

# Recapitalization and Competition of Commercial Banks: Evidence from Selected Sub-Saharan African Countries

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*Research Paper 502*

AFRICAN ECONOMIC RESEARCH CONSORTIUM  
CONSORTIUM POUR LA RECHERCHE ÉCONOMIQUE EN AFRIQUE

# **Recapitalization and Competition of Commercial Banks: Evidence from Selected Sub-Saharan African Countries**

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**THIS RESEARCH STUDY** was supported by a grant from the African Economic Research Consortium. The findings, opinions and recommendations are, however, those of the author and do not necessarily reflect the views of the Consortium, its individual members or the AERC Secretariat.

Published by: The African Economic Research Consortium  
P.O. Box 62882 - City Square  
Nairobi 00200, Kenya

ISBN            978-9966-61-201-4

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# Acknowledgement

This research study was supported by a grant from the African Economic Research Consortium, Nairobi, Kenya. The findings, opinions and recommendations are those of the authors, and do not necessarily reflect the views of the Consortium, its members or the AERC Secretariat.

# Abstract

In the past two decades, central banks in sub-Saharan African countries have witnessed a trend of the recapitalization policy, and many more are bracing up to undertake the same reform. Theoretically, increased capital should improve capacity to invest, take risks and manage loans, as well as minimize the probability of failure as the banks become 'too big to fall'. As important as this subject is, the empirical evidence, especially for countries in sub-Saharan Africa (SSA), is sparse and inconclusive. It is on this premise that this study investigated the effect of recapitalization on bank competition in six selected countries in the region. The study used bank-level and macroeconomic indicators between 2000 and 2015 with the aid of the Panzar-Rosse model to examine the level of competition before and after bank recapitalization. The results show that bank competition is higher for the period after recapitalization than the period before recapitalization. The study, therefore, recommends that bank recapitalization could be necessary, especially for countries with low minimum paid-up capital. Recapitalization will act as a built-in stabilizer and shock absorber, which will make banks self-reliant on government funds and higher capacity to invest. However, bank recapitalization should be treated with caution to avoid the band-wagon effect but should reflect a country's economy of scale and calculated appropriate statistics that improves bank capacity.

**Keywords:** Bank, Recapitalization, Competition, Panzar-Rosse, Sub-Saharan Africa

# 1. Introduction

## Background to the Study

Bank recapitalization refers to raising the operating capital of banks to a tolerable threshold, as required by the regulatory authority. Central banks increase commercial banks operating capital periodically to ensure sanity in the banking industry. It is part of financial sector reforms, and several central banks across the globe have used this as a veritable monetary policy tool. This study examined the impact of recapitalization on competition between banks in six countries in sub-Saharan Africa (SSA) that have used this financial toolbox. The countries are Ghana, Kenya, Nigeria, Sierra Leone, South Africa and Uganda. The global financial crisis of 2007–2009 triggered intense debate on the need to review the regulatory framework of banking operations across the continent. These crises gave birth to a new paradigm of reform to address the identified regulatory gap. It necessitated the call for urgent regulatory framework review in the Basel Committee on Banking Supervision (BCBS). Consequently, undercapitalization topped the holes identified in the economic lacklustre. Based on this regulatory shortcoming, there was an urgent need for recapitalization in the banking industry as proposed in the Global Banking Regulatory Framework (GBRF) in December 2010 (Basel III).

Central banks set different capital requirements for their operating commercial banks. Operating capital requirements for commercial banks are based on the country's financial development and emerging global issues. The threshold review is always upwards and seldom downwards, as evidenced in most countries. In June 2019 in Nigeria the Central Bank issued a five-year roadmap to stabilize the economy tagged, "2019 to 2024 Road Map". Incidentally, recapitalization topped the issues raised as communicated by the Central Bank Governor. Several arguments for recapitalization are stable capital adequacy ratio, strengthening the health of the capitalized banks, accelerating consolidation, economies of scale, ability to finance large-scale projects, international competitiveness, global integration, prevention of bank failures and overall financial sector development. These narratives are alluded to in the works of several authors (Soludo, 2004; Adegaju & Olokoye, 2008; Soludo, 2008; ; Nwosu et al., 2012; Jamal-Deen et al., 2014). Arguing strongly on the need/benefits for commercial banks to recapitalize in Nigeria, Soludo (2004) stated that the Amalgamated Banks of South Africa (ABSA) —the fourth largest bank in South Africa—was bigger than that of all of Nigeria's commercial banks.



Recapitalization has taken place in some sub-Saharan African countries. The countries include Nigeria, Ghana, Kenya, South Africa, Sierra Leone, Uganda, Sudan, Zambia and Zimbabwe (Soludo, 2005; Jamal-Deen et al., 2014). Assessing the effects of recapitalization on the banks' competitive behaviour will enhance understanding of banking operations, product choices, innovation, information symmetry, which should ultimately lead to better decision-making for bank executives and overall system tranquillity. It will also equip the regulators with information to manage monetary downturns in the economy.

## **Statement of the Problem and Objective of the Study**

Recapitalization affects the competitive behaviours of commercial banks in several ways. The increase in the minimum capital requirement that aims at making banks "too big to fail", however, tends to reduce the number of operating banks. This is attributed to the inability of some banks to meet the recapitalization deadline; increased capital requirements constrains new entrants; unhealthy rivalry among banks; and the likelihood of recklessness in risk-taking amongst others (Claessens et al., 2010; Sanusi 2012). Therefore, despite the recapitalization recommendation in the GBRF, its consequences on competition may not be pre-determined, hence the motivation for this study. The role of competition on commercial banks' behaviours in the financial ecosystem is critical because it results in reallocation and redistribution of market shares of the products, and disequilibrium of market power. Hence, the concept of bank competition is of great importance, since the study of market competition can help understand the social welfare implications of changes in the banking sector (Shaffer, 2004; Mirzaeia and Moore, 2014). Moreover, ascertaining the degree of competition in the financial industry can improve the production efficiency of financial services, the quality of financial products and leapfrogging innovation in the sector (Burlamaqui and Kregel, 2005; Claessens, 2009; Moyo, 2018). A competitive environment, therefore, gives room for new businesses to evolve due to pressure to retain and gain more market shares and allows consumers to continuously enjoy the best possible services at a minimum cost sometimes.

Several studies have been done on commercial banks' behaviours in sub-Saharan Africa concerning competition, efficiency, risk-taking behaviours, performance, interest rate and strategy (see, e.g., Mwega, 2003 ; Biekpe, 2011; Mlambo and Ncube, 2011; Mwenda and Mutoti, 2011; Simpasa, 2011; Kamau and Were, 2013), Ndung'u et al., 2016; Akande et al., 2018). The empirical works studied commercial banks' competitive behaviours with regard to profitability, performance, efficiency, economic crises of 2007/2009, interest and loan management and product strategy amongst others.

