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Effects Of Bank Activity Restriction and Stringent Capital Regulation On Bank Stability In Sub-Saharan Africa

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KEY WORDS
Banking regulation, Activity restriction, Capital regulation, Stability, SSA

ABSTRACT

This study investigates the effect of bank activity restrictions and stringent capital regulation on bank stability in commercial banks from Sub-Saharan Africa (SSA) countries. Secondary data for this study are collected from the Global Financial Development Database, Bank Regulation and Supervision Database, World Development Indicators Database, the Global Economy Database, and Worldwide Governance Indicators for the period 2003–2021. The dependent variable is bank stability, and the independent variables are stringent bank capital regulation and bank activity restrictions. The lag of the dependent variable, gross domestic product, inflation, bank concentration, and corruption are added as control variables. The purposive sampling method is employed to select the sample from the SSA population and the data analyzed using the dynamic model two-step General Method of Moment (GMM) estimation techniques. Bank activity restrictions and capital stringency are indexed based on the bank regulation and supervision survey of 2003- 2021. The empirical findings suggest strict capital regulation has negative effect and activity restriction has positive effect on bank stability. It was recommended that central banks and commercial bank management in the Sub-Sahara Africa economies work on enhancing the degree of strictness on capital regulations to attain a more stable banking sector so as to build shock resistant financial industry.

Introduction

A high degree of financial development through a stable financial system is the aim of every nation for economic stability. Bank stability refers to a strong and resilient banking system that can endure global financial stresses, regulatory constraints, and economic challenges while sustaining healthy competition in the allocation of financial and capital resources (Financial Stability Report, 2020). A sound banking system is all about building resilience and confidence in the banking sector so that it can resist external pressures caused by financial crises and bad economic activity. A stable banking sector is capable of allocating resources effectively, managing risk, and dispelling financial imbalances that occur as a result of unexpected actions (Lakner & Milanovic, 2013). It addresses systemic financial risk, preventing economic loss or trust loss, affecting individual investors, savers, and the overall economy (Pacces & Heremans, 2011). As a result, banking stability is thought to be a key factor driving growth.

Financial regulations imposed by central banks to improve bank stability have a significant

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influence on bank operations as a whole. This, in turn, contributes to a greater overall financial stability of the system. Thus, building a healthy banking sector through efficient inspection and regulation is critical for macroeconomic growth. A more rule-based legal regulatory system increases transparency and hence makes bank activities easier to monitor. The primary purpose of regulation in economic activity in general has always been to safeguard (uninformed) customers from a range of market flaws (Pacces & Heremans, 2011)

Every country in the world has banking regulation and monitoring, although these policies vary from extremely lax to very stringent, from heavily invasive to entirely governmental, and from partial government control to times of "free" banking. But the underlying question is whether these financial laws and regulations truly boost bank growth, or if they make things worse (J. Barth et al., 2006). It is critical to remember that stringent regulation does not necessarily correlate to excellent control (Neyapti & Dincer, 2005). Lee & Chih, (2013), argue that more regulation benefit bank stability. Naceur & Omran, (2008) concludes that regulatory considerations have a substantial and favorable impact on bank performance.

To the best of my knowledge, no prior research has looked at the effect of capital regulation and banking activity constraints on the stability of SSA banks. This paper expands and improves the previous cross-country research. First, this paper uses cross country over time data for substantially (54%) sub-Sahara Africa countries. Second, the model used is different from the previous studies on this area. The empirical finding is useful to regulators, policymakers, and bank management. In particular, the findings help regulators and policymakers understand the effects and implications of present constraints on bank stability, as well as the consequences of severe regulation. As a result, legislators should enact laws that assist banks in becoming more stable while lowering the excessive risks they face.

Review of literature

Theoretical framework

There is no established theoretical framework for anticipating the effects of regulation on banks. R.Barth et al., (2006) presented two wide views that resulted in contradictory predictions; the 'public interest view' and 'private interest view'. The first view holds that by regulating banks, the government promotes efficient banking and mitigates market failures for the benefit of civil society as a whole. In banking, if the banking system handled resources in a socially efficient manner while doing well in all other elements of finance, the public interest approach may be beneficial. In contrast, the second approach (Stigler, 1971) claims that regulation is frequently used to promote the particular interests of a small number of individuals rather than the wider public. This approach acknowledges the reality of market failures and views regulation as a product, with many demanders and producers interacting to determine the precise shape and function it serves. The private interest school thinks that banking regulation should strengthen the position of bankers and politically linked groups. Banks' role in providing resources draws interest groups, increasing rivalry to manipulate policy. The view promotes market discipline, regulatory scrutiny, information transparency, and limited regulatory authority (Shleifer, 2005).

