

Bawuah, Isaac

## Article

Bank stability and economic growth in Sub-Saharan Africa: trade-offs or opportunities? And how do institutions and bank capital affect this trade-off?

Cogent Economics & Finance

## Provided in Cooperation with:

Taylor & Francis Group

*Suggested Citation:* Bawuah, Isaac (2024) : Bank stability and economic growth in Sub-Saharan Africa: trade-offs or opportunities? And how do institutions and bank capital affect this trade-off?, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 12, Iss. 1, pp. 1-23, <https://doi.org/10.1080/23322039.2024.2381695>

This Version is available at:

<https://hdl.handle.net/10419/321547>

### Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

### Terms of use:

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*



<https://creativecommons.org/licenses/by/4.0/>

# Bank stability and economic growth in Sub-Saharan Africa: trade-offs or opportunities? And how do institutions and bank capital affect this trade-off?

Isaac Bawuah

**To cite this article:** Isaac Bawuah (2024) Bank stability and economic growth in Sub-Saharan Africa: trade-offs or opportunities? And how do institutions and bank capital affect this trade-off?, Cogent Economics & Finance, 12:1, 2381695, DOI: [10.1080/23322039.2024.2381695](https://doi.org/10.1080/23322039.2024.2381695)

**To link to this article:** <https://doi.org/10.1080/23322039.2024.2381695>



© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



[View supplementary material](#)



Published online: 04 Aug 2024.



[Submit your article to this journal](#)



Article views: 1046



[View related articles](#)



[View Crossmark data](#)

# Bank stability and economic growth in Sub-Saharan Africa: trade-offs or opportunities? And how do institutions and bank capital affect this trade-off?

Isaac Bawuah 

Department of Accounting and Finance, School of Business, Kwame Nkrumah University of Science and Technology, Ghana

## ABSTRACT

**Purpose:** There are concerns that while stringent capital policy may enhance banks' resilience, it may also have other unintended economic repercussions. This study contributes to this debate by investigating whether regulatory bank capital induces a trade-off between bank stability and economic growth and whether institutional quality affects this trade-off.

**Design/methodology/approach:** The study tested the model empirically with data from 71 banks in 9 Sub-Saharan African (SSA) countries from 2007 to 2021, using several estimators such as the system generalised methods of moments (SGMM), fixed effects (FE), two-stage least square (2SLS) and the Bayesian methods.

**Findings:** This study discovers that regulatory capital can maintain bank stability and economic growth, as opposed to the concern that higher regulatory capital poses economic problems. This indicates no support for a capital-induced trade-off between bank stability and economic growth, but rather opportunities. Further, while institutional quality alone does not directly impact this link, it enhances the positive effects of regulatory capital on economic growth. The findings suggest the need for governments to ensure strong institutional and capital policies to achieve economic growth.

**Originality/value:** This study has explored the intricate relationship among banking sector activities, institutional mechanisms, and the economy. The trade-off model is novel in the SSA literature, providing deeper insights into integrating selective Basel III into institutional strategies to achieve bank stability and economic growth.

## IMPACT STATEMENT

By investigating whether high regulatory bank capital induces a trade-off between bank stability and economic growth, and the impact of institutional quality and bank capital on the relationship between bank stability/capital and economics in Sub-Saharan Africa, the study offers insights that high regulatory capital can promote bank stability and economic growth simultaneously. This addresses concerns that banks constrain credit to meet regulatory capital requirements, undermining economic growth. The findings, however, suggest that regulatory capital improves stability, allowing banks to finance the economy. In addition, by establishing that the positive impact of bank stability on economic growth is stronger at higher levels of bank capital and institutional quality, this study offers bank management, policymakers, governments and financial regulators insights to supervise effective capital regulations and enhance the poor institutional environment in SSA. This guidance is critical for promoting institutional reforms, cooperative capital regulation and strong financial supervisory oversight.

## ARTICLE HISTORY

Received 23 October 2023  
Revised 6 June 2024  
Accepted 11 July 2024

## KEYWORDS



Bank capital ratios; bank stability; institutional quality; economic growth; Sub-Saharan Africa; bank capital

## SUBJECTS

Economics; Finance; Business, Management and Accounting; Political Economy

## 1. Introduction

Years after the global financial crisis (GFC) of 2007–2009, the stability of banks has significantly received both research and policy attention worldwide (Boermans & Van der Kroft, 2024; Plosser & Santos, 2024;

**CONTACT** Isaac Bawuah  [Isaacbawuahprof@gmail.com](mailto:Isaacbawuahprof@gmail.com)  Department of Accounting and Finance, School of Business, Kwame Nkrumah University of Science and Technology, Ghana

 Supplemental data for this article is available online at <https://doi.org/10.1080/23322039.2024.2381695>

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

Rubio & Yao, 2020). The GFC exposed the insufficiency of the existing policies to mitigate overleveraging and cross-border linkages (Fouejieu et al., 2019; Hartlage, 2012; Moosa, 2010). In response, the Basel Committee for Banking Supervision (BCBS) introduced Basel III as the third accord to restore financial resilience and confidence in the banking system by setting international standards for bank capital adequacy, stress testing, and liquidity requirements (King & Tarbert, 2011). The new standards followed past evidence that regulatory capital enhances bank stability (Allen et al., 2011; Berger & Bouwman, 2009; Holmstrom & Tirole, 1997).

However, high capital can be counterproductive. For instance, stringent capital may increase bank risk-taking, and decrease franchise value (stream of future profits), undermining the importance of capital regulations (Repullo, 2004). Moreover, evidence suggests a credit contraction following higher regulatory capital policy (Gambacorta & Mistrulli, 2004; Malovaná et al., 2023b). This implies a possible capital-induced trade-off relationship between bank stability and economic growth.

Research on bank capital and stability has produced contradictory results, and evidence on bank stability – growth trade-off remains significantly limited, leaving this academic issue open to further enquiry. This study asks whether higher regulatory capital recommended in Basel III for banking soundness could have other unintended economic consequences.

Banks in SSA face critical challenges that affect their sustainability. First, from a macro-economic context, they have limited access to finance hindering their independence. Second, SSA has high infrastructural financing needs, and given the deteriorated economic conditions, banks struggle to finance these projects. Third, SSA banks are significantly under-capitalised unable to maintain stability and finance their economy. Due to the significant impact of the GFC on the banking sector, Basel III promises to strengthen bank capital adequacy to promote bank stability. This study extends the literature to SSA focusing on Ghana, Nigeria, South Africa, Kenya, Zambia, Zimbabwe, Ethiopia and Mauritius. These countries face common institutional, banking and economic challenges making them unique for research enquiry. The enquiry is necessary due to concerns about the economic growth effect of stringent regulatory capital requirements, the level of uncertainty for banks in meeting future regulatory capital, and how this may vary depending on prevailing economic conditions and business cycles. These remain largely unanswered.

Extensive but inconclusive evidence exists in bank capital and bank stability literature. While many studies show that bank capital improves bank solvency/stability (e.g. Anani & Owusu, 2023; Chen, 2022; Danisman & Tarazi, 2024; González, 2023; Hoang et al., 2024; Passmore & Temesvary, 2022; Patel et al., 2022; Stewart et al., 2020; Thakor, 2014), other studies, however, suggest higher capital can be counterproductive (Alaoui Mdaghri Mdaghri & Oubdi, 2022; Huu Vu & Thanh Ngo, 2023; Le & Pham, 2021). For instance, Bordo et al. (2016) and Noss and Toffano (2016) argue that higher bank capital may reduce bank liquidity creation (by reducing lending to meet the regulatory capital requirement), which ultimately declines economic growth (Bordo et al., 2016; Noss & Toffano, 2016). In contrast, Bawuah (2024a) reports that higher bank capital improves liquidity creation in SSA.

Moreover, the literature suggests that institutional quality influences bank stability and economic growth (Ashraf et al., 2022; Khan et al., 2019; Stewart et al., 2020). Capital regulatory policies and supervision became necessary post-global financial crisis. Despite the higher regulatory capital imposition, the generosity of financial safety nets and poor governance weakened market discipline, rendering capital regulations ineffective. The strictness of the supervisory power could not keep pace with the new guidelines. Therefore, some scholars recommended institutional quality as an essential tool to achieve effective capital regulations (Stewart et al., 2020). Further, institutional quality can promote growth by reducing banking uncertainty and inefficiencies. This study proposes that institutional quality can enhance high-quality capital and improve discipline in the banking sector.

Apart from a study by Stewart et al. (2020) revealing that higher capital can simultaneously maintain bank stability and economic growth using a global dataset, no study has been conducted on this topic in developing African countries. In addition, limited studies exist on the direct impact of regulatory capital or bank stability on economic growth. Existing studies usually examine the effect of bank capital and stability on bank lending and explain the economic growth implications of the findings.

For instance, Bordo et al. (2016), Noss and Toffano (2016), Deli and Hasan (2017), and Conti et al. (2023) observe that regulatory capital may increase bank funding costs, forcing banks to raise interest or reduce lending, hindering economic growth.

The motivation of this study originates from the fact that: First, there is little evidence on the direct effect of bank capital or bank stability on economic growth; the existing studies focused on the indirect impact where bank capital affects credit supply, bank risk-taking, and funding cost, which in turn affects economic growth (Bordo et al., 2016; Deli & Hasan, 2017; Noss & Toffano, 2016). Second, given the high financial volatility in the SSA banking sector, concerns are raised about strengthening banks to contain potential frictions. However, limited empirical evidence on the impact of regulatory capital in correcting bank stability and economic growth simultaneously hinders understanding of the implications of capital standards. Third, given the region's weak institutional environment, the effectiveness of capital control policies in influencing bank stability and growth is an important research area to consider. Hence, the findings provide policymakers in this region insights into regulatory capital policies that bolster bank stability and growth within a sound institutional framework.

Consequently, the following questions guide the research:

1. Is there a trade-off between bank stability and economic growth?
2. Do bank capital and institutional quality affect the relationship between bank stability and economic growth?

First, the study discovered that regulatory capital simultaneously strengthens bank stability and economic growth without undermining the other. Second, the findings revealed that SSA countries have a significant institutional deficit, hindering direct economic growth. However, an appreciable improvement in institutional quality can supplement bank stability to improve economic growth. Third, the evidence suggests that bank stability fosters economic growth. These findings together make the following contributions to the existing knowledge. First, we contributed to the capital-stability literature by shedding light on the previous contradictory findings (e.g. Ramlall, 2018; Tran et al., 2022; Boachie et al. 2023; Kim & Sohn, 2017). Regulatory bank capital has proved essential in promoting banking sector resilience. Still, its impact on economic growth cannot be fully concluded per se, as it depends on bank stability conditions and key institutional configurations, yielding implications for reformative capital and institutional policies. Second, the study has enriched bank stability – capital – economic growth; and capital– institutional quality – economic growth theories by integrating these factors into the growth model. Third, we uncovered that the positive impacts of regulatory capital on economic growth can be enhanced at a higher institutional level, which provides effective regulation and supervision. This suggests that central banks, regulators and policymakers in this region must prioritise capital regulations by ensuring that banks are well-capitalised to achieve stability and economic growth within a sound institutional framework.

This study proceeds as follows. [Section 2](#) presents background of the study. [Section 3](#) reviews theories, and empirical literature and develops hypotheses. [Section 4](#) discusses data and methodology. [Section 5](#) presents empirical results and discussion. [Section 6](#) summarises the findings and concludes with policy implications.

## 2. Background

Banking sector stability has evolved and occupies an important role in finance literature. Banks play a crucial role in every economy (Batrancea, 2021a, 2021b). Hence inefficiency in the banking system becomes a potential country-wide or global crisis incidence. Banks are best described as an economic pendulum suspended from a fixed point that can swing the economy back and forth. Due to the high correlation between bank risks, the failure of one bank can trigger failure in other banks (Addi & Bouoiyour, 2023; Aharon et al., 2023; Dutta et al., 2023; Jagannath & Maitra, 2023). Therefore, the banking sector is the most regulated worldwide (Stewart & Chowdhury, 2021). A downward swing in the banking sector can have global consequences. For instance, the World Bank (2018) reports that the 2007–2008 global financial crisis which started in the U.S. decreased global economic output by some 0.34 percentage points from 3.53% before the crisis to 2.02% after the crisis. This was not different in other regions (e.g. North Africa and the Middle East, Sub-Saharan Africa and the Caribbean, Central Asia and Europe). For instance, the average growth rate in Europe and Central Asia fell from 2.40% to 1.80%;

Latin America and the Caribbean saw economic output plummet from 3.11% to 2.26%, and economic outputs in North Africa and the Middle East reduced from 5.05% to 3.39%. SSA suffered the most, experiencing a decline in general growth by 7.65% (World Bank, 2018). Due to SSA's vulnerability to external shocks, consistent regulatory policies and scholarly attention are needed in this region.