However, studies on recapitalization and commercial banks' behaviours are rare in the literature. There is an absence of empirical studies assessing the impact of recapitalization on commercial banks' competitive responses in sub-Saharan Africa. Previous studies had concentrated on the gains of consolidation to bank performance,

without considering counterfactual ex ante and ex post events. It is imperative to ascertain the state of competitiveness before and after recapitalization in order to decipher to what extent bank recapitalisation affects bank competitiveness. More so, most studies on competitive behaviours are single-country analyses (see, e.g., Buchs and Mathisen, 2005; Hauner and Peiris, 2005; Balogun, 2007; Greenberg and Simbanegavi, 2009; Zhao and Murinde, 2011; Mwenda and Mutoti, 2011; Biekpe, 2011; Simpasa, 2011; Mlambo and Ncube, 2011; Mwega, 2011; Simbanegavi et al., 2012; Ndung'u et al., 2016; Osuagwu and Nwokoma, 2017; Alex and Alan, 2018). This study, therefore, contributes to existing knowledge by investigating the impact of recapitalization on bank competition for a panel of countries in SSA.

The objective of this study was to examine the impacts of recapitalization on the competitive behaviours of commercial banks in the selected SSA countries. The outcomes will guide the decisions of these countries' central banks, bank management and other regulators, especially those considering recapitalization exercises. This study used data from different relevant financial institutions spanning 16 years, from 2000 to 2015. The bank level data were obtained from Bank Focus (formerly Bank Scope), and from the International Financial Statistics (IFS) and World Development Indicators (WDI) databases.

## **2. Stylized facts on selected sub-Saharan African countries' financial system structures**

### **Ghana**

In 1896, Standard Chartered Bank of the United Kingdom, which later became British Bank for West Africa, commenced business operations. Subsequently, Barclays Bank of the United Kingdom kicked off in 1917. The Commercial Bank of Ghana, which gave birth to the Central Bank of Ghana in 1957, was established in 1953. The 1970 Banking Act imposed a minimum paid-up capital requirement for foreign and locally owned banks of GH¢2 million and GH¢0.5 million (\$US 2 million and \$US0.5 million – 1970 estimated equivalent) respectively. And in August 1989, banks were required to maintain a minimum capital base equivalent to 6% of their net assets. In 1989, GH¢62 billion worth of non-performing loans were bought by the Bank of Ghana in bonds, totalling GH¢47 billion (Kukurah et al., 2014).

Consequently, this reduced the stock exchange market capitalization by US\$92.5 million in 1990. The Bank of Ghana Act 2002 (Act 612) was replaced with the Banking Act 2004 (Act 673), to strengthen the regulatory and supervisory roles. In February 2003, the Bank of Ghana, in order to enable competition in the industry, introduced the Universal Banking Business Licence (UBBL), which is expected to improve competition within the industry. It required existing banks to have a minimum net worth of GH¢70 billion (\$US80.74 billion – 2003 estimated equivalent).

In 2007, the Bank of Ghana recapitalized to GH¢ 25 million for locally owned banks which was meant to take effect on or before 31 December 2010 (Akomea and Adusei 2013). In addition, foreign-owned banks were required to recapitalize on or before 31 December 2009. Akomea and Adusei (2013) also observed that Ghanaian banks were required to recapitalize from GH¢7 million (\$US3.84 million to GH¢60 million (\$US32.88 million by the end of 2012). Meanwhile, new entrants were required to adhere to the new recapitalization rule. The Ghanaian banking sector reforms are divided into three categories: Pre- Financial Sector Adjustment Programme (FINSAP) Era (1957–1987); FINSAP Era (1985–1999); and Post-FINSAP Era (2000 to date). The minimum capital requirement was further raised in 2017, from 120 million Ghana cedis (27.05 million USD) to GH¢400 million (90.19 million USD) with a recapitalization deadline of 31

December 2018. According to the Bank of Ghana (2017), the deposit money banks (DMBs), the number of staff employed, deployment of automated teller machines (ATMs), the number of point of sale (POS) terminals, loan and advances, deposits and total assets increased significantly in 2017, relative to 2016.

## Kenya

The banking industry in Kenya has evolved tremendously in the past two decades, despite several economic quagmires experienced in the period. The industry led the revolution in electronic money in SSA, with the launch of M-Pesa in 2007. Pesa is the Kiswahili word for money. Historically, banking business kicked off in the 19th century with the emergence of the Standard Bank of South Africa in 1910. The Kenya banking sector currently has 40 commercial banks of which 25 are locally owned and 15 are foreign-owned. In 2017 bank branches decreased by 23 compared to 2016 (from 1,541 to 1,518); Nairobi County had the highest decrease of 14, Central Bank of Kenya (CBK) (2017). Meanwhile, a total of 13 of the 47 counties also recorded declines in the number of branches due to alternative service delivery channels. Kenya's market shares are divided into three peer groups using a weighted composite index. Banks in the large peer group increased their market share from 65.32% in December 2016 to 65.98% in December 2017, due to increased customer deposits CBK (2017). As part of its regulatory requirement in ensuring stability in the system, in 2007 CBK raised the minimum core capital for banks to Ksh1 billion (US\$10 million), from Ksh250 million (US\$2.5 million), setting 31 December 2012 as the deadline. Another three-phase proposal was made for Kenya's commercial banks to increase their core capital to Ksh2 billion (US\$20 million) by December 2017, Ksh3.5 billion (US\$35 million) by December 2018, and finally Ksh5 billion (US\$50 million) by December 2019. Kenya listed banks' first-quarter reports show that some players in the banking sector were either acquired or merged with others, leading to the creation of relatively bigger, highly capitalized and possibly more stable entities by 2020 (Cytonn, 2020).

## Nigeria

Commercial banking business started in Nigeria in 1891 with the emergence of African Banking Corporation, whose operations were taken over by the Bank of British West Africa (BBWA). The Bank of Nigeria was established in 1899 and was later absorbed by the BBWA in 1912. In 1925, Barclays Bank started operations in Nigeria, after the merger between Anglo-Egyptian Bank and National Bank of South Africa. National Bank was the first indigenous bank; it commenced business operations in 1933. The preponderance of bank failures in West African British colonies resulted in the invitation of G.D. Paton of Bank of England in 1948. The aim was to examine Nigerian banks critically in terms of performance sustainability; and to recommend to the authorities on the ways forward. This led to the Banking Ordinance of 1952 and the establishment of the Central Bank of Nigeria (CBN) in 1958. After the first

banking ordinance in 1952, the capital requirement for foreign commercial banks was raised from £200 thousand to £400 thousand (\$US580 thousand to \$US1,160 thousand – 1952 estimated equivalents). It was subsequently increased in 1969 to ₦1.5 million for international banks (\$US2,100 thousand 1969 estimated equivalents) and ₦600 thousand (\$US840 thousand – 1969 estimated equivalents) for indigenous commercial banks.

The capital base was further tightened in 1988 and was increased to ₦5 million (\$US 1.1 million – 1988 estimated equivalents). That is, ₦20 million (\$US2.7 million) in 1989, ₦50 million (\$US6.2 million) in 1990 and ₦500 million (\$US22.85 million) in 1997 with a deadline to recapitalize by December 1998. In order to further strengthen the system, and to avoid the proliferation of family banking systems, CBN tightened the entry requirement by raising the bar to ₦2 billion in 2001 for the new entrants. In 2004 all the banks were required to increase their minimum capital base to ₦25 billion from ₦2 billion on or before 31 December 2005. In 2009, banks were allowed to operate as regional, national and international banks with a minimum capital base of ₦15 billion, ₦25 billion and ₦100 billion respectively. Demand deposits grew from ₦448 billion (\$US2.7 million) in 2001 to ₦1.49 trillion (\$US2.7 million) in 2016. However, this also reduced the number of operating banks from 89 in 2004 before recapitalization to 25 in 2005 after recapitalization. More so, bank branches dropped to 3,233 from 3,492 in 2005, because some banks failed to recapitalize. However, bank branches rose to 4,952 in 2006 and have been on the increase ever since. Recapitalization also leapfrogged total market capitalization of the stock exchange from ₦662.5 billion (\$US4.03 billion) in 2001 to ₦5.12 trillion (\$US39.8 billion) in 2006 and ₦16.18 trillion (\$US63.8 billion) in 2016. Total assets, total loans disbursed, and financial deepening have also increased tremendously. The volume and value of cheques cleared has been declining due to the implemented cashless economy (electronic payment penetration in the system).