Given these two opposing views, and with similar conflicting predictions based on various theoretical models about the effects of specific regulations like bank activity restriction and capital regulation on bank performance, empirical studies are important in helping inform policy decisions.

Bank activity restriction

Bank activity restriction is among the way of regulating the banking system (Nyantaky & Sy, 2015). Albeit banks are not the same across countries, their activities are usually shared between deposit and lending, securities investment, insurance, real estate activities and non-financial businesses.

There are five primary theoretical reasons why nations throughout the world restrict bank operations and banking commerce linkages (J. R. Barth et al., 2004). The first reason is that conflict of interest might occur when banks participate in a variety of operations such as securities underwriting, insurance underwriting, real estate investing, and non-finance company activity. Such banks may seek to "dump" stocks on uninformed investors in order to aid corporations with outstanding debts. Second, wide financial activity may exacerbate moral hazard issues, encouraging riskier conduct and causing institutions to take on more risk (Boyd & Smith, 1998). Third, complicated banks are difficult to

regulate. Fourth, wide actions might result in the establishment of exceedingly huge and complex organizations that are difficult to oversee and "too big to discipline" (Laeven & Levine, 2005). Finally, huge financial conglomerates can reduce competition and efficiency. These arguments support the notion that governments may enhance banking by limiting its operations.

The other potential theoretical justifications for permitting banks to engage in a wide variety of activities are discussed in (J. Barth et al., 2006; Claessens et al., 2001).The consequences of activity limits and reduced regulatory restrictions allow for the use of economies of scale and breadth in acquiring and processing information about enterprises, creating reputational capital, and delivering a variety of services to clients. Second, fewer regulatory restrictions may boost a bank's capacity to diversify income sources and brand value, perhaps incentivizing more conservative behavior (Hellmann et al., 2000). Finally, broader activity may allow banks to diversify their income. Therefore, the effect of bank activity restrictions on bank stability is an empirical question that the researcher wants to explore.

Bank capital stringent

Capital adequacy is the minimum required by regulatory bodies for banks to manage operations, capture profitable expansion opportunities, absorb losses, and maintain client trust (Siddika & Haron, 2016). This regulation aims to reduce risk and bank failure by limiting the amount of capital required to compensate for losses (Asfaw & Kassahun, 2014). The Capital Adequacy Ratio (CAR) is a ratio that shows how capable a bank is of providing reserves to cover risks like credit risk, operational risk, and market risk. To put it simply, a bank's capital serves as a safety net against any losses, safeguarding both depositors and other lenders. It is stated as a proportion of a bank's risk-weighted credit exposures (Pradhan & Shrestha, 2017). The capital adequacy ratio, or the percentage of risk-weighted assets required to be kept in equity, is used to limit banks' risk, enhance their capacity to absorb losses, and avoid moral hazard (Miele & Sales, 2011). Properly implemented capital regulation incentivizes banks to improve risk management.

Toward the standardization in banking operation and supervision, the Basel Committee on Banking Supervision (BCBS), which provides comprehensive guidelines for managing bank capital to safeguard against operational and financial risk; the committee published Basel I, Basel II, and Basel III guidelines on capital adequacy.

The Basel Capital Accord requires at least 8% of risk-weighted assets (RWA) that a bank to have as "regulatory capital" (through combinations of equity, loan-loss reserves, subordinated debt, and other accepted instruments). (Loans and securities, for example) and asset equivalent off-balance sheet exposures (such as loan commitments, standby letters of credit, and obligations on derivatives contracts) as capital; of which 50% must be Tier 1 or core capital. Total risk-weighted assets are multiplied by 8 % to determine the bank's minimum capital requirement (Federal reserve bank, 2003). Goodwill (deduction from Tier 1 capital), increases equity due to securitization exposure, and investment in subsidiaries performing in the banking and financial sector that is not included in the national system, are all to be deducted from the capital base

Basel I encouraged banks to have higher capital ratios, but its simplicity in measuring risks led to regulatory arbitrage. Then in 1996 the initially developed Basel Accord being criticized for using book value accounting measures of capital rather than market values and its focus on credit risk left key exposures related to liquidity and operational risks makes Basel I not to be fully effective in standardizing practices (World Bank., 2019). Its lead to an amendment to incorporate the market risk to address banks' exposure in foreign exchange risk, securities trade, equities, commodities, and options (Siddika & Haron, 2016). This amendment allowed the bank to use internal model to measure the market risk and associated capital against this risk.