In general, the 2007-08 crises exposed the inefficiencies in bank risk management practices and raised concerns for regulatory and supervisory frameworks. Regulatory concerns at the international level include inter-alia, implementing liquidity standards for banks, binding leverage, and revising banks' capital requirements under Basel III (Basel Committee on Banking Supervision, 2011; Bank of International Settlements, 2010). Basel I and II from 1990 to 2004 inspired a large body of literature focusing on the effect of capital regulation on bank behaviour, especially, whether bank capital influences lending (e.g. Rochet, 1992; Shrieves & Dahl, 1992). To complement these micro-prudential measures, academics and policymakers argued for a complementary macroprudential framework to safeguard financial soundness at the systemic level (e.g. Borio & Disyatat, 2010; Malovaná et al., 2023a; Natsagdorj, 2023; Bastý et al., 2023). The regulatory response was based on two premises. First, the view that the bank capital buffer before the crises was not proportional to their risk-taking thus, considered suboptimal from a social perspective. Second, the view that the consequential effect of the crises spanned beyond bank shareholders, due to, for instance, supply-side effects in credit markets, or network externalities in the financial sector (Berrospide & Herreras, 2015). Basel III was then introduced following the GFC as a tool to restore banks deteriorated liquidity position and enhance stability by requiring banks to hold 13% regulatory minimum capital as a percentage of risk-weighted assets (Afzall et al., 2023; Durango-Gutiérrez et al., 2023; Song, 2023; Stewart et al., 2020).

Studies conducted in the context of bank capital ratios and bank stability, on average show that stricter capital regulations lessen systemic banking crises and insulate the banks against financial shocks (e.g. Anani & Owusu, 2023; Basel Committee on Banking Supervision, 2011; Chen, 2022; González, 2023; Passmore & Temesvary, 2022; Patel et al., 2022; Stewart et al., 2020; Thakor, 2014). For instance, Stewart et al. (2020) investigate the relationship between bank stability and economic growth and further examine the effect that regulatory capital and institutional quality have on this relationship based on panel data from over 100 countries from 1995 to 2015. They find no support for a regulatory capital-induced trade-off between bank stability and economic growth.

They further find that institutional quality improves the positive effect of bank capital on economic growth. In contrast, Thakor (2014) reviews empirical and theoretical perspectives on whether bank capital and stability have an economic trade-offs or a Faustian bargain relationship and observes that despite empirical studies highlighting the benefits of higher capital in the cross-section of banks, it does not conclusively settle the issue, suggesting a continued academic debate.

Up to this point, the debate on the consequences of regulatory capital on economic growth is still not settled. While some studies argue that during difficult financial times, higher bank capital can sustain credit supply, containing adverse macroeconomic implications (Kim & Sohn, 2017; Klein & Turk-Ariss, 2022; Stewart & Chowdhury, 2021), other studies, on the other hand, argue that increasing regulatory capital ratios for banks may have unintended negative consequences on economic growth by restricting lending activities, especially for less capitalised banks (Bordo et al., 2016; Noss & Toffano, 2016). Consistent with the literature, higher capital ratios allow banks to absorb greater risk and promote lending, improving economic growth (Berrospide & Edge, 2019), averring no capital-induced trade-off-stability and growth. In contrast, banks with shrinking funding sources may cease lending during capital regulations and sell assets to manage negative liquidity shocks (Roulet, 2018), implying a capital-induced trade-off between stability and growth. The inconsistency motivates this study. Besides, empirical evidence on the role of capital in the bank stability-growth trade-off does not exist in SSA literature.

Moreover, the literature highlights the importance of institutions to banks and the economy (Stewart et al., 2020). This study defines institutional quality as control of corruption, voice and accountability, regulatory quality, rule of law, political stability and governance effectiveness (Bawuah, 2024a). Countries with strong institutions effectively implement sound capital regulatory policies and achieve higher economic outputs than countries with weak institutions (Tran et al., 2023). The positive impact of strong institutions on bank capital and bank stability affects economic development by lowering transaction costs, ensuring financial discipline, improving resource allocation, financial supervision and financial



transparency (Elfeituri, 2022; Tran et al., 2023), suggesting a possible moderator role of institutional quality in bank capital/stability-growth nexus.

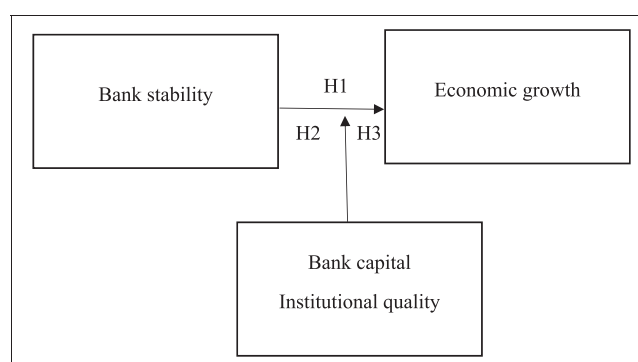
The novelty of this study is that it contributes three important new ideas to literature. First, we use comprehensive estimators including system GMM, fixed effects, two-stage least square and the Bayesian methods, unlike previous studies which used only the frequentist approach (e.g. Stewart et al., 2020). Wooldridge (2001) argues that while GMM is indispensable to complex estimation problems, it may not offer convincing improvements over fixed effects, OLS and 2SLS methods. Further, the Bayesian method solves the concerns that frequentist methods can sometimes produce misleading results. Hence, combining all four estimation techniques provides robust results. Second, this is the first study in SSA to estimate the capital-induced tradeoff between bank stability and economic growth. This allows testing in SSA the premise of ‘too much finance’. The originators of ‘too much finance’ contend that ‘too much money’ impedes economic growth (Law & Singh, 2014; Zhu et al., 2020).

Finally, unlike previous studies (e.g. Noss & Toffano, 2016; Roulet, 2018), this study introduces the index of the six world governance indicators and estimates its complementarity with bank capital and stability to influence economic growth. Therefore, this study significantly contributes to the current literature.

### 3. Empirical review and hypotheses development

This section reviews theories and perspectives on the effect of bank capital on bank stability, and the role of capital and institutions in explaining economic growth. It further develops hypotheses to explain the explored relationships as indicated in Figure 1. The theories include moral hazard theory, risk-absorption hypotheses, finance-led growth hypotheses and institutional theory. The moral hazard theory explains the relationship between bank stability and economic growth by highlighting that banks can engage in excessive risk-taking leading to instability. Hence, a risk-based capital requirement is needed to absorb risks and support economic growth (Jensen & Meckling, 1976). Also, the risk absorption hypothesis explains the relationship between bank stability and economic growth by positing that well-capitalised banks can absorb economic risks, improving bank stability and economic growth (Berger & Bouwman, 2009). The finance-led growth theory explains the relationship between bank stability and economic growth by positing that banks mobilise savings, provide financial intermediation functions, create credits, and thus drive economic growth. The institutional theory explains the role of institutional quality in the association between bank capital and economic growth by highlighting that strong institutions promote financial transparency and accountability, provide effective capital regulation and supervision, foster trust and cooperation in the banking system, protect banks and borrowers and consequently improve economic growth. However, weak institutional quality undermines this relationship (North, 1990).

To explain in detail, the theories are highlighted in different sub-groups. The first sub-group highlights the moral hazard in banking by Jensen and Meckling (1976). The agency theory proposes that higher capital can be an effective discipline mechanism which improves overall bank stability (Bawuah, 2024a; Jensen & Meckling, 1976). The equity value of a bank can be increased by investing in a risky portfolio since equity represents a call option on the bank’s total assets (Merton, 1977). Higher capital



**Figure 1.** Conceptual Framework.

Source: Author's construction.

mitigates this behaviour, exerting a negative effect between banks and risk-taking, improving stability. Even though other studies aver that higher capital induces greater risk-taking (Besanko & Kanatas, 1996; Hellmann et al., 2000), the most accepted view is that higher capital attenuates greater risk-taking, and improves bank stability (see, e.g. Coval & Thakor, 2005; Merton, 1977). According to Allen et al. (2011), well-capitalized banks have high shareholder monitoring efficiency, improving firm value. Coval and Thakor (2005) propose a positive effect between bank capital and bank stability but not based on the asset-substitution moral hazard proposed by Jensen and Meckling (1976). Instead, they argue that higher capital incentivises banks to improve loan screening to award funding to only creditworthy entrepreneurs. These perspectives justify persistent capital regulatory reforms in several countries (Thakor, 2014).

The second sub-group of theories includes the risk-absorption hypothesis by Berger and Bouwman (2009) which argues that higher capital improves bank risk absorption capacity and enhances liquidity creation thereby reducing the probability of losses through a fire sale of illiquid assets to meet liquidity demands (Berger & Bouwman, 2009). This theory supports higher capital adequacy.

Contrary to the view that higher capital may restrict the lending activities of less capitalised banks, stifling economic growth (Bordo et al., 2016; Noss & Toffano, 2016), the finance-led perspective, however, supports the positive relationship between bank stability and economic growth highlighting that stable banks can create credit, facilitate financial intermediation, manage risk in the economy, finance economic activities and thus promote economic growth (Figure 1). On average, those perspectives agree that higher capital is associated with higher bank stability and growth.

Finally, institutional theory by North (1990) explains the relationship between institutional quality and economic growth and other developmental patterns. For instance, institutional quality promotes financial discipline, strengthening bank efficiency, and economic growth. The theory suggests that within a sound institutional environment, capital control policies can spur economic development (Bawuah, 2024a; Stewart et al., 2020)

### **3.1. Bank stability and economic growth**

In this argument, bank stability is induced by bank capital and thus any effect that capital has on economic growth can be shared with bank stability on economic growth. The conventional view about capital adequacy ratios is that they promote financial stability. Higher capital improves financial stability by; (i) reducing the probability of financial distress; (ii) reducing bank default risks; (iii) minimising banks' excessive risk-taking behaviour, (iv) and providing a buffer for risks (Anani & Owusu, 2023; Martynova, 2015). This supports the risk-absorption hypotheses by Berger and Bouwman (2009). Fosu et al. (2017) and Fosu et al. (2018) also emphasise that capital regulations such as the Basel III may promote transparency and disclosure, improving bank stability.

Martinez-Miera and Suarez (2014) demonstrate that higher capital ratios can reduce systematic risk-taking and systemic crises. A different view by Martynova (2015) is that capital adequacy improves banks' profits and allows them to attract new funds. This incentivises banks to invest in risky assets for higher profits. Moreover, empirical studies show that higher capital reduces the riskiness of bank assets and improves bank soundness, and risk absorption capacity, stimulating bank stability (e.g. Anani & Owusu, 2023; Bekiros et al., 2018; Chen, 2022; González, 2023; Korbi & Bougatef, 2017; Passmore & Temesvary, 2022; Patel et al., 2022; Ramlall, 2018; Stewart et al., 2020; Thakor, 2014; Tran et al., 2022). For instance, Korbi and Bougatef (2017) investigate the relationship between regulatory capital and bank stability of Islamic and conventional banks in the Middle East and North Africa from 1999 to 2014 using unbalanced panel data from 68 Islamic banks and 156 traditional banks in 14 MENA countries. Employing the generalised method of moments, they find that regulatory capital improves banks' stability. In addition, Tran et al. (2022) report in 133 developing and emerging countries that higher capital promotes economic growth in emerging countries. In contrast, other studies argue that higher capital regulation increases bank risk-taking (e.g. Shikimi, 2023, Abascal & González, 2023). First, capital adequacy can have an unintended decrease in banks' profits, constraining future profits. Thus, shareholder value is decreased through lower returns to assets. This induces high risk-taking incentives to avert possible bankruptcy. Therefore, undermining the main effect of capital adequacy regulations (Hellmann et al., 2000). Higher capital can increase equity holders, which dilutes bank ownership, triggering management inefficiency and instability (Besanko & Kanatas, 1996). Also, higher capital can increase



investment risks and thus instability (Koehn & Santomero, 1980). When the environmental condition supports the view by market participants that risks in the financial system are small, banks will borrow at an interest rate insensitive to their capital. In that case, the regulatory capital increase might increase bank funding costs, which will force them to raise interest on loans or cut down on credit (Bordo et al., 2016; Conti et al., 2023; Deli & Hasan, 2017; Noss & Toffano, 2016). Generally, there is limited evidence on the direct effect of bank stability on economic growth. A few studies including Jayakumar et al. (2018) in 32 European countries find that banking stability Granger-causes economic growth in the long run. Stewart et al. (2020) using datasets from more than 100 countries find no support for a regulatory capital-induced trade-offs between banking stability and economic growth.