## Sierra Leone

The Bank of British West Africa Ltd (Standard Chartered Bank Sierra Leone Ltd), and Barclays Bank Sierra Leone Ltd (Rokel Commercial Bank), were the two banks that opened banking business before the country's independence in 1961. Bank of Sierra Leone started operations in August 1964. It led to the emergence of indigenous financial institutions such as the National Development Bank (NDB) in 1968, National Cooperative Development Bank (NCDB) in 1971 and Sierra Leone Commercial Bank (SLCB) in 1973. The SLCB is the first indigenous commercial bank. Commercial banks in this country have undergone turbulent periods like in other African countries, especially in the 1980s due to the harsh operating environment.

Moreover, minimum paid-up capital for banks has been reviewed periodically to reflect the current economic trend. Evidently, and according to Bank of Sierra Leone (2016), the reviews were, Leone (Le) 9 billion (\$US3.02 million) in 2007, Le18 billion (\$US4.5 million) in 2010, Le24 billion (\$US5.5 million) in 2012 and Le30 billion (\$US6.6 million) in 2014. During the period, assets of the commercial banks increased from Le3.62 trillion (\$US833 million) December 2012 to Le4.33 trillion (\$US999 million)

as at the end of December 2013. This represented 19.61% growth (Le710.70 billion - \$US164 million). Similarly, a 21.67% increase was recorded in deposits, from Le2.83 trillion (\$US651.5 million) as at the end of December 2012 to Le3.44 trillion as at the end of December 2013. The fundamental building blocks such as demand, savings and time deposits, shareholders' funds also rose significantly by 2013. The growth resulted from the Le27 billion (\$US6.2 million) minimum paid-up capital required as at the end of December 2013. Within this period, since increasing minimum bank capital was required, the number of commercial banks remained unchanged while of commercial bank branches increased. Bank branches rose to 101 in 2015 from 86 in 2011. Non-performing loans were high at the end of December 2015, compared to 2014 due to the Ebola outbreak, which affected significant economic activities.

## South Africa

Lombard Bank was the first bank to establish a business in South Africa, and this was in Cape Town on 23 April 1793. The proposal to create a Central Bank in South Africa was made in 1879; it was finally established on 31 March 1920 and named South Africa Reserve Bank (SARB). In 2019 a total of 4 banks controlled over 80% of the total assets of the industry market. These banks are Standard Bank Group, ABSA Group, First Rand Bank and Ned Bank. These four banks were the largest in Africa by 2018 and controlled the banking industry in the continent. Capitalization and capital adequacy based on Basel requirements have dominated the industry regulatory mantra since the 2007–2009 financial meltdown.

The Basel I Accord was implemented in South Africa in 1988, Basel II in 2008, and Basel III in 2013. In line with the Basel III framework, SARB increased the minimum capital requirement to ZAR250 million (\$US25.9 million). There were 19 registered banks, 3 mutual banks and 3 corporative banks with assets totalling ZAR5,295 billion (\$US400.11 billion) and Return on Assets (ROA) of 1.35% as at June 2018 (Shivambu, 2018). Standard Bank Group has outlets in 17 countries in Africa and 13 countries outside Africa and is rated globally as the 202nd largest bank by asset on Forbes List. Ned Bank is the third-largest bank in South Africa by assets but ranked second, in terms of several employment generations. Electronic channels for financial settlements are widely embraced in South Africa. The value and volume of electronic transactions increased from 2011 to 2016. However, the value and volume of cheques transactions have been on the decline since 2011, showing appetite for cheques and cash-based transactions.

## Uganda

Commercial banking operations started in the 1960s with the emergence of the Bank of Uganda and the Uganda Commercial Bank. After that, Bank of Baroda, Barclays Bank, Bank of India, Grindlays Bank, Standard Chartered Bank and Uganda Cooperative Bank commenced business operations. The Uganda banking industry experienced turbulence in the late 1990s, leading to the failure of some banks. This resulted in the restructuring of the industry in 2008 and 2009 through mergers and

acquisitions. As at the end of December 2011, commercial bank assets in Uganda stood at UGX12.982 trillion (\$US 5.145 billion). In October 2011, the industry had 22 licensed commercial banks, 455 bank branches and a total of 637 ATMs. These figures jumped in 2017 to 24 banks, 544 branches and 821 ATMs. In 2017 total assets were UGX26.5 trillion (\$US 7.34 billion) showing enormous growth. In 2010 Bank of Uganda directed all commercial banks to raise their minimum capital to UGX10 billion (approximately US\$4.34 million) on or before March 2011, and UGX25 billion (about US\$11 million) by March 2013. Besides this, effective November 2010, new entrants had to have a minimum capital of UGX25 billion. Interestingly, all the banks scaled this hurdle: they met the regulatory capital requirements. In a similar development, in 2014 Bank of Uganda redirected all the banks to recapitalize from UGX25 billion (\$US 9.6 million) to UGX27 billion (\$US 8.3 million) before the end of June 2015.

**Table 1: Comparable financial development indicators**

Country	Domestic credit to private sector (% of GDP) (A)	Exchange rate (USD) (B)	GDP growth rates (%) (C)	Int. rate spread (%) (D)	Inflation rate (%) (E)	No of bank branch/ 100,000 adults (2018) (F)	Bank concentration (%) (2017) (G)	No of banks (2015) (H)	Fin devt Index 2017 (I)
Ghana	16.79	1.08	6.257	9.239	16.1	8.646	36.3	25	0.13
Kenya	34.46	79.68	4.359	9.743	9.728	5.025	36.6	40	0.20
Nigeria	14.61	138.48	7.54	7.568	11.54	4.300	42.0	21	0.24
Sierra Leon	4.83	3,311.8	7.386	12.84	6.11	2.640	100.0	14	0.09
South Africa	151.55	8.317	3.288	3.989	5.788	10.116	76.7	27	0.63
Uganda	14.38	2,105.7	5.508	11.008	7.25	2.608	54.2	24	0.12

Source: World Bank database, IMF database

**Notes:** Columns **A to E** show the average of the 16 years (2000–2015) of the financial development indicators (authors' computations from the referenced data sources); Columns **F to I** are given, in the sourced databases

**A** = domestic credit to private sector as a percentage of gross domestic product (%)

**B** = exchange rate – USD/domestic currency (%)

**C** = annual gross domestic growth rate (%)

**D** = interest rate spread – lending rate less deposit rate (%)

**E** = annual inflation rate (%)

**F** = number of bank branches per 100,000 adults

**G** = bank concentration (%) – (share of assets of three top banks)

**H** = numbers of operating banks – total no. of the operating banks in the country

**I** = financial development index—depth (size and liquidity) access to financial services, efficiency (low cost of intermediation), range of activities in the stock market

From Table 1, South Africa ranked first in terms of the number of bank branches per 100,000 adults in 2018, with 10.1 branches per 100,000 adults. The number for Ghana was 8.646 and for Nigeria was 4.300; Uganda had the lowest number with 2.608 per 100,000 adults. This indicates that South Africans have the highest access to

bank branches, compared to the other selected countries. The financial development index also indicates that South Africa is performing better than the other five countries with an index of 0.63. In terms of the gross domestic product (GDP) growth rate, Sierra Leone (7.38%), Nigeria (7.54%), Uganda (5.5%), Ghana (6.2%) and Kenya (4.3%), were doing better than South Africa (3.2%). Kenya had the highest number of operating banks in 2015. In terms of intermediation efficiency, measured with interest spread rate, South Africa was the most efficient with a margin of 3.9%. Sierra Leone was the least efficient, with a 12.84% spread (Table 1).



