub-indices:

$$BSI_t = \sum_{i=1}^{n} \frac{I_{i,t}}{n} \qquad (3)$$

2.2 Financial inclusion

The definition of financial inclusion refers to social and financial exclusion. Leyshon and Thrift (1995) and Carbo et al. (2005) defined financial exclusion as the process of excluding a social group or individuals from access to the formal financial system. Additionally, Sinclair (2001) states that financial exclusion is the inability to access necessary financial services in an appropriate form.
According to these definitions, financial inclusion is the process that ensures the ease of access, availability and usage of the formal financial system for all members of an economy. Hence, financial inclusion has a multidimensional nature with the basic elements of access, usage and availability.

Access is the absence of barriers resulting from the frictions associated with the financial sector: information and transaction costs (Honohan 2004; Beck and De la Torre 2007). Usage refers to the lack of use when private agents can access but cannot use the financial services, for reasons such as lack of financial knowledge, education, savings, employment or income. The last

dimension, availability, refers to the quality and efficacy of the access to and use of financial services.

The data of all these dimensions of financial inclusion data have traditionally been separated into supply- and demand-side information. Several international institutions (M, FinMark Trust, AFI's FIDWG) have provided indicators for each dimension that include fundamental financial inclusion variables from both supply-side and demand-side sources. The data of all these dimensions of financial inclusion data have traditionally been separated into supply- and demand-side information. A number of international institutions (FMI, FinMark Trust, AFI's FIDWG) have provided indicators for each dimension that include fundamental financial inclusion variables from both supply-side and demand-side sources.

According to AFI's FIDWG, the loan and deposit accounts and the number of borrowers and depositors measure access, while outstanding loans and deposits refer to usage. On the other hand, availability refers to the number of bank branches and automated teller machines. Table 2 summarizes the different dimensions.
Each dimension has different indicators. All the indicators are summarized in Appendix A.
For the purpose of our paper, we develop an index that represents the overall inclusiveness in the financial sector. Hence, we calculated for each dimension a weighted average of all indicators, such that the financial inclusion index is the weighted average of the three dimensions[2].

Table 2. The dimensions of financial inclusion

Dimension	**Definition**
Accessibility	Availability of formal, regulated financial services: Physical proximity Affordability
Usage	Actual usage of financial services and products: Regularity Frequency Duration of time used
Availability	Products are well tailored to client needs Appropriate segmentation to develop products for all income levels

Source: Adapted from Alliance for Financial Inclusion Data Working Group (2011).

2.3 Competition

We measure competition by the Lerner index. The Lerner index is the difference between price and marginal cost, divided by price.

$$\text{Lerner index} = \frac{(P-MC)}{P} \qquad (4)$$

where :

- P is the price, which is computed by estimating the average price of bank production as the ratio of total revenues to total assets.
- MC is Marginal cost estimated on the basis of a translog cost function with one output (y: total assets) and three input prices (w_1 : price of labour, w_2 : price of physical capital, and w_3 : price of borrowed funds)[3]. The cost function is:

[2]As the data are few, we did not use principal components analysis to identify the main factor for each dimension.
[3]See Appendix B for the explanation of three input prices

$$\ln TC = \alpha_0 + \alpha_1 lny + \frac{1}{2\alpha_2}(lny)^2 + \sum_{j=1}^{3}\beta_j \ln w_j + \sum_{j=1}^{3}\sum_{k=1}^{3}\beta_{jk}\ln w_j \ln w_k + \sum_{j=1}^{3}\gamma_j lny \ln w_j + \varepsilon \quad (5)$$

where TC (total costs) is the sum of personnel expenses, other non-interest expenses.

Then, the estimated coefficients of the cost function are used to compute the MC:

$$MC = \frac{TC}{y}\left[\alpha_1 + \alpha_2 lny + \sum_{j=1}^{3}\gamma_j \ln w_j\right] \quad (6)$$

The Lerner index ranges from zero to one. An index of one means that the firm has pricing power. However, there is no pricing power when the index is zero.

2.4 Other variables

In addition, we include bank characteristics variables: (1) size, measured as the natural logarithm of the bank's total assets; (2) capital strength, measured by the ratio of the book value of equity to total assets; and (3) liquidity level, measured by the liquid assets to deposits ratio and funding.
To control for the quality of the institutional environment in our sample countries, we use seven measures: the first is the level of corruption measured by the corruption perception index. The other variables are regulatory quality, business environment, diversification, rule of law, competition and bank soundness.

Regulatory quality and the rule of law are published by the World Bank Development Indicators, while the other variables are made available by the Mo Ibrahim Foundation. In addition, we include two macroeconomic variables, country income measured as the natural logarithm of GDP per capita and inflation measured by changes in the Consumer Price Index inflation. These data come from the World Bank Development Indicators. Appendix B describes our variables and data sources.