Beyond the short-run negative effect of tighter bank capital on lending, a significant number of studies point out that high regulatory capital is growth-enhancing (e.g. Afzal et al., 2023; Economou & Panagopoulos, 2023; Klein & Turk-Ariss, 2022; Stewart & Chowdhury, 2021). In summary, there is little evidence of the direct effect of bank capital or bank stability on economic growth. Many studies have focused on the indirect impact of capital influencing credit supply, bank risk-taking, and funding cost, which consequently affects economic growth. Regulatory capital policies can force banks to cut down on credit or increase interest on lending which declines economic growth. However, higher capital improves bank stability and increases bank risk absorption capacity, promoting growth. Banks in SSA countries are relatively fragile with concerns about strengthening banks' soundness (Bawuah, 2024a; Yakubu & Bunyaminu, 2023). Therefore, high regulatory capital may bolster bank stability and economic growth with support from studies that report a positive relationship between bank stability and economic growth (e.g. Jayakumar et al., 2018; Stewart et al., 2020). Therefore, this study hypothesises that;

**H1:** *Bank stability has a positive and significant effect on economic growth.*

### **3.2. Bank capital, institutional quality, bank stability and economic growth**

While higher capital requirements improve bank stability (see, e.g. Batrancea, 2021a, 2021b; Chen, 2022; Passmore & Temesvary, 2022; Patel et al., 2022; Ramlall, 2018; Stewart et al., 2020; Wang et al., 2015), it may as well have unintended negative consequences on economic growth. First, regulatory capital restricts short-run credit and slows economic growth (Conti et al., 2023; Deli & Hasan, 2017; Noss & Toffano, 2016). Banks will reduce credit or raise interest to meet higher regulatory capital requirements, deteriorating lending conditions. Consequently, households and firms will cut spending and investments, implying negative economic implications. The implication is that a bank's higher capital adequacy policy cannot simultaneously address bank stability and economic growth without undermining the other. While extensive evidence points to the positive effect of bank capital on bank stability, evidence on the consequences of higher regulatory capital on two important concepts (i.e. economic growth and bank stability) is scant. The only existing evidence is drawn from Thakor (2014) and Stewart et al. (2020). While Thakor (2014) emphasises a modest capital-induced trade-off relationship between bank stability and economic growth, Stewart et al. (2020), on the other hand, find no capital-induced trade-off relationship between stability and growth. This study expands the literature on SSA and provides empirical implications of capital regulatory policies on bank stability and economic growth.

In addition, institutional quality is gaining centre stage in modern research as a driver of social, financial and economic progress. Institutional quality involves systems, procedures, and societies, by which interests and legitimate rights of people are freely expressed, their differences negotiated, and their commitments met. Kaufmann et al. (2009) define institutional quality as the traditions and institutions of a country exercising authority. This includes the quality of processes that select government, monitor and replace government, the capacity to formulate sound policies and laws, and respect for individual rights and institutions. Quality governance forms the foundation of economic growth, political cohesiveness, and security. Institutional quality encourages bank management to adopt prudential finance strategies to improve solvency and protect investments (Khan et al. 2019). Institutional quality promotes credit supply by lowering credit costs and default rates. Nedić et al. (2020) conclude that institutional quality indicators are important determinants of economic growth. According to Stewart et al. (2020), institutional quality enhances the positive effect of bank

capital on economic growth. Also, Anginer et al. (2018) show that capital can substitute for weak institutions in promoting bank stability. Based on these findings, the following hypotheses are formulated:

**H2:** *Higher capital induces no negative trade-off relationship between bank stability and economic growth.*

**H3:** *Institutional quality enhances the positive effect of bank capital/bank stability on economic growth.*

Figure 1 provides a conceptual framework explaining the hypotheses. The direct relationship between bank stability and economic growth has been indicated in H1. H2 highlights the possible trade-off relationship between bank stability and economic growth, in conditions of high regulatory capital. H3 indicates the possible moderation role of bank capital and institutional quality in the relationship between bank stability and economic growth.

## 4. Methodology and descriptive statistics

### 4.1. Data

This study uses unbalanced bank-level panel data from 71 universal/commercial banks from 9 bank-based economies in SSA from 2007 to 2021. The study period ends in 2021 because that is the year for which most banks have sufficient available data for the study variables. The bank-level data were extracted from the selected bank's annual statements and screened to obtain a panel of 71 banks with sufficient data to compute bank-specific variables such as bank stability, capital adequacy ratios and bank size. In summary, this study uses 10 banks from Ghana; and 11 from Nigeria as a West African sample. Further, it uses 14 banks in South Africa, 3 from Zimbabwe, 7 from Zambia and 5 from Botswana as a Southern Africa sample. Moreover, we selected 11 banks from Kenya, 3 from Mauritius and 7 from Ethiopia as an East Africa sample. In total, an unbalanced 71 bank-level data with 994 bank-year observations was used. Economic variables such as GDP per capita, financial development, domestic investment, trade and inflation were sourced from the World Development Indicator (WDI) dataset. Institutional quality indicators were obtained from the World Governance Indicators (WGI) dataset from the World Bank (WB). The sample selection was purely based on data availability. Table A1 in Appendix A lists the sampled banks.

### 4.2. Variables

This section discusses the study's variables. The main dependent variable is economic growth measured as GDP per capita, in 2010 in US dollars, following Muhammad and Khan (2019) and computed as a trade-off metric using GDP per capita and z-score. The independent and moderator variables include bank capital, stability, and institutional quality (see Table 1). Following Tran et al. (2022), we measure bank capital using two ratios which are the non-risk-based ratio (total equity to total assets) (CAR), and regulatory capital to risk-weighted assets (RCAP) (Table 1).

High bank capital, based on the risk-absorption hypothesis and as indicated in the literature, supports bank stability and economic growth (Conti et al., 2023; Deli & Hasan, 2017). The trade-off metric in Equation 6 allows the effect of the main result (direct effect) to be established under the trade-off

**Table 1.** Variable measurement and description.

Variable	Symbol	Measurement	Priori expectations	Source
Economic Growth	GDPPC	GDP per capita, in constant 2010		WDI
Capital Adequacy Ratio (Equity)	CAR	Total equity to total assets	+	Bank dataset
Regulatory Capital	RCAP	Capital to risk-weighted assets		Bank dataset
Bank stability	Z-score	Natural Logarithm of Z-score	+	Bank dataset
Institutional quality	IQI	An index of rule of law, regulatory quality, governance effectiveness, control of corruption, political stability and voice and accountability.	+	WGI, WB
Trade openness	Trade	$(\text{Import} + \text{export})/\text{GDP}) \times 100$	+	WDI
Financial development	FD	Domestic credit to private sector development (%GDP)	+	WDI
Domestic investment	DI	Gross fixed Capita formation	+	WDI
Inflation	INF	Consumer Price Index	–	WDI
Bank Size	SIZE	Natural logarithm of total assets	+	Bank dataset

Source: Author's elaboration from literature.

model. We use the six institutional quality indicators from WGI (voice and accountability, regulatory quality, rule of law, control of corruption, political stability and governance effectiveness) as the institutional quality index. Due to the high correlation among the indicators, the principal component analysis (PCA) was used to compute an institutional quality index (IQI) from the six indicators. The measure aligns with other studies (e.g. Bawuah, 2024b; Elvik, 2021; Kesar et al., 2021; Tarek & Ahmed, 2017).

Consistent with the literature (Batrancea et al., 2020; Stewart et al., 2020; Tran et al., 2022), z-score is used for bank stability. It is given as:

$$z - score = \left( \frac{ROA + E/A}{\sigma(ROA)} \right) \quad (1)$$

Where ROA is return on assets, E is total equity and A is total assets. The z-score can be understood as the number of standard deviations by which returns would have to decrease from the mean to reduce all equity in the bank (Stewart et al., 2020)

Other variables were used as control variables. For instance, we use inflation (consumer price index) to control the macroeconomic environment (Alshubiri, 2017; Jamil, 2022; Sun et al., 2022). Bank size is measured as a natural logarithm of total assets (Chodorow-Reich et al., 2022; Do et al., 2022) and was used to control size effect. We measure financial development (FD) as domestic credit to the private sector development as a percentage of GDP (Wang et al., 2024). FD facilitates credit and boosts productivity and economic growth. Trade was calculated as  $(\text{Import} + \text{export})/\text{GDP}) \times 100$  following Wang & Li (2024). Trade openness reflects trade liberalisation. It creates an opportunity for international activities and increases demand and supply of goods and services, creating employment opportunities and enhancing growth. Following Dinga et al. (2024), domestic investment (DI) was measured as gross fixed capital formation (% of GDP). This construct represents a country's domestic investment climate. Table 1 provides variable description and measurement.

### 4.3 Empirical model

This study uses the lag of GDP per capita as independent variables, therefore regression methods such as OLS may produce bias and inconsistent results due to possible high correlation with the error terms (Segovia & Cepeda, 2024). Following the literature (e.g. Batrancea, 2022; Kesar et al., 2021; Tran et al., 2022), we use the generalised methods of moments (GMM) regression method by Arellano and Bond (1991) and Holtz-Eakin et al. (1988). GMM is more suitable because it can: (i) control the inter-temporal dependence of the lag variables and the independent variables, and (ii) control for possible endogeneity issues associated with lag instruments (Segovia & Cepeda, 2024). However, Levine et al. (2000) argue that GMM may suffer from other conceptual and statistical problems. Time-consistent variables become weak instruments (Blundell & Bond, 1998). To achieve precision and reduce potential bias, Arellano and Bover (1995) and Blundell and Bond (1998) propose a system GMM that uses both difference and system levels regression.

The general form of the GMM model is specified as:

$$y_{i,t} = \alpha + \beta \dot{y}_{1t-1} + \delta x_{i,t} + \mu_i + \varepsilon_{i,t} \dots \dots \dots 2$$

Where;  $\dot{y}_{i,t}$  = dependent variable measured for bank  $i$ , at the time,  $\alpha$  = intercept,  $\beta$  = slope coefficient of  $\dot{y}_{1t-1}$ ,  $\mu_i$  = individual-specific effect,  $\varepsilon_{i,t}$  = error term for firm  $i$  at time  $t$

We compute a trade-off model using the geometric mean of bank stability and economic growth consistent with Stewart et al. (2020), as indicated in Equation 3.

$$\sqrt{(\text{GDP per Capita}) * (\text{Z-score})}. \quad (3)$$

This captures the mean output of bank stability and economic growth, where a lower value from equation 3 indicates lower levels of economic outputs and Z-score, and vice versa. The Bank z-score is restated in equation 4.

$$z - score = \left( \frac{ROA + E/A}{\sigma(ROA)} \right) \quad (4)$$

As indicated, we proxy economic growth with GDP per capita and bank stability with Z-score. A country must have a higher Z-score and GDP per capita to achieve a higher score in the trade-off model. The trade-off Model in Equation 3 allows for directly estimating the trade-off between bank stability and economic growth using a single value. Further, GDP per capita and bank stability are normalised using the min-max normalisation to get a normalisation value for both variables of a range of 0, (1) (Stewart et al., 2020), as indicated in Equation 5.

$$\frac{X_{it} - \min(x)}{\max(x) - \min(x)} \quad (5)$$

$X_{it}$  is the variable's observation, and  $x$  represents all observations for a variable. The inverse logit transformation in equation 6 was used to solve the estimation challenge between the dependent variable which is limited dependent, and the boundless independent variables.

$$\text{Trade-off}^* = \text{Lin}\left(\frac{\text{trade-off}}{1 - \text{trade-off}}\right) \quad (6)$$

Finally, we convert the response variable to an unbounded scale as indicated in equation 7.

$$\text{Trade-off}^*_{i,t} = \beta_0 + \beta_1 \text{CAP}_{i,t} + \beta_2 \text{IQI}_{i,t} + \beta_3 (\text{CAP})^* (\text{IQI}) + \beta_4 \text{SIZE}_{i,t} + \beta_5 \text{INF}_{i,t} + \beta_6 \text{Trade}_{i,t} + \beta_7 \text{FD}_{i,t} + \beta_8 \text{DI}_{i,t} + e_{i,t} \quad (7)$$

With equation 7, we can now estimate the effect of bank capital and institutional quality on bank stability – economic growth trade-off. As already indicated, two capital ratios (CAP) were used: the capital adequacy ratio (CAR) and the regulatory capital (RCAP). IQI is the institutional quality index. It measures the country's institutional framework and explains whether institutional shortcoming explains stability and economic growth. Control variables include bank size (SIZE), inflation (INF), financial development (FD) and domestic investment (DI).