## 3. Literature review

### Theoretical literature

#### *Relationship between capital and competition*

Three significant schools of thought exist that debate the relationship between increased capital requirements and competitive conduct of firms. They are, the optimistic, pessimistic and the substitutive perspectives. The optimistic school of thought posits that increase in capital increases competition. Predominant amongst them is the Karl Marx theory on the competition. Marx believed that competition arises from self-expansion of capital and is related to the circulation of commodities as well as the production, realization and distribution of surplus value (Semmler, 1982). This implies that an increase in capital increases competition.

Similarly, the findings of the Pecking order theory of 1984 showed that the value of a firm could be increased by changing the capital structure of that firm with an appropriate optimum mix of capital structure (Myers and Majluf, 1984). In addition, Brander and Lewis (1986) examined the impact of oligopolistic firms' financial structures on their competitive behaviours, and the findings showed that firms' output level is a veritable tool in competitive weapons. Research by other authors (Cornett and Tehranian, 1994; Laderman, 1994; Wagster, 1996) observed positive relationships between capital requirements and market share prices of banks in US, Germany, Switzerland and the Netherlands.

However, substitutive views exist such as that of Modigliani and Miller (1958) who pioneered the financing strategies of a firm. Modigliani and Miller (1958,) studied the impact of capital structure on firm value creation; their findings show that capital structure does not affect firm value. Pessimistic views such as that expressed by Amel et al. (2004) opined that commercial banks operating beyond a specific size have higher operating costs and operating beyond lowest average cost, introduce inefficiencies and instability that reduce competition in the market. Similarly, the findings of Berger and Mester (1997) and Amel et al. (2004) revealed that banks that are too big are more inefficient and unstable. This finding corroborated the work of Berger et al. (1993), which found that the most efficient banks have a substantial cost and competitive advantages over those with average or below-average efficiency. That is, huge banks are unstable and uncompetitive. Other authors (Bikker and Groeneveld, 1998; Salas and Saurina, 2003; Claessens and Laeven, 2004) assessed competitive structure in the

banking industry, and their findings show that concentration impairs competitiveness. Furthermore, Eysell and Arshadi (1990), Madura and Zarruk (1993) and Cooper et al. (1991) found a negative correlation between regulatory capital requirements and competition in banks in the US, UK, Canada and Japan.

The pessimists believe that capital build-up and concentration reduce competition with attendant consequences of driving up banking costs and stifling financial inclusion. By extension, they claim that high regulatory capital requirements could impose entry barriers for new entries, and this would restrict competition and encourage market power by existing banks (Berger et al., 1993). Other studies concluded that the effectiveness of regulatory capital on competition is contentious and questionable (Van Roy, 2003; Hakenes and Schnabel, 2010; Oduor et al., 2017). Oduor et al. (2017) studied the impact of regulatory capital requirements on bank competition using 167 banks in 37 countries in Africa, and the findings show that competitive behaviours are improved for foreign banks while domestic banks are less competitive. Building on the above discussions, the impacts of recapitalization on commercial banks competitiveness is unclear. Based on the previous, our study assessed the impact of increased regulatory capital requirements on bank competition concerning the countries that have witnessed recapitalization in the banking industry in the sub-Saharan African countries.

## Measures of competition

Some studies identified two measures of competition in the literature to include structural and non-structural methods (Bikker and Haaf, 2000; Bikker, 2010; Bikker et al., 2012). The structural method measures competition in terms of market concentrations. Concentration measures the number of banks (fewness) and distribution of banks size (inequality) in a geographical location. The ratio is the index of concentration, and this is the cornerstone of the structural method. According to Bikker and Haaf (2000), concentration ratios include: the  $k$  bank Concentration Ratio (CR $_k$ ), the Herfindahl-Hirschman Index (HHI), the Hall-Tideman Index (HTI), the Rosenbluth Index (RI), the Comprehensive Industrial Concentration Index (CCI), the Hannah and Kay Index (HKI), the U Index (U), the multiplicative Hause Index (HI), the additive Hause Index (Ha) and the Entropy measure (E). Some of these concentration ratios characteristics are highlighted below. According to Bikker and Haaf (2000), features of the banking market, relative impact larger and smaller banks have on competition, the relative effect of size distribution, and several banks determine the validity of the ratios used. Concentration ratios generally measure the impact of banks concentration on banks' competition. The non-structural method does not use a concentration ratio index as a measure of competition. It instead, measures competition in terms of contestability and not market structure by considering banks as entities, making different decisions. The building blocks include the Lerner Index (1934), the Iwata model developed in 1974, , the Brenham model developed in 1982, and the Panzar and Rosse (1977, 1982, 1987) model. These models were developed

to address the shortcomings of the theoretical and empirical nature of the structural models. Shaffer (2004) submitted that the Panzar-Rosse model is the preferred and most widely used measure of competition in the literature for its data friendliness, estimation techniques and dependable robustness.

Similarly, Shaffer (1993 and 2002), Shaffer and DiSalvo (1994), Claessens and Laeven, (2004) submitted empirically show that conduct may be less competitive than the concentration measures would suggest. Thus, concentration is generally a poor measure of banks' competition. Another measure is the Bone Indicator. Furthermore, Claessens and Laeven (2004) and Claessens (2009) identified the traditional measures of competition to include: the market structure (measured by the number of banks), banking concentration or average bank size, entry restrictions and the impact of new entrants. Others are the efficiency of banks, the business cycle swings, health of institutional framework and ease of cross-border to investment penetration.

## **Empirical Literature**

Empirical studies on the impact of recapitalization on the competitive conduct behaviours of commercial banks are sparse both in developed and developing economies. However, the literature on banks' competition is abundant, especially in developed economies. Recapitalization of banks is not a frequent monetary tool used often in most economies. Several authors have used the structure-conduct-performance (SCP) model to investigate the competition of banks in Cameroon (Atemnkeng and Nzongang, 1999), Malawi (Chirwa, 2001), Kenya (Kamau and Were, 2013) and in 40 emerging and advanced countries (Mirzaei, Moore & Liu, 2013). Atemnkeng and Nzongang (1999), Mirzaei, Moore & Liu (2013) and Chirwa (2001) showed that market power positively and significantly affects commercial bank performance. Similarly, Kamau and Were (2013) used SCP and Data Envelopment Analysis (DEA) to investigate competition and efficiency conditions of banks. Their findings showed that a decrease in concentration enhances market competition and also redistributes profitability shares more evenly.