In 2004 the initially developed Basel-I substantially amended to a more sensitive new capital requirement known as Basel-II to accommodate the highly complex on- and off-balance sheet items, encourage more risk sensitive capital requirement over banks own assessment, and provide greater transparency (Siddika & Haron, 2016). BCBS recommends 8% minimum capital requirement under Basel II also. The Basel II Accord was built around three mutually reinforcing pillars: Minimum criteria for own funds - the capital adequacy ratio must be at least 8%, computed as the ratio between the bank's equity and assets, but this time the assets

are weighted based on three risks: credit, market, and operational risk. The supervisory process for bank activity- includes internal performance assessment procedures of its own equity. The supervisory authority is responsible for the assessment mode used by banks, improving the bank-supervisor dialogue, and responding quickly to prevent capital decline. Market discipline is necessitates more precise reporting requirements from the Central Bank and the public on ownership structure, risk exposures, and capital sufficiency to the risk profile. These criteria include the regular release of information (every six months for national banks and quarterly for foreign institutions). Then, in response to the 2007-2009 global financial crises, Basel-III was introduced as a more resilient regulatory framework that addresses pre-crisis failings and serves as the foundation for a resilient banking system by improving regulatory capital quality, risk capture, and macro prudential elements (BIS, 2017). Barth et al., (2004) wrote the banking shock during that period shows the beneficial effects of well-functioning banking systems for economic growth and underline current efforts to reform bank regulation and supervision.

Basel III is the third and most recent advancement of the Basel Accords, and it is a global regulatory standard established by the BCBS on capital adequacy (including a new leverage ratio and capital buffers), market liquidity risk (with new short-term and long-term liquidity ratios), and stability-focused stress testing. The G-20 agreed on Basel III improvements to global regulatory standards in November 2010, which were subsequently announced by the Basel Committee on Banking Supervision in December 2010 (BCBS).

The primary goal of these changes is to tighten the capital adequacy criteria on the quality and quantity of capital that banks must keep in order to absorb losses. The Basel III framework, which focuses on improving the safety and stability of the banking industry, emphasizes the need of improving the quality and quantity of capital components, leverage ratios, liquidity norms, and increased disclosures. Basel III is thus an attempt to address the root causes of the most recent crisis (BCBS, 2010).

Empirical framework

There are two opposing conclusions on financial stability in Sub-Saharan Africa (SSA). The first group states African financial systems are quite stable, owing to regulatory improvements in most African nations during the last two decades, as well as banks' strong capitalization and liquidity levels. Aside from a few minor hidden pockets of fragility, the continent has only suffered one major banking crisis during the previous 15 years, in Nigeria (Beck et al., 2014).

In contrast, the second group articulates SSA's banking and financial systems remain inadequate, and the problem of financial instability stems from the weak implementation of financial liberalization policies leads to financial monopoly (Fowowe, 2011). Banking instability is driven by a poor regulatory system of central banks in SSA economies, as opposed to other sub-regions such as Asian and Western nations (World Bank., 2019). The majority of SSA nations' financial systems were undeveloped throughout the colonial period, and the post-independence SSA financial sector remained shallow, with commercial banks dominating (Gakunu, 2007).

In both case it emphasize the importance of regulatory frameworks in banks. (McKinsey, 2016) and (Anginer et al., 2019) highlight the need for prudential regulation during financial crises, despite government support and capital injections.

Bank stability and bank activity restriction

The empirical findings on relationship between bank regulation and stability are mixed. (J. R. Barth et al., 2001, 2004, 2013; Beck et al., 2006; Fell & Schinasi, 2005; Fernández & González, 2005; Gondwe et al., 2023) examined the relationship between bank activity restriction and bank financial stabilities. (J. R. Barth et al., 2001; Fell & Schinasi, 2005; Fernández & González, 2005; Gondwe et al., 2023) find that activity restrictions reduce risk- taking; greater regulatory restrictions on bank activities are associated with a lower probability of suffering a major banking crisis and it is effective at reducing banking risk and help banks in attaining financial stability. Stricter regulations benefited bank stability (Lee & Chih, 2013). The implementation of strict regulatory standards will make the banking industry more robust and safeguard its long-term stability and sustained economic growth.