We further estimate the model using the two-stage least-squares (2SLS) and the fixed effect (FE) methods. Conventional panel methods do not check explanatory variables' endogeneity problems. Therefore, outputs from such estimators are often inconsistent and biased (Gujarati & Porter, 2009; Wooldridge, 2015). Given this, the conventional practice is applying the 2SLS approach—a case of an extraordinary situation of more instrumental variable practice (Kumar & Datta, 2021). The instrumental variables are associated with the explanatory variables but not the disturbance term. As a result, we employ the instrumental 2SLS estimation technique as sensitivity analysis.

Table 2 presents descriptive statistics of the variables showing measures of central tendency and variations (mean, standard deviation, minimum and maximum) and distribution metrics (i.e. skewness and kurtosis). The average value of economic growth is 5.399 with a standard deviation of 4.234, indicating that economic growth in the sampled countries is relatively lower. Bank stability has a mean of 0.449. Furthermore, the mean for capital adequacy ratio (equity) and regulatory capital are 7.956 and 2.992 percent, respectively, indicating that bank capital is less than one-tenth of total assets. IQI averages -0.774 and ranges between -2.275 and 0.95 which underscores the persistent weak institutional environment in SSA.

**Table 2.** Descriptive Statistics.

Var	Obs	Mean	Std. Dev	Skewness	Kurtosis	Min	Max
GDPPC	876	5.399	4.234	0.654	1.375	-1.697	19.675
Z-score	901	0.449	1.013	0.353	3.786	-5.183	9.952
CAR	954	7.956	1.387	0.339	2.785	4.786	10.655
IQI	723	-0.747	0.785	-0.023	1.001	-2.275	0.956
RCAP	885	2.991	2.496	1.145	3.563	-21.922	10.736
SIZE	876	7.685	1.550	0.453	2.453	3.836	11.859
INF	990	7.724	7.757	-0.045	1.876	-18.074	31.771
Trade	879	34.09	20.976	0.216	2.076	7.087	51.087
FD	785	12.622	2.128	8.209	15.012	6.098	22.087
DS	990	10.023	0.198	9.578	10.179	-2.865	4.987

Note. All variables are explained in Table 1.

Source: Author's calculation from research dataset.

**Table 3.** Correlation analysis.

Var	1	2	3	4	5	6	7	8	9	10	VIF
1. Economic Growth	1										1.03
2. Bank Stability	.026*	1									1.10
3. Capital Adequacy	.164*	.045	1								1.91
4. Regulatory Capital	.039*	.040	−.066	1							2.01
5. Institutional Quality	.005	.028	−.340*	.088	1						1.07
6. Bank Size	.461*	.090	.314*	−.164	−.034	1					2.97
7. Inflation	−.041	.033	−.154	−.015	−.018	−.032	1				1.12
8. Financial development	.043*	.342*	−.065	.010	−.07	.009	−.05	1			1.15
9. Domestic investment	.31*	−.01	.022	.41*	.081	−.04	.164		1		2.08
10. Trade	.41	.395	.015	−.31	−.09	.33*	−.15	−.16	.31*	1	1.13

Note. Significance level \*  $p < 0.5$ .

Source: Author's calculation from research dataset.

Table 3 shows Pearson pair-wise correlation results and the variance inflation factor (VIF). Correlation tests for possible multicollinearity problems among the independent variables. The results show that all the explanatory variables have a significant correlation with economic growth, except institutional quality. Even though statistically significant, a weak correlation was observed for capital adequacy (non-risk-weighted assets) and economic growth (0.164); institutional quality and capital adequacy (−0.340); and bank size and capital adequacy ratio (0.314). However, no correlation coefficient exceeded 0.6. Hair (2009) posits that a correlation coefficient is higher when above 0.8. Therefore, the variables do not suffer from multicollinearity problems. Further, a VIF value of more than 10 indicates a multicollinearity problem (O'Brien, 2007). However, none of the VIF values exceed 10.

## 5. Empirical results and discussion

### 5.1. Trade-off Models

Before estimating the empirical results, the Breusch and Pagan (1980) test was conducted, and the results indicated non-zero variance across the entity (existence of panel effect). This renders pooled OLS an inconsistent estimator. Further, the Hausman test was applied to choose between FE and RE methods. Hausman detects endogeneity problems (Baltagi, 2008). The Hausman test showed a significant  $p$ -value ( $p < 0.05$ ), hence accepting the fixed effect and rejecting the random effect (Hsiao, 2022). More generally, FE was preferred because it allows for adjusting for unobservables such as omitted variables, endogeneity, selection bias, and confoundedness that affect the estimation. From the diagnostics tests conducted (AR2 and Hansen J tests), all evidence points to a significant fit and validity of the estimation models for SGMM.

#### 5.1.1. Bank stability and economic growth: trade-off or opportunities?

Table 4 (Models 1– 21) presents the empirical results of the trade-off or opportunity model for bank stability and economic growth for SGMM (Models 1 – 7), FE (Models 8 – 14) and 2SLS (Models 15 – 21) by alternating the CAR, Z-score, IQI, IQI\*RCAP, IQI\*Z-score, CAR\*Z-score and RCAP\*Z-score in the models for the various estimators. The empirical results find no evidence of a negative z-score. The main effect of the Z-score on the trade-off metric is positive, consistent with hypothesis 1, and the interaction with bank capital is modestly negative ( $\beta = -0.387$ ; sig < 0.01, Model 6 for SGMM). This indicates that at the higher level of bank capital, the impact of stability is likely to reduce (Boachie et al. 2023), inferring the substitutability of these measures for bank resilience due to the equity component in both measurements. We therefore conclude that bank stability fosters economic growth. This is consistent with hypothesis 1, and other empirical studies including Stewart et al. (2020), and Ibrahim and Alagidede (2018). Despite concerns that bank stability may hinder economic growth by dampening lending (Bordo et al., 2016; Noss & Toffano, 2016), the findings do not support the negative relationship between bank stability and economic growth. The explanations are that a stable financial sector is more efficient in resource allocation, contributes to quality information, reduces asymmetric information, and performs important growth functions such as liquidity creation and lending. In contrast, a less stable banking sector is unproductive to economic growth. This is particularly true in the SSA region, a bank-based

Table 4. Determinants of economic growth.

Models	Dependent variable: GDP per capita														
	SGMM					FE					2SLS				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
gdpr-1	0.605*** (0.209)	0.391*** (0.038)	0.214*** (0.021)	0.242*** (0.054)	0.432*** (0.043)	0.241*** (0.048)	0.358*** (0.100)	0.086 (0.171)	0.086 (0.171)	0.105 (0.045)	0.154*** (0.014)	0.247 (0.098)	0.342 (0.230)	0.453*** (0.178)	0.556*** (0.148)
z-score	0.308*** (0.043)				0.147*** (0.017)	0.287 (0.147)	0.224*** (0.054)	1.810 (1.510)				0.214*** (0.057)	0.327*** (0.098)	0.216*** (0.065)	1.448 (0.776)
CAR		0.765*** (0.254)		0.789*** (0.427)		0.358*** (0.078)			0.729*** (0.265)		0.214*** (0.047)		0.327*** (0.054)		0.245*** (0.098)
RCAP		0.111 (0.021)		0.141 (0.155)		0.342 (0.105)	0.354*** (0.105)		0.063 (0.123)		0.342 (0.265)	0.216 (0.165)		0.217 (0.200)	0.002 (0.081)
IQI			0.650 (1.060)	0.650 (1.060)	0.810 (0.981)				0.652 (1.128)		0.652 (1.128)	0.216 (0.165)			0.235 (0.6)
IQI*RCAP				1.111*** (0.533)					-0.054 (0.134)						
IQI*Z-score					0.093 (0.059)							-0.054 (0.134)			
CAR*Z-score						-0.387***							-0.427*** (0.026)		0.056 (0.039)
RCAP*Z-score							0.039 (0.072)								0.243*** (0.008)
Bank Size	0.825*** (0.123)	0.214 (0.154)	0.176 (0.176)	0.751 (0.465)	0.254*** (0.048)	0.342*** (0.097)	0.251*** (0.058)	0.065* (0.006)	0.548*** (0.102)	0.748*** (0.273)	0.506*** (0.217)	-0.050 (0.008)	-0.398*** (0.098)	0.267*** (0.086)	0.452*** (0.109)
FD	0.254*** (0.024)	0.432*** (0.109)	0.187 (0.109)	0.025*** (0.004)	0.054*** (0.007)	0.076 (0.095)	0.056 (0.075)	0.654 (0.509)	0.342 (0.278)	0.354 (0.124)	0.259*** (0.035)	0.084*** (0.009)	-0.346*** (0.100)	0.376 (0.298)	0.276 (0.198)
DI	0.054* (0.021)	0.231 (0.167)	0.453*** (0.100)	-0.214*** (0.112)	0.786*** (0.307)	-0.432*** (0.058)	-0.543 (0.498)	0.242 (0.109)	0.224*** (0.036)	0.546*** (0.121)	0.146*** (0.012)	-0.062*** (0.007)	0.309 (0.290)	0.356*** (0.100)	-0.453*** (0.187)
Trade	2.564*** (0.214)	0.453*** (0.102)	0.265*** (0.097)	0.021*** (0.006)	0.432*** (0.098)	0.347 (0.298)	0.432 (0.342)	0.054*** (0.009)	0.342*** (0.078)	0.354*** (0.091)	0.014 (0.654)	0.056*** (0.009)	0.548 (0.409)	0.089*** (0.007)	0.065 (0.037)
Inflation	0.004 (0.005)	-0.231* (0.016)	-0.187 (0.100)	0.004 (0.028)	-0.243 (0.163)	0.342*** (0.067)	0.453*** (0.100)	0.276** (0.076)	-0.231 (0.187)	-0.009 (0.025)	-0.008 (0.025)	0.054 (0.058)	-0.254 (0.176)	0.389 (0.287)	0.387 (0.109)
Constant								0.342** (0.054)	0.342* (0.086)	6.530*** (1.876)	4.689*** (2.228)	0.065 (0.109)	0.342*** (0.065)	0.432*** (0.100)	0.460 (0.109)
Heteroskedasticity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR (2) (p-value)	0.674	0.453	0.354	0.432	0.342	0.432	0.654								
Hansen J: (p-value)	0.342	0.321	0.343	0.453	0.276	0.564	0.453	14.097***	14.5***46	12.097***	11.987***	14.986***	13.097***	17.986***	
Hausman $\chi^2$								0.532	69.765	0.453	0.346	0.543	0.353	0.398	0.453
Adjusted $R^2$								62.865	64.753	51.888	51.888	78.097	49.097	53.097	32.908
F-Statistics								0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Prob.															

Note(s): Robust standard errors are in parentheses, \*\*\*, \*\* and \* denote 1, 5 and 10 per cent significant levels, respectively. Panel cross-section heteroskedasticity LR Test (null hypothesis: residuals are homoscedastic).



economy driven by quality banking services. In general, the high regulatory capital for SSA banks has enhanced banking resilience.