Koetter and Vins (2008), Akande and Kwenda (2017) used the Lerner index to assess the competitive behaviour of banks in Germany and sub-Saharan Africa respectively. The results of the study by Koetter and Vins (2008) revealed that both market power and average revenues declined among the German banks. Meanwhile, the Akande and Kwenda (2017) findings showed that monopolistic competitive market power is driven by capital. In addition, several authors used the Panzar-Rosse model to measure competition in Tanzania (Simpasa, 2011), Ghana (Biekpe, 2011), Zambia (Simpasa, 2013), and Africa region (Fosu, (2013). Simpasa (2011) showed that banks in Tanzania earned their income under oligopolistic conduct condition. Biekpe (2011) showed that there is evidence of a non-competitive market structure in the Ghanaian banking system which hinders efficiency in intermediation. Simpasa (2013) found that Zambian banks earned their revenue under conditions of monopolistic competition.

In African sub-regional markets, Fosu (2013) showed that banks are characterized as monopolistically competitive. Fosu (2013) further argued that, except for North Africa, African banks exhibit higher competitiveness than other regions of the World. Similarly, Mwega (2011) examined the competitiveness and efficiency of Kenya's financial services sector. The study employed SCP, HHI, Panzar Rosse, Persistence of Profitability (POP), Conjectural Variation and DEA. The findings showed reduced concentration and enhanced competition in the period under review. The results concluded that small banks are the least competitive and most concentrated, followed by large banks and medium-sized banks.

Poshakwale and Qian (2011) studied the impact of financial reforms on competitiveness and production efficiency of the Egyptian banking sector. The findings showed a positive and significant effect of reforms on competitiveness and production efficiency. However, Onipe, Bilikisu, Farouk, Lamidi, Musa (2015), and Uddin and Suzuki (2014) observed the negative link between competition and bank performance in Nigeria and Bangladesh respectively. Similarly, Zhao and Murinde (2011) investigated the impact of bank reforms on competition, risk-taking and efficiency in Nigeria. The study employed conjectural variations and the results show that, as competition increases, excessive risk-taking decreases and efficiency increases. Studies on recapitalization and bank competition in SSA are very scanty and almost non-existent. Gudmundsson et al. (2013) also investigated the role of capital on bank competition and stability in Kenyan, using the Lerner index and the Panzar–Rosse model. The findings showed a significantly non-linear effect of core capital on the competition. Gudmundsson et al. (2013) further noted that an increase in core capital on competition is a “phase impact”; it reduces competition to a point, then increases. The benefits of increasing capital requirements on competitiveness are consolidation effect induced. Nwosu et al. (2012) investigated the impact of bank recapitalization on the risk-taking behaviours of commercial banks in Nigeria. The findings showed that an increase in bank capital promotes bank stability. Using Bone Indicator, Amidu and Wilson (2014) investigated the impact of globalization and institutional quality on bank competition on African banks. The results showed that globalization enhances bank competition, given the more robust governance structures and institutional quality.

Dietrich and Wanzenried (2010) and Soyemi et al. (2013) showed that bank size, capital adequacy ratio and the cost to income ratio are positively significantly related to the profitability of the bank. Kamau (2009) concurred that banks performed reasonably well during the post-liberalization period in Kenya. Aransiola (2013), Obamuyi (2013), and Adegaju and Olokoyo (2008) established that bank consolidation had affected bank performance positively. However, Somoye (2008) showed that recapitalization impact is marginal in Nigeria. While Mullings (2003), and Olweny and Shipho (2011) argued that the effects of capital requirements on the stability of banks are overwhelming, Hauner and Peiris (2005) showed that the impact of bank consolidation in Uganda is uncertain. However, Akomea and Adusei (2013) argued that recapitalization encourages high concentration in Ghana. They concluded that it is

inimical to customers. Kukurah et al. (2014) also studied the effects of recapitalization policy on the performance of banks in Ghana. The findings show that recapitalization does not necessarily translate to excellent bank performance. Building on the works of Maudos and Fernández de Guevara (2007), Koetter and Vins (2008) investigated the degree of competition and efficiency in the German savings banks and the findings show that both market power and average revenues declined in the reviewed period.

Andrieş and Că Praru (2012) examined competition among the European Union banks. The results show a significant increase in competition from 2001 to 2006 and a decrease between 2005 and 2007. In addition, Seelanatha (2010) studied competition and performance of Sri Lankan banks and the findings revealed market power exists in the industry. Mullings (2003) investigated the behaviour of Jamaican banks in terms of capital requirement. Using the Seemingly Unrelated Regression (SUR) model, the results show that capital requirements are significantly positive determinants of the profit-maximization of banks and so marginal risk-based requirement cost is positively related to bank performance. Similarly, Muhammad (2012) examined the impacts of banking sector reforms in Bangladesh using CAMELS (capital adequacy, assets, management capability, earnings, liquidity, sensitivity) measures. The findings revealed a mixed result for banks types: local banks failed to achieve satisfactory improvement, but foreign banks did. There exist several works that examined the competitive conduct behaviours of commercial banks (for example, Buchs and Mathisen, 2005; Mugume, 2010; Akande and Kwenda, 2017; Alex and Alan, 2018; Mongi, 2015). Conversely, there are limited empirical works on the link between recapitalization and competition. Our study investigated the impact of recapitalization on bank competition in sub-Saharan Africa, and it is limited to the countries selected—Ghana, Kenya, Nigeria, South Africa, Sierra Leone and Uganda.

## 4. Methodology and data description

### Methodology

The study adopted the Panzar–Rosse model to ascertain the objective, which investigates the impact of recapitalization on bank competition in selected sub-Saharan African countries. The t-test of significance was further used to establish whether there exists a significant difference between the scores before and after recapitalization.

### Model Specification

“The Panzar–Rosse model is the most widely applied assessment of the competition in the banking literature” (Leon, 2015, page 24). The Panzar–Rosse model was developed by the conjugal works of John C. Panzar and James N. Rosse (Panzar and Rosse, 1977; Panzar and Rosse, 1987). They provided a framework for knowing the degrees of competition by classifying the market as follows: monopoly, oligopoly, monopolistic competition and perfect competition with the aid of the H-statistic. The theoretical framework of Panzar–Rosse is based on the long-run income for commercial banks where the objective of the banks is profit maximization using the constructed H-statistic to assess the competitive nature of banking markets and the market power of banks. The H-statistic is the sum of elasticities of input prices subject to the profit-maximizing level of revenue. Building from the works of Bikker and Haaf (2002), Mwega (2011), Mlambo and Ncube (2011), Simpasa (2011) and Bikker, et al., (2012), with the assumption of an n-input single-output production function the Panzar–Rosse equation is specified thus:

$$\ln TR_i = \alpha + \sum_{i=1}^n \beta_i \ln w_i + \sum_{j=1}^j \gamma_j \ln C_j + \varepsilon_i \dots\dots\dots(1)$$

Where TR is total revenue;  $w_i$  is the price of the  $i^{\text{th}}$  input factor (wherein interest expenditure, price of capital and price of labour represents the input prices);  $\alpha$  is the intercept;  $\beta$  and  $\gamma$  are coefficients; and  $C_j$  is the  $j^{\text{th}}$  bank-specific control factor on the following assumption that  $E(\varepsilon | w_1, \dots, w_n, C_1, \dots, C_j) = 0$

Following Bikker et al. (2006), the dependent variable of Equation (1) should be (the logarithm of) interest income or total income. That is income in levels rather than scaled with total assets.