2.5 Robust estimation

Our model suffers from three biases: unobserved country heterogeneities, causality bias and dynamic endogeneity bias.[4]

The first type of bias due to the omission of other explanatory variables that could be correlated with the error term. While causality bias is explained by the correlation between the error term and bank stability, the dynamic endogeneity bias is generated by the correlation between the error term and the lagged value of the bank stability variable.

[4]As explained by Baltagi (2013), standard estimators, such as the pooled ordinary least squares estimator, the fixed effects model and the random effects model, are inconsistent because of these three bias.

Therefore, to overcome the three biases and to check the robustness of our model (Equation 1), we use the dynamic panel GMM estimators developed by Arellano and Bond (1991) and improved by Arellano and Bover (1995) and then by Blundell and Bond (1998).System-GMM is based on a system composed of first differences instrumented on lagged levels and of levels instrumented on lagged first differences.

We employ the two-step estimator and correct the standard errors of the two-step estimator for small sample bias by introducing the corrections proposed by Newey and Windmeijer (2009) on the matrix of instruments to prevent the problem of too many instruments. Then, we report the P-values of the Hansen test (Hansen P-value) and the Arellano and Bond test (AR2 P-value) for over identifying restrictions.

3. Data

We collect data from different sources. First, we collect balance sheet and income statement data from Bankscope published by Bureau van Dijk. We focused only on commercial banks operating in African countries. Our panel covers the period 2005-2014.

We removed countries for which necessary data were missing. This exercise led to a final sample of 2,660 observations for 266 banks operating in 38 African countries. Additional information is obtained from the World Development Indicators for macroeconomic conditions and Transparency International for the quality of the institutional environment. This paper uses a range of dynamic models and estimators to model the probability of unemployment, both singly and jointly with the probability of low-wage employment. The models include the previous state to allow for state dependence. An important focus is the treatment of unobserved heterogeneity and initial conditions. If the unobserved heterogeneity exhibits persistence over time, then ignoring it will lead to an overstatement of the true state dependence in unemployment.

4. Results

We report the results for financial inclusion and bank competition based on the different specifications for the model inTable 3. [5]

[5]Prior to developing the dynamic panel GMM estimators, we demonstrated the efficiency of the FE model with respect to the pooled OLS and the RE models. To this end, we first used the Hausman test to choose between the RE model and the FE model. We obtained a small p-value (i.e., less than alpha level (0.05)), which implied the superiority of the FE model over the RE model. Second, we applied the Breusch-Pagan Lagrangian multiplier test to select the best model between pooled OLS and the RE model. The results showed that the p-value corresponding to the LM statistic was less than alpha level (0.05), which implied that pooled OLS is not the appropriate model. Combining the results of these tests together, we concluded that FE is the best model.

Table 3. The estimation results of the effect of financial inclusion and competition on banking stability

	Model [1]	Model [2]	Model [3]	Model [4]	Model [5]	Model [6]	Model [7]
Constant	- 0.2475*** (0.067)	-0.2151*** (0.090)	-0.1659*** (0.0121)	-0.2124** (0.102)	-0.2643** (0.1149)	-0.2041* (0.108)	-0.2395*** (0.062)
Lagged Banking stability	0.1196*** (0.041)	0.1912*** (0.0248)	0.2504*** (0.0316)	0.1852*** (0.0160)	-0.1931*** (0.0460)	0.1496*** (0.025)	1.4937*** (0.071)
Financial inclusion	-0.0640** (0.0315)	-0.0867*** (0.0324)	-0.0694** (0.0291)	-0.0649** (0.0285)	-0.0763** (0.0365)	-0.0607** (0.0263)	-0.0511** (0.0168)
Lerner index	0.6435*** (0.145)	0.5802*** (0.1639)	0.5912*** (0.1398)	0.5891*** (0.1411)	0.6122*** (0.1672)	0.5896*** (0.1444)	0.5764*** (0.1806)
Size	0.0740** (0.011)	0.0702** (0.021)	0.0571** (0.010)	0.0496** (0.017)	0.0481*** (0.0101)	0.0518*** (0.095)	0.0434*** (0.0169)
Capital strength	-0.0132*** (0.0042)	-0.0265*** (0.003)	-0.0102*** (0.0026)	-0.0132*** (0.0041)	-0.0153*** (0.0038)	-0.0237*** (0.0037)	-0.0219*** (0.0074)
Liquidity	-0.0122*** (0.002)	-0.0173*** (0.003)	-0.0091*** (0.006)	-0.0134*** (0.002)	-0.0161*** (0.003)	-0.0148*** (0.002)	-0.0216*** (0.003)
Country income	-0.2992*** (0.041)	-0.2599*** (0.033)	-0.2601*** (0.040)	-0.1980*** (0.039)	-0.2199*** (0.036)	-0.2939*** (0.0399)	-0.0257*** (0.0029)
Inflation	-0.4461*** (0.013)	-0.4745*** (0.011)	-0.2219*** (0.013)	-0.3395*** (0.014)	-0.0399*** (0.011)	-0.0456*** (0.012)	-0.0241*** (0.023)
Regulatory Quality	-0.2955*** (0.0479)						
Diversification		0.0552** (0.0163)					
Business Environment			-0.1087*** (0.019)				
Rule of Law				-0.0382** (0.014)			