The positive and significant effect of bank capital (CAR) on the trade-off metric is consistent across the respective Models in Table 4. This suggests that higher bank capital facilitates a more positive impact of bank stability on economic growth. This indicates that higher capital induces no negative trade-off between bank stability and economic growth in SSA. Instead, capital induces economic growth opportunities from bank stability, agreeing with hypothesis 2, and consistent with Stewart et al. (2020) and the risk-absorption theory. Well-capitalized banks are insulated from possible financial shocks and can finance entrepreneurial and economic activities to stimulate growth. The results contradict arguments that increasing capital adequacy, although may improve bank soundness, can have unintended negative effects on economic growth by restricting credit or forcing banks to raise interest on lending (Bordo et al., 2016; Conti et al., 2023; Deli & Hasan, 2017; Noss & Toffano, 2016). Instead, the empirical evidence suggests that higher capital adequacy can simultaneously promote bank stability and growth, especially when the credit is extended to productive projects. The explanation is that lending is a major source of bank profits in SSA. Banks are incentivised to increase lending at higher capital levels, creating more liquidity and leading to higher economic growth.

### 5.1.2. The interactive effect of bank capital and institutional quality on economic growth

The results in Table 4 show no direct significant (Models 3, 10 and 17) effect of institutional quality on economic growth. This may agree with other studies that while institutional quality may be important for economic output, it may require other complementarity to be growth-enhancing (Stewart et al., 2020). However, when interacting with bank capital (RCAP) the interaction term becomes positive and significant ( $\beta = 1.111$ ; sig < 0.05, Model 4 for SGMM), consistent with hypothesis 3. This suggests that bank capital and institutional quality have a strong interaction relationship and that the effect of RCAP increases at higher levels of institutional quality (Anginer et al., 2018; Stewart et al., 2020). Even though the results show no significant evidence of a direct relationship between institutional quality and economic growth, the combined effect of IQI and RCAP produces a significantly stronger impact on economic growth. This suggests that poor institutional quality may not directly benefit economic growth, but its significance on overall economic growth cannot be underestimated. In summary, the findings contradict the concerns that higher bank capital can undermine the prospect of economic growth. Rather, the overall economic growth and bank stability are enhanced at higher capital and institutional quality levels.

Regarding the control variables, bank size increases growth, while inflation hurts growth. These are consistent with the priori expectation, and other empirical studies including Abbas and Ali (2022), Abdelsalam et al. (2022), and Adem (2022). Moreover, trade, domestic investment and financial development promote economic growth consistent with extant literature (De Clercq et al., 2023; Segovia & Cepeda, 2024; Srdelić & Dávila-Fernández, 2024).

## 5.2. Bayesian estimation

Some authors criticise the frequentist approach, including the estimators employed in Table 4. They believe it may be inadequate to produce robust results (Briggs, 2023; Ha et al., 2021; Nguyen et al., 2019; Thach et al., 2021; 2022). Therefore, they suggest supplementing the frequentist methods with non-frequentist (without using P-values) approaches like Bayesian regression. As a result, we further use Bayesian regression to estimate the models. This approach moves from the 'effect or no effect' evaluation. Rather, it estimates the distribution effect (Oanh et al., 2023). The posterior effect distribution provides specific information about the size of the impact and its uncertainty. The Bayesian approach provides several interesting properties. First, unlike the frequentist methods that ask whether bank capital and stability affect economic growth (and rejecting an alternative as inappropriate), Bayesian statistics, however, provides the probability that bank capital and stability may affect growth, thus providing more intuitive interpretations that are consistent with theory (Oanh et al., 2023). Second, the Bayesian approach is based on something other than asymptotic theory and therefore can address multicollinearity problems (Oanh et al., 2023), and is more efficient for small sample sizes, complex models and data structuring (Kruschke & Liddell, 2018; Oanh et al., 2023).

This study specifies normal priors for the parameters within the models. Normal priors are specified for parameters to achieve mathematical convenience since normal distributions are well-behaved. Further, it is more flexible to adjust for varying levels of uncertainty and can also prevent extreme parameter values. Further, normal priors produce a more efficient analysis (Murrar et al., 2024), as many Bayesian software packages are optimised for normal distributions. Specifically, this study chooses normal priors with a mean of 0 and a variance of 1. A normal prior with  $(N(0, 1))$  in a Bayesian model is a prior distribution that: represents a 'standard normal' distribution, has a mean ( $\mu$ ) of 0, indicating no prior bias or expectation, has a variance ( $\sigma^2$ ) of 1, indicating a moderate level of uncertainty or spread, is a 'weakly informative' prior, and providing a gentle suggestion rather than a strong prior belief.

Table 5 presents the Bayesian results. In Model 22, the mean coefficient of Z-score is 0.309, and the positive probability effect of Z-score on economic growth is 94.3%. Interacting the Z-score with CAR produces a coefficient of 0.358. The probability of no trade-off is 100%, implying a stable and apparent impact consistent with Stewart et al. (2020). It can also be observed that both CAR and RCAP exhibit a positive effect on economic growth. The probability of the positive impact is more than 92.7% consistent with the earlier results and confirms that higher capital induces no trade-off between bank stability and economic growth. From Model 23, the mean coefficient of IQI\*RCAP is 1.900, and the positive probability impact of the interaction on growth is 97%. Further, the IQI\*Z-score has a mean coefficient of 1.941, and the probability of the effect on growth is 94.1%. This underscores the belief that bank stability and effective capital policies thrive in a quality institutional environment.

### 5.2.1. Comparing the frequentist and Non-frequentist methods

Table 6 compares the results between the frequentist approach (SGMM, FE and 2SLS) and the non-frequentist approach (Bayesian) to appreciate the differences in results based on varied estimations. This is important in identifying which of the methods provides a more robust result. Both the Bayesian and the SGMM methods confirm the positive effect of z-score on growth. FE and 2SLS report positive but

**Table 5.** Determinants of economic growth: Bayesian method.

Models	(22)		(23)	
	Mean coefficient	Probability of coefficient	Mean coefficient	Probability of coefficient
gdpt – 1	0.497 (0.387; 0.608)	1.000**	0.359 (0.209; 0.509)	0.1000**
z-score	0.309 (0.108; 0.509)	0.943**		
CAR	0.522 (0.390; 0.654)	1.000**	0.737 (0.567; 0.907)	1.000**
RCAP	0.501 (0.397; 0.609)	0.927**	0.435 (0.217; 0.654)	0.708**
IQI			0.154 (0.100; 0.209)	0.632*
IQI*RCAP			1.900 (1.015; 2.786)	0.970**
IQI*Z-score			1.941 (1.017; 2.865)	0.941**
CAR*Z-score	–0.358 (–0.208; –0.509)	1.000**		
RCAP*Z-score	0.088 (0.016; 0.156)	0.010		
Bank Size	0.426 (0.265; 0.587)	0.900**	0.425 (0.287; 0.564)	0.890**
FD	0.403 (0.309; 0.498)	0.564*	0.235 (0.105; 0.365)	0.899**
DI	0.055 (0.003; 0.108)	0.632*	0.472 (0.376; 0.568)	0.945**
Trade	0.526 (0.398; 0.654)	1.000**	0.349 (0.289; 0.409)	1.000**
Inflation	–0.198 (–0.109; –0.287)	0.509*	–0.255 (–0.201; –0.310)	0.554*
_Cons	0.403 (0.309; 0.498)	0.876**	0.404 (0.399; 0.409)	1.000**
Var	14.597 (8.097; 21.097)	–	18.996 (11.896; 26.097)	–

Notes: \*, \*\* is probability of mean < 0, and > 0, respectively; 95%-credible interval in brackets.

Source: Author's estimation.

**Table 6.** Estimated parameters of SGMM, Bayesian, FE and 2SLS.

Relationship with economic growth	Bayesian	SGMM	FE	2SLS
Bank stability	0.309	0.308	1.810	1.448
Trade-off of capital	0.737	0.765	0.729	0.245
IQI*RCAP	1.900	1.111	−0.054	−0.005
IQI*Z-score	1.941	0.093	0.093	0.056
CAR*Z-score	0.358	−0.387	−0.427	0.243
RCAP*Z-score	0.088	0.039	0.102	0.013

Note. The dependent variable is economic growth.

Source: Author's work.

insignificant results. Even though the coefficients are marginally different (i.e. Bayesian = 0.737; SGMM = 0.765; FE = 0.729; 2SLS = 0.245), all the estimations support the positive effect of bank capital on the trade-off metric, implying that higher capital can improve both bank stability and economic growth simultaneously without undermining the other. The results suggest that capital adequacy can maintain bank stability and economic growth. Further, institutional quality can catalyse bank stability to increase economic growth, by facilitating important bank economic activities.

Concerning whether bank capital and institutional quality affect the relationship between bank stability and economic growth, the results indicate that IQI\*RCAP are positive and significant with Bayesian and SGMM models, but negative and insignificant with FE and 2SLS models, suggesting the robust estimation of the Bayesian and the SGMM methods. The results show that within a sound institutional environment, the positive effect of bank capital on economic growth is greater. It can be observed that the Bayesian model offers the most robust estimation of the trade-off effect of bank capital on bank stability and economic growth.

## 6. Summary and conclusion

### 6.1. Main findings and theoretical contribution

This study draws on the bank stability – growth trade-offs approach (Stewart et al., 2020), which integrates z-score and GDP per capita to model trade-off metric to investigate whether regulatory capital induces a trade-off between bank stability and economic growth. Further, the study examines whether institutional quality can explain the relationship between bank stability/capital and economic growth. Based on bank-level panel data from 71 banks in 9 Sub-Saharan African countries from 2007 to 2021, and several estimation techniques such as SGMM, FE, 2SLS and the Bayesian model, the empirical results support the negative trade-off effects. Specifically, the study discovers that high regulatory capital can benefit bank stability and economic growth, averring no capital-induced trade-off between bank stability and economic growth. This suggests capital adequacy can simultaneously promote a stable bank and a strong economy without undermining the other. The findings further indicate that bank stability fosters economic growth. Moreover, the relationship between bank stability and economic growth is moderated by institutional quality and is amplified at higher institutional levels. Together, these findings carry important theoretical insights to help us understand the role of capital policies on banking resilience and economic outcomes under prevailing institutional conditions in SSA countries.

The study contributes to current literature in several ways. First, it advances the scope of bank capital and growth literature (e.g. Chen, 2022; Conti et al., 2023; Patel et al., 2022; Thakor, 2014) by exploring how bank capital can induce a trade-off between bank stability and economic growth. Limited studies exist on this trade-off model on a global scale (Stewart et al., 2020). This study advances this line of enquiry in SSA. Consequently, the findings support the importance of regulatory capital policies in shaping banking activities. The findings confirm the supply-leading hypothesis or the finance-led-growth theory by Fishkin et al. (1973) positing that bank stability can drive economic growth by facilitating savings, allocating credits and managing risks. Also, the evidence underscores the risk-absorption hypothesis that higher capital allows banks to absorb risks in the banking system to continuously provide credit to entrepreneurs and businesses to undertake productive activities which drive economic growth. This is counter to the argument that capital adequacy while improving bank soundness (Danisman & Tarazi, 2024; Hoang et al., 2024), will constrain economic growth (Huu Vu & Thanh Ngo, 2023; Le & Pham, 2021). Rather, this study reveals that capital simultaneously catalyse bank stability and economic growth.

Second, the study adds to the literature on institutional conditions under which bank stability will have a greater impact on economic growth. The extension is crucial because past studies in this region failed to consider how institutional deficits or gains can cause the banking system to have a pronounced impact on economic outcomes (Anani & Owusu, 2023). Even though the empirical results showed no significant direct effect of institutional quality on economic growth, the moderation with bank stability demonstrated that the impact of institutions on growth cannot be underestimated and that bank stability can drive growth at high levels of capital and institutional quality, highlighting the importance of institutional theory in explaining capital – growth nexus. The insignificant relationship between institutional quality and economic growth highlights the institutional deficits in SSA countries. SSA countries primarily have weak institutions which prevents them from achieving higher economic development. This suggests the need to promote good governance in SSA.

Relying on multi-theoretical approaches such as risk-absorption theory, moral hazard, financial fragility theory, finance-led growth theory and institutional theory, this study helps shed light on the mixed findings in extant literature (e.g. Ramlall, 2018; Tran et al., 2022; Boachie et al. 2023; Kim & Sohn, 2017) and also addresses the concerns of the negative implications of regulatory capital on growth. The empirical evidence nullifies these concerns and suggests that bank capital can maintain bank stability and economic growth without undermining the other.