## Data Sources and Description

The study utilizes panel data for six countries that have recapitalized banks and have at least three years before and after recapitalization between 2000 and 2015 (time scope of the study). The bank level data were obtained from Bank Focus (formerly Bank Scope) while other data were obtained from the databases of International Financial Statistics (IFS) and World Development Indicators (WDI). The bank level data were limited to the countries of SSA that recapitalized and also to the data available in the Bank Scope database. However, we are quite convinced that the range of the data obtained was good enough to establish and test the impacts of recapitalization on the competitive behaviours of commercial banks in SSA. The data used include both bank indicators such as return on asset, assets, deposits, equity, number of non-performing loans, total loans, credit risk, loan quality, revenue, cost, profitability, operating cost, interest expenditure, non-interest expenditure, price of labour, price of capital and macroeconomic indicators such as GDP growth rate, inflation rate and lending rate.

A descriptive analysis of the data is presented in Table 3. It shows the summary statistics for the whole period (2000–2015) before and after recapitalization. Table 3 further shows the probability values of the t-test of the significance of the variables before and after recapitalization. As expected, all of the bank level indicators increased significantly after recapitalization except return on assets, revenue, credit risk, loan quality, price of labour and price of capital that also increased, although not significantly. However, the macroeconomic indicators showed no significant difference before and after recapitalization. Mean cost and profitability for the period after recapitalization increased by 450% and 200%, respectively, when compared to the period before. Details of Capitalisation dates are shown in Appendix A.

**Table 3: Summary statistics of data**

Description	Overall mean	Mean before recapitalization	Mean after recapitalization	Pr( T  >  t )
<b>Return on asset (US\$)</b>	19.46917 (16.86712)	17.54035 (15.43059)	22.28821 (18.61783)	0.1769
<b>Assets (US\$)</b>	80255.94 (143374.6)	37006.59 (84652.51)	143466.5 (184184)	0.0002***
<b>Deposits (US\$)</b>	59712.07 (106357.4)	27578.62 (63844.96)	106676.3 (135868.4)	0.0002***
<b>Equity (US\$)</b>	9229.172 (17523.61)	2564.607 (5261.61)	18969.69 (23725.41)	0.0000***
<b>Number of non-performing loans</b>	1304.26 (2255.9)	569.1735 (1001.664)	2378.616 (3041.213)	0.0001***
<b>Total loans</b>	47311.19 (91119.47)	22854.68 (58133.77)	83055.31 (116482.1)	0.0012***



<b>GDP growth rate</b>	5.889688 (4.907622)	6.212982 (5.424049)	5.417179 (4.058289)	0.4381
<b>Inflation rate</b>	9.418854 (7.569918)	10.21474 (7.05092)	8.255641 (8.225291)	0.2148
<b>Lending rate</b>	19.42031 (5.618832)	20.4714 (5.81438)	17.8841 (5.002807)	0.0259**
<b>Credit risk</b>	0.5842163 (1.135424)	0.4783276 (0.1581948)	0.7389768 (1.773327)	0.2716
<b>Loan quality</b>	0.0649238 (0.0579723)	0.0606337 (0.0519336)	0.0711939 (0.0660253)	0.3835
<b>Revenue (US\$)</b>	6745.895 (15817.44)	4897.654 (17007.31)	9447.171 (13660.32)	0.1675
<b>Cost (US\$)</b>	3133.611 (6201.969)	1118.826 (2364.146)	6078.296 (8540.256)	0.0001***
<b>Profitability (US\$)</b>	1227.542 (2328.918)	665.2467 (1461.77)	2049.357 (3040.28)	0.0037***
<b>Operating cost (US\$)</b>	1127.985 (2797.771)	244.3181 (1037.61)	2419.498 (3885.74)	0.0001***
<b>Interest expenditure (US\$)</b>	2948.151 (6101.857)	1542.11 (4063.337)	5003.134 (7839.041)	0.0057***
<b>Non-interest expenditure (US\$)</b>	2434.368 (5740.932)	881.5796 (1957.678)	4703.829 (8236.815)	0.0011***
<b>Price of labour</b>	0.0403877 (0.1032121)	0.0336684 (0.0802321)	0.0502084 (0.1303025)	0.4435
<b>Price of capital</b>	14.46661 (24.49712)	12.06606 (25.11745)	17.97511 (23.43645)	0.2478

Source: Authors' computation from Stata Output Note: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$   
Standard deviation values are in parentheses

Country specific summary statistics for the six countries across key variables employed are illustrated in Appendix B.

## 5. Presentation of results and analysis

### Presentation of Panel Unit results

The Fisher-type panel Unit Root test was performed for the variables that were employed in the panel regression to estimate the Panzar–Rosse H-statistic. The null hypothesis of this test is that all variables contain a unit root. All variables were stationary at level with drift while variables such as GDP growth rate, price of labour and credit risk were equally stationary at level with the trend as well as without drift or trend. The results, therefore, established that the variables were mean-reverting and consequently suitable for robust analysis. The Panel Unit results are shown on Table 4 below.

**Table 4: Panel Unit Root results**

Description	With trend	With drift	No trend & no drift	Order of integration
<b>ltotrevass</b>	1.3108 (0.9006)	-3.0157 (0.0024)***	0.6477 (0.7392)	At level
<b>Leqtyasst</b>	0.9100 (0.8154)	-1.8784 (0.0345)**	1.8991 (0.9670)	At level
<b>lnplass</b>	1.3877 (0.9129)	-4.1282 (0.0001)***	-0.8248 (0.2076)	At level
<b>Lassets</b>	1.8012 (0.9597)	-0.1887 0.0425**	3.2681 (0.9988)	At level
<b>gdpgrate</b>	-3.3892 (0.0009)***	5.1630 (0.0000)***	-2.3435 (0.0125)**	At level
<b>inflate</b>	0.1263 (0.5499)	-5.1762 (0.0000)***	-2.7353 (0.0049)***	At level
<b>ldeposits</b>	-0.9270 0.1802	-0.9270 (0.0180)**	3.1433 (0.9983)	At level
<b>lpricelabour</b>	-9.3900 (0.0000)***	-6.3825 (0.0000)***	-9.4254 (0.0000)***	At level

<b>lendrate</b>	-0.4488 (0.3282)	-3.9218 (0.0002)***	-0.4538 (0.3264)	At level
<b>Credit risk</b>	-6.9362 (0.0000)***	-9.3416 (0.0000)***	-8.0224 (0.0000)***	At level
<b>Lintexp</b>	0.8736 (0.8058)	-3.1660 (0.0016)***	0.4573 (0.6748)	At level
<b>lPriceofkl</b>	0.8764 (0.8065)	-3.3557 (0.0010)***	0.1954 (0.5769)	At level

Source: Authors' computation from Stata Output Note: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ ; Probability values are in parentheses

## Impact of Recapitalization on Competitiveness of Commercial Banks in selected sub-Saharan African countries

The study estimated 4 regressions of equation 2: the first 2 adopted revenue as the dependent variable with 11 regressors and then a reduced model with 8 regressors. The third equation employed return on asset (ROA) as the dependent variable for the full model with 11 regressors. The first three estimations employed the Panzar–Rosse model to analyse the level of competitiveness before and after bank recapitalization (wherein a Hausman specification test was done, and the results suggested that random and not fixed-effect model be used, as shown in Appendix C). The fourth estimation simply runs a pooled regression combining both periods but employs interactive dummies for the three key indicators—log of interest expense, price of capital and price of labour—and used revenue as the dependent variable. It serves as a robustness check to confirm the results of the Panzar–Rosse model with the different proxies for the dependent variable used.