Corruption perception index					-0.1816*** (0.0177)		
Competition						0.0405** (0.0137)	
Soundness of Banks							0.0525*** (0.009)
AR2 P-value	0.426	0.492	0.433	0.478	0.412	0.491	0.417
Hansen P-value	0.361	0.293	0.224	0.341	0.314	0.351	0.337

*Note:*The dependent variable is banking stability. The regression coefficients are estimated using the dynamic panel two-step system GMM estimations. Standard errors are presented in brackets below the corresponding coefficient. ***. ** and * correspond to statistical significance at 0.01, 0.05 and 0.10, respectively. All regressions include individual and temporal effects. Hansen P-value indicates the p-value of the Hansen test of overidentifying restriction. AR2 P-value represents the p-value of the Arellano-Bond test for the null hypothesis of second-order autocorrelated disturbance

We find that the coefficient of financial inclusion is negatively significant. Indeed, a more inclusive financial system is associated with greater banking instability (khan, 2011). In other words, financial inclusion does not reduce the distance between financial institutions and low-end customers. Indeed, African banks have to support higher operating costs to invest in markets and new products and therefore generate a higher risk.

Table 3 shows a positive and significant coefficient of the competition. This implies that having more market power increases bank stability. As the market becomes less competitive, banks in Africa are likely to benefit from more stability and lower risk. This finding confirms the hypothesis of competition fragility. Indeed, competition may erode franchise value by reducing monopoly rent and hence encouraging banks to take more risks to increase the return value.
As are our results concerning market power and financial inclusiveness, our results concerning the control variables are consistent with the findings of the existing literature. As might be expected, larger banks and banks with better management are more stable. The coefficients of bank capitalization and liquidity show a negative and significant relationship with stability. These results suggest that a high degree of capitalization and lower loan activity may increase the risk of banks.

Regarding country-level macro controls, GDP per capita and inflation have a negative impact on banking stability, indicating that when expanding their activity, banks may face less pressure to control their inputs and therefore become less stable. In addition, the coefficients for diversification and the index for corruption in the business environment are significantly positive. However, a good business environment and strong rule of law hamper stability.

5. Conclusion

The objective of this paper was to examine the effect of financial inclusion and competition on African banking stability. Our results indicate that with a higher degree of financial inclusion, banks are more unstable. In addition, the result suggests that any beneficial effects of financial inclusion on bank stability tend to be more pronounced in banking sectors with more competition.

Our findings have important policy implications. First, the findings suggest that banking stability is strongly influenced by the degree to which under-banked and unbanked customers have access to basic financial services.

Therefore, we recommend that policymakers enhance financial inclusion by addressing market imperfections rather than seeking a general increase in financial inclusiveness. Policymakers may increase the bank supply by eliminating market imperfections and focus on lending technologies that reduce transaction costs or improve borrower identification to mitigate information costs. Furthermore, our results suggest that policymakers face the trade-off between focusing on promoting financial inclusion and focusing on enhancing bank competition when considering policies for improving financial stability. Hence, we recommend that policymakers improve the regulatory frameworks for financial innovation in the low-income market segment, which can enhance financial stability. In addition, policymakers must focus on the synergies between promoting financial development and enhancing financial competition and adapt some aspects of the current bank regulation.

Appendix A. Definition of financial inclusion indicators

Dimension	Indicator	Definition
Accessibility The ability to use financial services, minimal barriers to open an account.	Borrowers at commercial banks	The number of SME and customers borrowers at commercial banks
	Borrowers at commercial banks per 1,000 adults	The total number of resident customers that are nonfinancial corporations (public and private) and individuals from the household sector who obtained loans from commercial banks for every 1,000 adults.
	Deposit accounts with commercial banks	The number of SME and customers deposit accounts at commercial banks
	Deposit accounts with commercial banks per 1,000 adults	The total number of deposit accounts that are held by resident nonfinancial corporations (public and private) and individuals from the household sector, at commercial banks, for every 1,000 adults in the reporting jurisdiction.
	Depositors with commercial banks	Depositors with commercial banks are the reported number of deposit account holders (SME and customers) at commercial banks and other resident banks functioning as commercial banks that are resident nonfinancial corporations (public and private) and households. For many countries data cover the total number of deposit accounts due to lack of information on