## **6.2. Implications for policy and practice**

This study has two implications. Since the SSA economy is bank-based which supports major entrepreneurial activities and finances the economy, central banks and regulatory authorities must concentrate on implementing and maintaining capital adequacy policies. This can help mitigate any growth deficit associated with inefficient banking systems. We however caution that while stringent capital requirements for banks are anticipated to enhance financial stability, its wrong enforcement can lead to poor economic performance when banks become more cautious to extend loans to households and businesses due to the need to maintain higher capital buffers. This suggests the need for SSA central banks to cooperate and define the Basel III standards and design tailored capital standards, reflecting the SSA market, economic and institutional environment. This suggestion is crucial because knowing how and when regulators must balance between prudential regulations and growth can avert any curse associated with stringent capital regulatory policies. The findings also indicate that additional efforts to strengthen the banking sector such as regulatory discipline, quality macroprudential policies, and constant review of bank risk-based capital to ensure adequate buffer can have positive economic consequences.

In terms of policy, the study finds that the institutional void in SSA constrains the realisation of higher economic growth. Policymakers must focus on improving the institutional environment and address problems of governance ineffectiveness, poor regulatory quality, corruption, political instability, weak democracy and injustices. Thus, policies need to focus on maintaining strong supervisory control and monitoring. The social implication of the findings is that higher capital and robust institutions lead to greater access to credit for marginalised groups in the population, promoting financial inclusion and reducing poverty. In summary, institutional quality and capital-induced economic growth, by extension, can foster job creation and promote general well-being.

This study is not immune to limitations. First, the study only provides evidence of one-way relationships. Economic growth can also affect bank stability, bank capital and institutional quality. Hence further studies must consider the causality relationship among the explored variables. Even though the growth model was sufficient, some determinants of growth such as FDI, technology, and human development index were not considered. Future studies must address that. Moreover, segregating the banks into smaller and larger banks based on capitalisation and assets, and assessing how regulatory capital produces a trade-off between bank stability and growth for each group will provide further insights into the size effects.

## **Disclosure statement**

No potential conflict of interest was reported by the author(s).

## Funding

The author declares that no funds, grants, or other support were received during the preparation of this manuscript.

## About the author

**Isaac Bawuah** holds a postgraduate certificate in Finance and an undergraduate certificate in banking and Finance from Kwame Nkrumah University of Science and Technology (KNUST), Ghana. His research interests include corporate governance, climate finance, institutional quality in developing countries, sustainable development and assessment in Sub-Saharan Africa.

## ORCID

Isaac Bawuah  <http://orcid.org/0000-0003-0555-1576>

## Data availability statement

The data and material supporting this study can be obtained upon reasonable request.

## References

- Abascal, R., & González, F. (2023). What drives risk-taking incentives embedded in bank executive compensation? Some international evidence. *Journal of Corporate Finance*, 79, 102357. <https://doi.org/10.1016/j.jcorpfin.2023.102357>[Mismatch]
- Abbas, F., & Ali, S. (2022). Dynamics of diversification and banks' risk-taking and stability: Empirical analysis of commercial banks. *Managerial and Decision Economics*, 43(4), 1000–1014. <https://doi.org/10.1002/mde.3434>
- Abdelsalam, O., Elnahass, M., Ahmed, H., & Williams, J. (2022). Asset securitizations and bank stability: evidence from different banking systems. *Global Finance Journal*, 51, 100551. <https://doi.org/10.1016/j.gfj.2020.100551>
- Addi, A., & Bouoiyour, J. (2023). Interconnectedness and extreme risk: Evidence from dual banking systems. *Economic Modelling*, 120, 106150. <https://doi.org/10.1016/j.econmod.2022.106150>
- Adem, M. (2022). Impact of diversification on bank stability: Evidence from emerging and developing countries. *Discrete Dynamics in Nature and Society*, 2022(1), 7200725. <https://doi.org/10.1155/2022/7200725>
- Afzall, M. A., Nadri, K., & Tavakolian, H. (2023). Can the transition from Basel II to III change the monetary policy impact on the Iranian economy and banking system? *Economic Analysis and Policy*, 77, 357–371. <https://doi.org/10.1016/j.eap.2022.11.018>
- Aharon, D. Y., Ali, S., & Naved, M. (2023). Too big to fail: The aftermath of Silicon Valley Bank (SVB) collapse and its impact on financial markets. *Research in International Business and Finance*, 66, 102036. <https://doi.org/10.1016/j.ribaf.2023.102036>
- Alaoui Mdaghri, A., & Oubdi, L. (2022). Basel III liquidity regulatory framework and bank liquidity creation in MENA countries. *Journal of Financial Regulation and Compliance*, 30(2), 129–148. <https://doi.org/10.1108/JFRC-01-2021-0002>
- Allen, F., Carletti, E., & Marquez, R. (2011). Credit market competition and capital regulation. *Review of Financial Studies*, 24(4), 983–1018. <https://doi.org/10.1093/rfs/hhp089>
- Alshubiri, F. N. (2017). Determinants of financial stability: An empirical study of commercial banks listed in Muscat Security Market. *Journal of Business & Retail Management Research*, 11(4), 192–200. <https://doi.org/10.24052/JBRMR/V11IS04/DOFSAESOCBLIMSM>
- Anani, M., & Owusu, F. (2023). Regulatory capital and bank risk-resilience amid the Covid-19 pandemic: How are the Basel reforms faring? *Finance Research Letters*, 52, 103591. <https://doi.org/10.1016/j.frl.2022.103591>
- Anginer, D., Demirgüç-Kunt, A., & Mare, D. S. (2018). Bank capital, institutional environment and systemic stability. *Journal of Financial Stability*, 37, 97–106. <https://doi.org/10.1016/j.jfs.2018.06.001>
- Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), 277–297. <https://doi.org/10.2307/2297968>
- Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51. [https://doi.org/10.1016/0304-4076\(94\)01642-D](https://doi.org/10.1016/0304-4076(94)01642-D)
- Ashraf, J., Luo, L., & Khan, M. A. (2022). The spillover effects of institutional quality and economic openness on economic growth for the belt and Road Initiative (BRI) countries. *Spatial Statistics*, 47, 100566. <https://doi.org/10.1016/j.spasta.2021.100566>
- Baltagi, B. H. (2008). *Econometric analysis of panel data*. (Vol. 4). Wiley.
- Bank of International Settlements. (2010). *Basel Committee of Banking Supervision*. International Framework for Liquidity Risk Measurement, Standards, and Monitoring. Bank of International Settlements.



- Basel Committee on Banking Supervision. (2011). Basel III: A global regulatory framework on bank capital adequacy, liquidity and funding. *Bank for International Settlements*, 189, 1–59.
- Batrancea, L. M. (2021a). An econometric approach on performance, assets, and liabilities in a Sample of Banks from Europe, Israel, United States of America, and Canada. *Mathematics*, 9(24), 3178. <https://doi.org/10.3390/math9243178>
- Batrancea, L. M. (2022). Determinants of economic growth across the European Union: A panel data analysis on small and medium enterprises. *Sustainability*, 14(8), 4797. <https://doi.org/10.3390/su14084797>
- Batrancea, L. (2021b). The Influence of liquidity and solvency on performance within the healthcare industry: Evidence from publicly listed companies. *Mathematics*, 9(18), 2231. eISSN:2227–7390/sept.2021 <https://doi.org/10.3390/math9182231>
- Batrancea, L., Rathnaswamy, M. K., & Batrancea, I. A. (2021). Panel data analysis on determinants of economic growth in seven non-BCBS countries. *Journal of the Knowledge Economy*, 13(2), Page1651-1665–1665. <https://doi.org/10.1007/s13132-021-00785-y>
- Batrancea, L., Rathnaswamy, M. M., Batrancea, I., Nichita, A., Rus, M.-I., Tulai, H., Fatacean, G., Masca, E. S., & Morar, I. D. (2020). Adjusted net savings of CEE and Baltic Nations in the context os sustainable economic growth: A panel data analysis. *Journal of Risk and Financial Management*, 13(10), 234.
- Bawuah, I. (2024a). Bank capital and liquidity creation in Sub-Saharan Africa: The role of quality institutions. *African Journal of Economic and Management Studies*, 15(3), 458–482. <https://doi.org/10.1108/AJEMS-01-2023-0036>
- Bawuah, I. (2024b). Mobile money and financial inclusion: The role of institutional quality. *Global Social Welfare*, 11, 1–15. <https://doi.org/10.1007/s40609-023-00325-3>
- Bekiros, S., Nilavongse, R., & Uddin, G. S. (2018). Bank capital shocks and countercyclical requirements: Implications for banking stability and welfare. *Journal of Economic Dynamics and Control*, 93, 315–331. <https://doi.org/10.1016/j.jedc.2018.01.049>
- Berger, A. N., & Bouwman, C. H. (2009). Bank liquidity creation: *The Review of Financial Studies*, 22(9), 3779–3837. <https://doi.org/10.1093/rfs/hhn104>
- Berrospide, J. M., & Herrerias, R. (2015). Finance companies in Mexico: Unexpected victims of the global liquidity crunch. *Journal of Financial Stability*, 18, 33–54. <https://doi.org/10.1016/j.jfs.2015.02.004>
- Berrospide, J. M., & Edge, R. M. (2019). *The effects of bank capital buffers on bank lending and firm activity: What can we learn from five years of stress test results?* (Finance and Economics Discussion Series 2019, No 050). Board of Governors of the Federal Reserve System, United States.
- Besanko, D., & Kanatas, G. (1996). The regulation of bank capital: Do capital standards promote bank safety? *J. Financ. Intermed*, 5(2), 160–183. <https://doi.org/10.1006/jfin.1996.0009>
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143. [https://doi.org/10.1016/S0304-4076\(98\)00009-8](https://doi.org/10.1016/S0304-4076(98)00009-8)
- Boachie, R., Aawaar, G., & Domeher, D. (2023). Relationship between financial inclusion, banking stability and economic growth: A dynamic panel approach. *Journal of Economic and Administrative Sciences*, 39(3), 655–670. <https://doi.org/10.1108/JEAS-05-2021-0084>
- Boermans, M. A., & Van der Kroft, B. (2024). Capital regulation induced reaching for systematic yield: Financial instability through fire sales. *Journal of Banking & Finance*, 158, 107030. <https://doi.org/10.1016/j.jbankfin.2023.107030>
- Bordo, M. D., Duca, J. V., & Koch, C. (2016). Economic policy uncertainty and the credit channel: Aggregate and bank-level US evidence over several decades. *Journal of Financial Stability*, 26, 90–106. <https://doi.org/10.1016/j.jfs.2016.07.002>
- Borio, C., & Disyatat, P. (2010). Unconventional monetary policies: An appraisal. *The Manchester School*, 78(s1), 53–89. <https://doi.org/10.1111/j.1467-9957.2010.02199.x>
- Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies*, 47(1), 239–253. <https://doi.org/10.2307/2297111>
- Briggs, W. M. (2023). A partial solution for the replication crisis in economics. *Asian Journal of Economics and Banking*, 7(2), 180–190. <https://doi.org/10.1108/AJEB-03-2023-0027>
- Basty, N., Ghazouani, I., & Jeriji, M. (2023). How macroprudential regulation and board effectiveness interact to shape bank risk-taking behaviour. *Research in International Business and Finance*, 66, 102069. <https://doi.org/10.1016/j.ribaf.2023.102069>
- Chen, Y. (2022). Bank interconnectedness and financial stability: The role of bank capital. *Journal of Financial Stability*, 61, 101019. <https://doi.org/10.1016/j.jfs.2022.101019>
- Chodorow-Reich, G., Darmouni, O., Luck, S., & Plosser, M. (2022). Bank liquidity provision across the firm size distribution. *Journal of Financial Economics*, 144(3), 908–932. <https://doi.org/10.1016/j.jfineco.2021.06.035>
- Conti, A. M., Nobili, A., & Signoretti, F. M. (2023). Bank capital requirement shocks: A narrative perspective. *European Economic Review*, 151, 104254. <https://doi.org/10.1016/j.euroecorev.2022.104254>
- Coval, J., & Thakor, A. (2005). Financial intermediation as a beliefs-bridge between optimists and pessimists. *Journal of Financial Economics*, 75(3), 535–569. <https://doi.org/10.1016/j.jfineco.2004.02.005>
- Danisman, G. O., & Tarazi, A. (2024). Economic policy uncertainty and bank stability: Size, capital, and liquidity matter. *The Quarterly Review of Economics and Finance*, 93, 102–118. <https://doi.org/10.1016/j.qref.2023.11.008>