Overall R squared is high for all regressions as they are all greater than 0.83, showing that the explanatory variables represent at least 83% of the dependent variable—total revenue or ROA. The probability chi-squared for all four regressions is 0.0000, which implies that the overall models for all estimations are significant at 1% significant level. To test for the long-run equilibrium condition, the Wald test was carried out. The result of the Wald test before recapitalization indicated that the Wald test (Wald  $\chi^2(11) = 387.40$ ) and Wald  $\chi^2(11) = 180.38$ ) after recapitalization. The probability of Wald  $\chi^2$  (Prob >  $\chi^2 = 0.0000$ ) for both periods is highly significant, indicating that commercial banks in the selected SSA market are in the long run at equilibrium. This also validates the condition for the employment of Panzar–Rosse to test for competitiveness in the banking industry.

The study employed the Arellano-Bond tests for first-order and second-order serial correlation test in the residuals and the Sargan test of over-identifying restrictions to ascertain the validity of the instrument. The results suggest that the null hypothesis of no second-order serial correlation cannot be rejected, hence the instruments are

valid. And the null hypothesis that there is no first-order serial correlation in the error term can be rejected at 5% level of significance, suggesting that the test for second-order serial correlation in our regressions is reliable.

Meanwhile, results in Table 5 show that price of capital, price of labour, log of equity divided by asset, the log of non-performing loans divided by asset, the log of deposit and lending rate are significant determinants of total revenue and ROA in all three estimations for the period before recapitalization. However, the third estimation differs slightly in that the log of interest expenses are also a significant determinant of ROA while the lending rate is not.

On the other hand, the log of interest expense and log of equity on the total asset are significant determinants of the log of total revenue in the first equation. The log of interest expense, price of labour, the log of equity on the total asset and inflation rate are significant determinants of the log of total revenue in the second equation and then log of interest expense. The lending rate is a significant determinant of the log of ROA in the third equation.

The fourth estimation combines both periods and shows that price of capital, price of labour, the log of equity divided by asset, the log of deposit and credit risk are significant determinants of total revenue. The three interactive dummies introduced in this last equation are not significant at 5% significant level, given that their probability values are all less than 0.05.

The H-statistic, which is the sum of the three critical inputs as specified above, suggests that competition improves after recapitalization as evident in all three estimations. H-statistic was -0.15, -0.28 and -0.82 before capitalization and then 0.94, 0.97 and 0.7 after recapitalization for the first, second and third estimations respectively. Recall that when H-statistic is 1, it is said to represent perfect competition,  $0 < \text{H-statistic} < 1$  represents monopolistic competition and  $\text{H-statistic} < 0$  represents monopoly power. It, therefore, suggests that the banking industry moved from a monopoly power before bank recapitalization to monopolistic competition after bank recapitalization.

**Table 5: Panzar-Rosse estimation results for competition**

	Estimation 1 with revenue as a dependent variable		Estimation 2 with revenue as a dependent variable		Estimation 3 with ROA as the dependent variable		Estimation 4 with interactive dummies
	Before recapitalization	After recapitalization	Before recapitalisation	After recapitalization	Before recapitalization	After recapitalization	
lintexp	-0.09 (0.20)	0.86*** (0.16)	-0.20 (0.18)	0.88*** (0.13)	-0.67* (0.36)	0.57* (0.30)	0.02 (0.18)
lpriceofkl	-0.44*** (0.06)	-0.07 (0.08)	-0.42*** (0.06)	-0.08 (0.06)	-0.74*** (0.10)	-0.06 (0.15)	-0.46*** (0.09)
lpriceoflabour	0.38*** (0.07)	0.15 (0.09)	0.34*** (0.06)	0.17** (0.07)	0.59*** (0.12)	0.19 (0.17)	0.31*** (0.11)
lnplass	0.59*** (0.14)	-0.07 (0.25)	0.53*** (0.14)	-0.18 (0.18)	0.61** (0.25)	-0.18 (0.49)	0.32 (0.25)
leqtyass	1.26*** (0.37)	0.83** (0.33)	1.14*** (0.38)	0.58*** (0.21)	3.77*** (0.72)	0.86 (0.66)	1.49*** (0.45)
lloanass	-1.05 (0.87)	-0.02 (0.28)			0.45 (1.57)	0.66 (0.56)	0.25 (0.37)
gdpgрте	-0.01 (0.01)	0.01 (0.03)	-0.01 (0.02)	0.01 (0.03)	-0.01 (0.03)	-0.02 (0.06)	0.01 (0.03)
inflr	0.01 (0.02)	-0.03 (0.02)	0.01 (0.02)	-0.03* (0.02)	0.02 (0.03)	-0.03 (0.03)	0.02 (0.02)
ldeposits	1.26*** (0.26)	0.22 (0.18)	1.49*** (0.25)	0.15 (0.16)	1.48*** (0.47)	0.53 (0.34)	0.66*** (0.23)
lendinrate	-0.05** (0.02)	0.00 (0.05)			-0.07 (0.04)	0.23** (0.10)	-0.02 (0.05)

credrisk	1.58 (2.88)	-0.12 (0.14)		-0.61 (5.19)	-0.27 (0.26)	-0.51** (0.21)
I. dummy lintexp						
I. dummy						-0.12 (0.10)
Lpriceofkl						0.14 (0.10)
I. dummy						0.10 (0.10)
lpriceoflabour						0.10 (0.10)
Constant	2.63 (2.75)	1.95 (2.18)	0.99 (1.27)	1.65 (1.30)	9.14* (4.96)	-7.98* (4.20)
Observations	57	39	57	39	55	37
Within R2	0.7354	0.7315	0.6722	0.7274	0.3198	0.1533
Between R2	0.9955	0.9877	0.9955	0.9852	0.9711	0.8746
Overall R2	0.9732	0.9552	0.9668	0.9534	0.8740	0.8348
Prob>chi2/Pr ob> F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
H-Statistic	-0.15	0.94	-0.28	0.97	-0.82	0.7

Recall that H-statistic is calculated by summing up the three input price elasticities in each case; Standard errors in parentheses

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Source: Authors' computation from Stata Output

This result was surprising at face value because it is expected that recapitalization should lead to mergers and then to fewer banks with more significant market share and consequently steeper barriers to entry which are characteristics of anti-competition. However, we note that the positive relationship between the increase in capital and the increase in competition has been established by the Marx theory of competition and capital structure. We further posit that recapitalization could increase competition due to three reasons. The first point is validated by the major criticism of the HHI as against the Panzar–Rosse model. Roberts (2014) and DeVany and Kim (2003) posit that HHI erroneously assumes that market share directly translates to market power and ignores bank behaviour. Furthermore, Mason (1939) and Bain (1956) opined that the more concentrated an industry is the easier it is for firms to operate in an uncompetitive manner and so the structure, conduct and performance of firms in a given market reflect market concentration. More so, the use of the Panzar–Rosse model ascertains competition via firm behaviour by measuring the transmission of input prices on firms' revenues. According to Panzar–Rosse, therefore, the results show that competition increased after recapitalization because the increase in total revenue is now induced by higher input prices.