		account holders. The major types of deposits are checking accounts, savings accounts, and time deposits.
	Depositors with commercial banks per 1,000 adults	The total number of loan accounts of resident nonfinancial corporations (public and private) and individuals from the household sector that have obtained credit from commercial banks for every 1,000 adults in the reporting jurisdiction.
	Loan accounts with commercial banks	The total number of loan accounts of resident nonfinancial corporations (public and private) and individuals (household sector) that have obtained credit (loans) from the reporting institutions.
	Loan accounts with commercial banks per 1,000 adults	The total number of loan accounts of resident nonfinancial corporations (public and private) and individuals from the household sector that have obtained credit from commercial banks for every 1,000 adults in the reporting jurisdiction.
Usage The private agents could access but couldn't use the financial services	Outstanding deposits with commercial banks	The total amount (in millions of domestic currency) of all types of outstanding deposits (including accrued interest) of resident nonfinancial corporations and individuals from the household sector.
	Outstanding deposits with commercial banks (% of GDP)	The total amount (in millions of national currency) of all types of outstanding deposits

		(transferable and nontransferable) of individuals from the household sector with commercial banks as a percentage of GDP.
	Outstanding loans with commercial banks	refer to the total amount (in millions of national currency) of all types of outstanding loans
Availability The quality and efficacy of access to and use of financial services	Automated Teller Machines (ATMs)	The total number of ATMs of all financial institutions
	Automated Teller Machines (ATMs) per 1,000 km2	The total number of ATMs of all financial institutions for every 1,000 square kilometers
	Automated Teller Machines (ATMs) per 100,000 adults	The total number of ATMs of all financial institutions for every 100,000 adults
	Branches of commercial banks	The commercial bank branches are retail locations of resident commercial banks and other resident banks that function as commercial banks that provide financial services to customers and are physically separated from the main office but not organized as legally separated subsidiaries.
	Branches of commercial banks per 1,000 km2	The number of commercial banks and their branches for every 1,000 square kilometers in the reporting jurisdiction
	Branches of commercial banks per 100,000 adults	The number of commercial banks and their branches for every 100,000 adults in the reporting jurisdiction.

Source: IMF

Appendix B. Definition of Variables and Data Sources

Variables names	Definition	Source
Banking Stability variables		
Capital adequacy	Equity to total loans	International Monetary Fund
Asset quality	Fixed assets/ assets	International Monetary Fund
Management soundness	Cost to income ratio, Non-interest expenses/Gross income.	International Monetary Fund
Earnings	Return on Assets (ROA) Return on Equity (ROE)	International Monetary Fund
Liquidity	Liquid assets/asset, liquid assets to short-term deposits	International Monetary Fund
Credit risk	Total loans to total assets, Loan loss provisions to net interest income.	International Monetary Fund
Competition variables		
Price	the ratio of total revenues to total assets	Bankscope
Total costs	personnel expenses, other non-interest expenses, and interest expenses	Bankscope
Price of labor	the ratio of personnel expenses to total assets	Bankscope
Price of physical capital	the ratio of other non-interest expenses to fixed assets	Bankscope
Price of borrowed funds	the ratio of interest expenses to all funding	Bankscope
Bank variables		
Size	Ln(total asset)	Bankscope
Liquidity	total loans/to total deposits	Bankscope
Capital strength	Book value of equity/total assets	Bankscope
Macroeconomic variables		
Country income	The natural of logarithm of GDP per capita	World Bank Development Indicators.
Inflation	the annual rate of the change in CPI index	World Bank Development Indicators.
Institutional variables		
Corruption perception index	An index measures various aspects of corruption, conventionally defined as the exercise of public power for private gain	Mo Ibrahim Foundation

Regulatory Quality	Price controls or inadequate bank supervision. the burdens imposed by excessive regulation in areas such as foreign trade and business development.	World Bank Development
Business Environment	This indicator captures the business regulatory environment; the level of market-based competition; and the quality of the competitive bidding process	Mo Ibrahim Foundation
Diversification	This indicator assesses the extent to which exports are diversified.	Mo Ibrahim Foundation
Rule of Law	Measures the effectiveness and predictability of the judiciary, and, more importantly, the enforceability of contracts and proprietary rights.	World Bank Development
Competition	It assesses the level to which the fundamentals of market-based competition have developed and the extent to which safeguards exist, and are enforced, to prevent the development of economic monopolies and cartels.	Mo Ibrahim Foundation
Soundness of Banks	This indicator assesses the soundness of banks, ranging from needing recapitalization to being generally healthy with sound balance sheets.	Mo Ibrahim Foundation

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