- De Clercq, M., D'Haese, M., & Buysse, J. (2023). Economic growth and broadband access: The European urban-rural digital divide. *Telecommunications Policy*, 47(6), 102579. <https://doi.org/10.1016/j.telpol.2023.102579>
- Deli, Y. D., & Hasan, I. (2017). Real effects of bank capital regulations: Global evidence. *Journal of Banking & Finance*, 82, 217–228. <https://doi.org/10.1016/j.jbankfin.2016.11.022>
- Dinga, G. D., Fonchamnyo, D. C., & Afumbom, N. S. (2024). A multidimensional appraisal of domestic investment, external debt and economic development nexus: Evidence from SSA. *Journal of Business and Socio-Economic Development*, 56(1):234–246. <https://doi.org/10.1108/JBSED-12-2022-0130>
- Do, T. D., Pham, H. A. T., Thalassinos, E. I., & Le, H. A. (2022). The impact of digital transformation on performance: Evidence from Vietnamese commercial banks. *Journal of Risk and Financial Management*, 15(1), 21. <https://doi.org/10.3390/jrfm15010021>
- Durango-Gutiérrez, M. P., Lara-Rubio, J., & Navarro-Galera, A. (2023). Analysis of default risk in microfinance institutions under the Basel III framework. *International Journal of Finance & Economics*, 28(2), 1261–1278. <https://doi.org/10.1002/ijfe.2475>
- Dutta, A., Voumik, L. C., Kumarasankaralingam, L., Rahaman, A., & Zimon, G. (2023). 'The Silicon Valley bank failure: Application of Benford's Law to spot abnormalities and risks', *Risks*, 11(7), 120. <https://doi.org/10.3390/risks11070120>
- Economou, F., & Panagopoulos, Y. (2023). Assessing the credit creation process under the Basel III framework: Some evidence from the Eurozone. *Finance Research Letters*, 51, 103428. <https://doi.org/10.1016/j.frl.2022.103428>
- Elfeituri, H. (2022). Banking stability, institutional quality, market concentration, competition and political conflict in MENA. *Journal of International Financial Markets, Institutions and Money*, 76, 101476. <https://doi.org/10.1016/j.intfin.2021.101476>
- Elvik, R. (2021). Democracy, governance, and road safety. *Accident; Analysis and Prevention*, 154, 106067. <https://doi.org/10.1016/j.aap.2021.106067>
- Fishkin, J., Keniston, K., & McKinnon, C. (1973). Moral reasoning and political ideology. *Journal of Personality and Social Psychology*, 27(1), 109–119. <https://doi.org/10.1037/h0034434>
- Fosu, S., Danso, A., Agyei-Boapeah, H., Ntim, C. G., & Murinde, V. (2018). How does banking market power affect bank opacity? Evidence from analysts' forecasts. *International Review of Financial Analysis*, 60, 38–52. <https://doi.org/10.1016/j.irfa.2018.08.015>
- Fosu, S., Ntim, C. G., Coffie, W., & Murinde, V. (2017). Bank opacity and risk-taking: Evidence from analysts' forecasts. *Journal of Financial Stability*, 33, 81–95. <https://doi.org/10.1016/j.jfs.2017.10.009>
- Fouejieu, A., Popescu, A., & Villieu, P. (2019). Trade-offs between macroeconomic and financial stability objectives. *Economic Modelling*, 81, 621–639. <https://doi.org/10.1016/j.econmod.2019.02.006>
- Gambacorta, L., & Mistrulli, P. E. (2004). Does bank capital affect lending behaviour? *Journal of Financial Intermediation*, 13(4), 436–457. <https://doi.org/10.1016/j.jfi.2004.06.001>
- González, F. (2023). Creditor rights, bank competition, and stability: International evidence. *Journal of International Financial Markets, Institutions and Money*, 82, 101711. <https://doi.org/10.1016/j.intfin.2022.101711>
- Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics*. McGraw-hill.
- Ha, V. D., Nguyen, T. X. L., Ta, T. H. N., & Nguyen, M. H. (2021). Does capital affect bank risk in Vietnam: A Bayesian approach. In N. Ngoc Thach, V. Kreinovich, & N. D. Trung (Eds.), *Data science for financial econometrics. Studies in computational intelligence* (vol. 898). Springer.
- Hair, J. F. (2009). Multivariate data analysis.
- Hartlage, A. W. (2012). The Basel III liquidity coverage ratio and financial stability. *The Michigan Law Review*, 111, 453.
- Hellmann, T. F., Murdock, K. C., & Stiglitz, J. E. (2000). Liberalization, moral hazard in banking, and prudential regulation: Are capital requirements enough? *American Economic Review*, 90(1), 147–165. <https://doi.org/10.1257/aer.90.1.147>
- Hoang, K., Tran, S., Nguyen, D., & Nguyen, L. (2024). Bank capital, institutional quality and bank stability: International evidence. *International Journal of Revenue Management*, 14(1), 33–53. <https://doi.org/10.1504/IJRM.2024.135965>
- Holmstrom, B., & Tirole, J. (1997). Financial intermediation, loanable funds, and the real sector. *The Quarterly Journal of Economics*, 112(3), 663–691. <https://doi.org/10.1162/003355397555316>
- Holtz-Eakin, D., Newey, W., & Rosen, H. S. (1988). Estimating vector autoregressions with panel data. *Econometrica*, 56(6), 1371–1395. <https://doi.org/10.2307/1913103>
- Hsiao, C. (2022). *Analysis of panel data*. (No. 64) Cambridge University Press.
- Huu Vu, T., & Thanh Ngo, T. (2023). Bank capital and bank stability: The mediating role of liquidity creation and moderating role of asset diversification. *Cogent Business & Management*, 10(2), 2208425. <https://doi.org/10.1080/23311975.2023.2208425>
- Ibrahim, M., & Alagidede, P. (2018). Effect of financial development on economic growth in sub-Saharan Africa. *Journal of Policy Modeling*, 40(6), 1104–1125. <https://doi.org/10.1016/j.jpolmod.2018.08.001>
- Jagannath, M. V. K., & Maitra, D. (2023). Do election cycles, political stability, and government effectiveness matter for the risk of banks? Evidence from Indian banks. *Journal of Behavioral and Experimental Finance*, 39, 100830. <https://doi.org/10.1016/j.jbef.2023.100830>

- Jamil, M. N. (2022). Monetary policy performance under control of exchange rate and consumer price index. *Journal of Environmental Science and Economics*, 1(1), 28–35. <https://doi.org/10.56556/jescae.v1i1.7>
- Jayakumar, M., Pradhan, R. P., Dash, S., Maradana, R. P., & Gaurav, K. (2018). Banking competition, banking stability, and economic growth: Are feedback effects at work? *Journal of Economics and Business*, 96, 15–41. <https://doi.org/10.1016/j.jeconbus.2017.12.004>
- Jensen, M., & Meckling, W. (1976). A theory of the firm: Managerial behaviour, agency costs and ownership structure. *J. Financ. Econ*, 3(4), 305–360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)
- Kaufmann, D., Kraay, A., & Mastruzzi, M. (2009). *Governance matters VIII: Aggregate and individual governance indicators, 1996–2008*. World Bank Policy Research Working Paper No. 4978.
- Kesar, A., Bandi, K., Jena, P. K., & Yadav, M. P. (2021). Dynamics of governance, gross capital formation, and growth: Evidence from Brazil, Russia, India, China, and South Africa. *Journal of Public Affairs*, 23(1). p. e2831.
- Khan, M. A., Khan, M. A., Abdulahi, M. E., Liaqat, I., & Shah, S. S. H. (2019). Institutional quality and financial development: The United States perspective. *Journal of Multinational Financial Management*, 49, 67–80. <https://doi.org/10.1016/j.mulfin.2019.01.001>
- Kim, D., & Sohn, W. (2017). The effect of bank capital on lending: Does liquidity matter? *Journal of Banking & Finance*, 77, 95–107. <https://doi.org/10.1016/j.jbankfin.2017.01.011>
- King, P., & Tarbert, H. (2011). Basel III: An overview. *Banking & Financial Services Policy Report*, 30(5), 1–18.
- Klein, P. O., & Turk-Ariss, R. (2022). Bank capital and economic activity. *Journal of Financial Stability*, 62, 101068. <https://doi.org/10.1016/j.jfs.2022.101068>
- Koehn, M., & Santomero, A. M. (1980). Regulation of bank capital and portfolio risk. *The Journal of Finance*, 35(5), 1235–1244. <https://doi.org/10.2307/2327096>
- Korbi, F., & Bougatef, K. (2017). Regulatory capital and stability of Islamic and conventional banks. *International Journal of Islamic and Middle Eastern Finance and Management*, 10(3), 312–330. <https://doi.org/10.1108/IMEFM-06-2016-0079>
- Kruschke, J. K., & Liddell, T. M. (2018). The Bayesian new statistics: Hypothesis testing, estimation, meta-analysis, and power analysis from a Bayesian perspective. *Psychonomic Bulletin & Review*, 25(1), 178–206. <https://doi.org/10.3758/s13423-016-1221-4>
- Kumar, P., & Datta, S. K. (2021). Interdependence between environmental performance and economic growth with a policy approach towards sustainability: Evidence from panel data. *Current Research in Environmental Sustainability*, 3, 100105. <https://doi.org/10.1016/j.crsust.2021.100105>
- Law, S. H., & Singh, N. (2014). Does too much finance harm economic growth? *Journal of Banking & Finance*, 41, 36–44. <https://doi.org/10.1016/j.jbankfin.2013.12.020>
- Le, T. D., & Pham, X. T. (2021). The inter-relationships among liquidity creation, bank capital and credit risk: Evidence from emerging Asia-Pacific economies. *Managerial Finance*, 47(8), 1149–1167. <https://doi.org/10.1108/MF-04-2020-0189>
- Levine, R., Loayza, N., & Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics*, 46(1), 31–77. [https://doi.org/10.1016/S0304-3932\(00\)00017-9](https://doi.org/10.1016/S0304-3932(00)00017-9)
- Malovaná, S., Hodula, M., Bajžík, J., & Gric, Z. (2023a). Bank capital, lending, and regulation: A meta-analysis. *Journal of Economic Surveys*, 38(3), 823–851. <https://doi.org/10.1111/joes.12560>
- Malovaná, S., Hodula, M., Gric, Z., & Bajžík, J. (2023b). Macroprudential policy in central banks: Integrated or separate? Survey among academics and central bankers. *Journal of Financial Stability*, 65, 101107. <https://doi.org/10.1016/j.jfs.2023.101107>
- Martinez-Miera, D., & Suarez, J. (2014). Banks' endogenous systemic risk-taking. *manuscript, CEMFI*, 42.
- Martynova, N. (2015). Effect of bank capital requirements on economic growth: A survey. De Nederlandsche Bank Working Paper No. 467. Available at SSRN: <https://ssrn.com/abstract=2577701> or <https://doi.org/10.2139/ssrn.2577701>
- Merton, R. (1977). An analytic derivation of the cost of deposit insurance and loan guarantees: An application of modern option pricing theory. *The Journal of Banking Finance*, 1(1), 3–11. [https://doi.org/10.1016/0378-4266\(77\)90015-2](https://doi.org/10.1016/0378-4266(77)90015-2)
- Moosa, I. A. (2010). Basel II was a casualty of the global financial crisis. *Journal of Banking Regulation*, 11(2), 95–114. <https://doi.org/10.1057/jbr.2010.2>
- Muhammad, B., & Khan, S. (2019). Effect of bilateral FDI, energy consumption, CO2 emission and capital on the economic growth of Asia countries. *Energy Reports*, 5, 1305–1315. <https://doi.org/10.1016/j.egyr.2019.09.004>
- Murrar, A., Asfour, B., & Paz, V. (2024). Banking sector and economic growth in the digital transformation era: Insights from maximum likelihood and Bayesian structural equation modeling. *Asian Journal of Economics and Banking*. <https://doi.org/10.1108/AJEB-12-2023-0122>
- Natsagdorj, N. (2023). Macroprudential policy to manage systemic risk deriving from financial institutions in Mongolia. In H. Taguchi, T. Osada, O. Ito, & K. Hirota (Eds.) *Challenges in fiscal and monetary policies in Mongolia. New frontiers in regional science: Asian perspectives* (vol. 66). Springer.
- Nedić, V., Despotović, D., Cvetanović, S., Djukić, T., & Petrović, D. (2020). Institutional reforms for economic growth in the Western Balkan countries. *Journal of Policy Modeling*, 42(5), 933–952. <https://doi.org/10.1016/j.jpolmod.2020.04.002>