This leads us to the second justification, which is that recapitalization increased the capital base of banks (rise in paid-up capital) and therefore the capacity to invest. It means that they now have more potential to take more risk (as shown in the summary statistics) to invest in inputs if the output (revenue) must increase. This is empirically supported by Gudmundsson et al. (2013) who investigated the role of capital on bank competition and stability in Kenya's banking industry from 2000 to 2011. The study employed the Lerner index and the Panzar and Rosse H- statistic to show that an increase in core capital reduces competition up to a point, then increases competition, implying that the benefits of raising capital requirements on competitiveness start to be realized once consolidation in the banking sector starts to take place.

Finally, banks recapitalised in the region in order to minimize reliability on government funds in banks, which is "cheap funds" and allow banks to run as complete private institutions that have the potential to do the real business of banking, core intermediation business and real sector support. It is, therefore, expected that when banks divest from their concentrated public funds' holdings with less dependence on government patronage, arising from the sufficient private investments, then competition inherent in private-sector machinery will be forced to unleash and manifest. It is, therefore, on this premise that we submit that bank recapitalization in the selected sub-Saharan African countries improved competition.

## 6. Conclusion and recommendation

Competition and performance of banks remain critical to the survival and sustenance of the banking industry, in addition to the growth and development of the economy. It is the prime objective of the monetary authorities to formulate and implement monetary policies and reforms that will improve and strengthen the financial sector of the economy. Bank recapitalization is one of those reforms that have been used for decades and maybe centuries ago in other climes. Given this, several African countries have in the last two decades recapitalized banks to varying degrees, once, twice, thrice, and many other countries are still planning to. With the emergence of recapitalization in the financial literature, our study, therefore, examined competition of the banking industry before and after recapitalization. With the aid of the P–R model, the study shows that competition after bank recapitalization was much better than in the period before it. Therefore, banks competitive behavioural conducts improve after recapitalization.

The study shows that there exists a high correlation between bank recapitalization and the improvement in the competition of selected African countries. So, the scepticism that recapitalization reduces market share is empirically faulted by the findings of this study. However, bank recapitalization often leads to mergers and acquisitions through forcing some banks to merge or be bought which may lead to loss of jobs and a reduction in the concentration of banks. Nevertheless, the fundamental idea for perfect competition is that price should equal marginal cost, and the Panzar–Rosse model examines the transmission of prices. Therefore, the study infers that bank recapitalization increases the rate at which banks adjust prices towards the marginal cost.

The study, therefore, recommends that bank recapitalization may be necessary, especially for countries with a low minimum paid-up capital in its banking system. This is also to the extent of the proportion of public funds in the banks' balance sheet. Recapitalization will act as a built-in stabilizer and shock absorber which will make banks self-reliant on government funds and higher capacity to invest. These will translate into a menu of service options for bank customers which underscores the improved competition in the financial ecosystem. Furthermore, bank recapitalization should be treated with caution to avoid the band-wagon effect but should reflect a country's economy of scale and calculated appropriate statistics that improves bank capacity.



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# Appendices

## Appendix A. Years of recapitalization and respective new minimum bank capital

S/No	Country	Year of Recapitalization	New bank minimum capital
1	Nigeria	2005	₦25 billion a
2	Ghana	2011	GH¢ 60 million
3	Kenya	2013	KES 1 billion
4	South Africa	2008	ZAR250 million
5	Uganda	2012	UGX 10 billion
6	Sierra Leone	2008	Le 9 billion

## Appendix B. Summary statistics of variables employed for selected countries

Description	Nigeria	Ghana	Kenya	South Africa	Uganda	Sierra Leone
<b>Revenue (US\$)</b>	5805.78 (4066.37)	804.56 (889.50)	922.35 (758.48)	32355.94 (26510.29)	540.48 (720.31)	46.26 (89.77)
<b>Return on Assets (US\$)</b>	28.46 (18.52)	20.15 (17.61)	24.46 (15.67)	26.79 (12.8)	16.86 (12.68)	0.09 (0.15)
<b>Equity (US\$)</b>	9818.25 (7364.6)	7869.24 (17011.67)	1492.99 (1254.19)	33810.98 (26997.3)	2324.27 (4413.36)	59.31 (37.78)
<b>GDP growth rate</b>	7.54 (7.26)	6.26 (2.7)	4.36 (2.39)	3.29 (1.77)	6.51 (2.21)	7.39 (7.93)
<b>Total loan (US\$)</b>	30524.27 (24223.04)	21988.73 (54333.29)	6527.41 (4606.97)	222164.3 (95531.41)	2503.66 (3747.37)	158.78 (93.27)
<b>Cost (US\$)</b>	3764.16 (2669.23)	588.12 (797.84)	478.01 (383.54)	13082.72 (9864.33)	833.72 (1480.9)	54.93 (86.16)
<b>Profitability (US\$)</b>	1407.89 (1228.34)	359.76 (665.25)	372.67 (347.79)	5538.83 (2410.32)	-331.78 (932.48)	17.86 (36.27)
<b>Assets (US\$)</b>	69228.27 (51404.77)	46320.37 (116325.3)	11019.8 (8028.9)	347512.7 (136651.9)	6927.05 (10112.02)	527.5 (288.4)
<b>Liquidity (US\$)</b>	0.56 (0.12)	1.44 (3.46)	0.76 (0.06)	0.9 (0.2)	0.6 (0.14)	0.46 (0.1)
<b>Non-interest p (US\$)</b>	1933.45 (1392.63)	518.95 (1098.07)	337.6 (221.2)	11636.35 (9725.37)	156.52 (173.04)	23.29 (40.56)

Operating expenditure	6275.59 (3925.09)	397.92 (354.24)	10.96 (4.29)	82.7 (23.9)	0.43 (0.24)	0.26 (0.19)
Price of labour	0.15 (0.21)	0.09 (0.06)	0.001 (0.001)	0.0003 (0.0001)	0.00015 (0.00008)	0.0007 (0.0007)
Inflation rate	11.54 (3.81)	16.1 (6.8)	9.73 (5.55)	5.79 (2.29)	7.25 (5.02)	6.1 (12.5)
Deposits	52323.44 (37848.31)	36836.74 (93037.96)	8779.48 (6314.4)	256295.5 (98909.6)	3698.12 (4328.53)	339.1 (185.7)
Lending rate	18.47 (2.72)	26.82 (4.65)	16.08 (2.8)	11.67 (2.53)	21.17 (2.016)	22.3 (2.22)
Credit risk	0.42 (0.09)	1.13 (2.77)	0.6 (0.03)	0.63 (0.16)	0.43 (0.1)	0.29 (0.062)
Non-	1775.29 (1003.8)	594.39 (1233.9)	332.69 (64.27)	5049.96 (3084.96)	49.42 (59.89)	23.79 (24.47)

Standard deviation values are in parentheses





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