- Nguyen, H. T., Trung, N. D., & Thach, N. N. (2019). Beyond traditional probabilistic methods in econometrics. In V. Kreinovich, N. Thach, N. Trung, & D. Van Thanh (Eds.), *Beyond traditional probabilistic methods in economics. ECONVN 2019. Studies in computational intelligence* (vol 809).
- North, D. C. (1990). A transaction cost theory of politics. *Journal of Theoretical Politics*, 2(4), 355–367. <https://doi.org/10.1177/0951692890002004001>
- Noss, J., & Toffano, P. (2016). Estimating the impact of changes in aggregate bank capital requirements on lending and growth during an upswing. *Journal of Banking & Finance*, 62, 15–27. <https://doi.org/10.1016/j.jbankfin.2015.09.020>
- Oanh, T. T. K., Van Nguyen, D., Le, H. V., & Duong, K. D. (2023). How capital structure and bank liquidity affect bank performance: Evidence from the Bayesian approach. *Cogent Economics & Finance*, 11(2), 2260243. <https://doi.org/10.1080/23322039.2023.2260243>
- O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*, 41, 673–690.
- Passmore, W., & Temesvary, J. (2022). How investor demands for safety influence bank capital and liquidity trade-off. *Journal of Financial Stability*, 60, 100987. <https://doi.org/10.1016/j.jfs.2022.100987>
- Patel, A., Sorokina, N., & Thornton, J. H. Jr. (2022). Liquidity and bank capital structure. *Journal of Financial Stability*, 62, 101038. <https://doi.org/10.1016/j.jfs.2022.101038>
- Plosser, M. C., & Santos, J. A. (2024). The cost of bank regulatory capital. *The Review of Financial Studies*, 37(3), 685–726. <https://doi.org/10.1093/rfs/hhad077>
- Ramlall, I. (2018). *Understanding financial stability*. Emerald Publishing Limited.
- Repullo, R. (2004). Capital requirements, market power, and risk-taking in banking. *Journal of Financial Intermediation*, 13(2), 156–182. <https://doi.org/10.1016/j.jfi.2003.08.005>
- Rochet, J.-C. (1992). Capital requirements and the behaviour of commercial banks. *European Economic Review*, 36(5), 1137–1170. [https://doi.org/10.1016/0014-2921\(92\)90051-W](https://doi.org/10.1016/0014-2921(92)90051-W)
- Roulet, C. (2018). Basel III: Effects of capital and liquidity regulations on European bank lending. *Journal of Economics and Business*, 95, 26–46. <https://doi.org/10.1016/j.jeconbus.2017.10.001>
- Rubio, M., & Yao, F. (2020). Bank capital, financial stability and Basel regulation in a low interest-rate environment. *International Review of Economics & Finance*, 67, 378–392. <https://doi.org/10.1016/j.iref.2020.02.008>
- Segovia, M. A. F., & Cepeda, L. E. T. (2024). Financial development and economic growth: New evidence from Mexican States. *Regional Science Policy & Practice*, 16(7), 100028. <https://doi.org/10.1016/j.rspp.2024.100028>
- Shikimi, M. (2023). Risk-taking and bank competition under a low-interest rate environment: Evidence from loan-level data. *Pacific-Basin Finance Journal*, 78, 101945. <https://doi.org/10.1016/j.pacfin.2023.101945>
- Shrieves, R. E., & Dahl, D. (1992). 'The relationship between risk and capital in commercial banks. J. Bank. Finance', pp. *Journal of Banking & Finance*, 16(2), 439–457. [https://doi.org/10.1016/0378-4266\(92\)90024-T](https://doi.org/10.1016/0378-4266(92)90024-T)
- Song, G. (2023). Evaluating large bank risk using stock market measures in the Basel III period. *Journal of Corporate Accounting & Finance*, 34(1), 21–32. <https://doi.org/10.1002/jcaf.22579>
- Srdelić, L., & Dávila-Fernández, M. J. (2024). International trade and economic growth in Croatia. *Structural Change and Economic Dynamics*, 68, 240–258. <https://doi.org/10.1016/j.strueco.2023.10.018>
- Stewart, R., & Chowdhury, M. (2021). Banking sector distress and economic growth resilience: Asymmetric effects. *The Journal of Economic Asymmetries*, 24, e00218. <https://doi.org/10.1016/j.jeca.2021.e00218>
- Stewart, R., Chowdhury, M., & Arjoon, V. (2020). Bank stability and economic growth: Trade-offs or opportunities? *Empirical Economics*, 61(2), 827–853. <https://doi.org/10.1007/s00181-020-01886-4>
- Sun, L., Wang, K., Xu, L., Zhang, C., & Balezentis, T. (2022). A time-varying distance-based interval-valued functional principal component analysis method—A case study of consumer price index. *Information Sciences*, 589, 94–116. <https://doi.org/10.1016/j.ins.2021.12.113>
- Tarek, B. A., & Ahmed, Z. (2017). Governance and public debt accumulation: Quantitative analysis in MENA countries. *Economic Analysis and Policy*, 56, 1–13. <https://doi.org/10.1016/j.eap.2017.06.004>
- Thach, N. N., Ha, D. T., Trung, N. D., & Kreinovich, V. (2021). eds., *Prediction and causality in econometrics and related topics*. (Vol. 983). Springer Nature.
- Thach, N. N., Kreinovich, V., Ha, D. T., & Trung, N. D. (2022). eds. *Financial econometrics: Bayesian analysis, quantum uncertainty, and related topics*. (Vol. 427). Springer Nature.
- Thakor, A. V. (2014). Bank capital and financial stability: An economic trade-off or a Faustian bargain? *Annual Review of Financial Economics*, 6(1), 185–223. <https://doi.org/10.1146/annurev-financial-110613-034531>
- Tran, H. S., Nguyen, T. D., & Nguyen, T. L. (2023). Market structure, institutional quality and bank stability: Evidence from emerging and developing countries. *Competitiveness Review: An International Business Journal*, 33(6), 1046–1068. <https://doi.org/10.1108/CR-02-2022-0016>
- Tran, S., Nguyen, D., & Nguyen, L. (2022). Concentration, capital, and bank stability in emerging and developing countries. *Borsa Istanbul Review*, 22(6), 1251–1259. <https://doi.org/10.1016/j.bir.2022.08.012>
- Wang, Q., Hu, S., & Li, R. (2024). Could information and communication technology (ICT) reduce carbon emissions? The role of trade openness and financial development. *Telecommunications Policy*, 48(3), 102699. <https://doi.org/10.1016/j.telpol.2023.102699>
- Wang, Y., Li, X., Abdou, H., & Ntim, C. G. (2015). Financial development and economic growth in China. *Investment Management and Financial Innovations*, 13(3), 8–18.

- Wang, Q., Wang, L., & Li, R. (2024). Trade openness helps move towards carbon neutrality—Insight from 114 countries. *Sustainable Development*, 32(1), 1081–1095. <https://doi.org/10.1002/sd.2720>
- Wooldridge, J. M. (2001). Applications of generalized method of moments estimation. *Journal of Economic Perspectives*, 15(4), 87–100. <https://doi.org/10.1257/jep.15.4.87>
- Wooldridge, J. M. (2015). Control function methods in applied econometrics. *Journal of Human Resources*, 50(2), 420–445. <https://doi.org/10.3368/jhr.50.2.420>
- World Bank. (2018). *Global Economic Prospects, January 2018: Broad-Based Upturn, but for How Long?*. The World Bank.
- Yakubu, IN., & Bunyaminu, A. (2023). Regulatory capital requirement and bank stability in Sub-Saharan Africa. *Journal of Sustainable Finance & Investment*, 13(1), 450–462. <https://doi.org/10.1080/20430795.2021.1961558>
- Zhu, X., Asimakopoulou, S., & Kim, J. (2020). Financial development and innovation-led growth: Is too much finance better? *Journal of International Money and Finance*, 100, 102083. <https://doi.org/10.1016/j.jimonfin.2019.102083>

## Appendix A

**Table A1.** Sampled Banks used in the study and countries.

No. of banks in a country	No. of banks for the whole sample	Country	Bank
1	1	NIGERIA	FIRST BANK OF NIGERIA LTD
2	2		CITIBANK NIGERIA LIMITED
3	3		GUARANTEE TRUST BANK PLC
4	4		UNITED BANK FOR AFRICA PLC
5	5		ACCESS BANK PLC
6	6		UNION BANK
7	7		ZENITH BANK
8	8		ECO BANK
9	9		HERITAGE BANK
10	10		UNITY BANK
11	11		STANBIC BANK
1	12	GHANA	FIDELITY BANK GHANA
2	13		AGRICULTURAL DEVELOPMENT BANK
3	14		ZENITH BANK LIMITED
4	15		ACCESS BANK GHANA LIMITED
5	16		GHANA COMMERCIAL BANK LIMITED
6	17		ECOBANK GHANA
7	18		STANDARD CHARTERED BANK
8	19		CONSOLIDATED BANK OF GHANA
9	20		ZENITH BANK
10	21		SOCIETE GENERAL BANK GHANA
1	22	KENYA	CONSOLIDATED BANK OF KENYA
2	23		TRANS NATIONAL BANK LIMITED
3	24		PARAMOUNT BANK.
4	25		BANK OF BARODA LTD
5	26		ABC BANK
6	27		BANK OF AFRICA
7	28		CITI BANK
8	29		ECOBANK
9	30		GUARANTEE TRUST BANK
10	31		GUARDIAN BANK
11	32		GUARANTY TRUST BANK KENYA
1	33	ETHIOPIA	LION INTERNATIONAL BANK S.C
2	34		DASHEN BANK
3	35		COOPERATIVE BANK OF OROMIA
4	36		ZEMEN BANK
5	37		NIB BANK
6	38		ADDIS INTERNATIONAL BANK
7	39		BUNNA INTERNATIONAL BANK
1	40	SOUTH AFRICA	FIRSTRAND BANK LIMITED
2	41		BIDVEST BANK
3	42		ABSA BANK LIMITED
4	43		STANDARD BANK
5	44		NEDBANK LIMITED
6	45		AL BARKA BANKING GROUP
7	46		HABIB OVERSEAS BANK
8	47		ACCESS BANK SOUTH AFRICA
9	48		BARCLAYS BANK

(continued)

**Table A1.** Continued.

No. of banks in a country	No. of banks for the whole sample	Country	Bank
10	49		SOCIETE GENERAL
11	50		DEUTSCHE BANK
12	51		CHINA CONSTRUCTION BANK
13	52		BANK F CHINA JOHANNESBURG
14	53		CITI BANK
1	54	ZAMBIA	ZAMBIA NATIONAL COMMERCIAL BANK
2	55		STANDARD CHARTERED BANK ZAMBIA PLC
3	56		ABSA BANK ZAMBIA PLC
4	57		AB BANK ZAMBIA
5	58		STANBIC BANK
6	59		UNITED BANK OF AFRICA
7	60		ACCESS BANK
1	61	ZIMBABWE	ZB FINANCIAL HOLDINGS LIMITED
2	62		CBZ HOLDINGS
3	63		FBC HOLDINGS LIMITED
1	64	MAURITIUS	AFRICAN EXPORT-IMPORT BANK
2	65		AFRASIA BANK
3	66		SBM HOLDINGS LIMITED
1	67	BOTSWANA	FIRST NATIONAL BANK OF BOTSWANA
2	68		ABSA BANK BOTSWANA LIMITED
3	69		STANDARD CHARTERED BANK OF BOTSWANA
4	70		ACCESS BANK
5	71		STANBIC BANK