Contrary (J. R. Barth et al., 2004, 2013; Beck et al., 2006) find that restricting bank activities do not necessarily reduce financial fragility; and has negative relationship between bank activity restriction and banking sector development &

stability. Private interest views argue that restrictions can give regulators pleasure for rent seeking (Djankov et al., 2002). Therefore activity restrictions can affect bank risk taking behavior in either direction. This study estimates the following hypothesis.

H_1: Bank activity restrictions have positive effect on bank stability.

Bank stability and strict capital regulation

Banking crises are important not just because of the devastation that they bring to one particular sector of the economy, but because typically the shock waves affect the entire economy (Hellmann et al., 2000). It is broadly agreed that regulatory requirements on the amount of capital, relative to its total assets, that a bank should hold is important in understanding bank performance and bank fragility as well as the overall development of the banking industry (R.Barth et al., 2006). (Hellmann et al., 2000) describe two competing effects of capital on bank stability. They claim that when banks use their own capital, they bear a portion of the risk for their actions and hence are more disciplined and cautious about engaging in excessive risk taking, known as the capital-at-risk effect. Higher capital requirements, on the other hand, may reduce financial stability by encouraging banks to take greater risks in order to restore their profits and franchise, a phenomenon known as the franchise-value effect (Gondwe et al., 2023).

The majority of researches provide empirical support for capital regulations. Several other research, however, provide conflicting conclusions. Kosmidou et al., (2005) find negative relationship between capital requirement and bank financial soundness. Increasing capital requirements considerably enhance financial instability in Africa, with the exception of large banks. Beck et al., (2006) find little indication that capital regulations reduce the fragility of the banking sector. Barth et al., (2004) shows that capital stringency is not robustly linked with banking sector stability, development, or bank performance after controlling for other supervisory-regulatory policies.

The influence of capital on bank risk can thus take either direction. Therefore, the effect of capital regulation on SSA banks is also examined in this study.

H_2: Stringent bank capital regulations have positive effect on bank stability.

The relationship between bank stability and bank regulation has become a popular study topic in banking. However, research that specifically investigates the effect of regulations on bank stability in the banking sectors of SSA countries has gotten very little attention. The goal of this research is to address a gap in the current knowledge on the effects of capital and activity constraints on banking stability in SSA.

Many SSA countries' financial markets are now undergoing regulatory changes. With the onset of globalization and a rising demand for modernization, several countries are opening their markets to foreign entities. This research is timely and informs current regulatory changes. This study focuses on evaluating two main hypotheses.

H_1: Bank activity restrictions have positive effect on bank stability

H_2: Stringent bank capital requirements have positive effect on bank stability.

Research Methods and Materials

Research philosophy

Pragmatism is the research philosophy that underpins this work. Pragmatism emphasizes the practical application of research results and the use of many methodologies to study research problems (Kothari, 2004). This philosophy is particularly well-suited to the study since it allows for the use of both quantitative and qualitative methodologies to gain a full understanding of the research topic.

Research approach

The research used a qualitative and quantitative approach to measure the effects of bank capital stringency and bank activity restriction on bank stability, The aim of using a qualitative research approach is to study/generate complete and in-depth information for the researcher whereas a quantitative research approach supports the researcher to generate statistics or figures that focus on the extensive information in a detailed manner, the research aims to gain a qualitative understanding of the processes and perceptions associated with financial regulation. This study employed a mixed-methods approach, integrating both qualitative and quantitative research methodologies. This method allowed for a comprehensive understanding of the factors influencing performance by gathering both

quantitative and qualitative data. A mixed-methods strategy was utilized, combining quantitative and qualitative research techniques.

Research design

A research design is the overall strategy or framework for a study. Of course, there are obviously many sorts of research designs, but the most appropriate one for the study is determined depending on the type of the study and the nature of the problem; hence, an explanatory research design are used. According to Kothari (2004), research design is the best way for describing the current state of the topic at hand.

Population and sample size

Target Population: The study's population comes from countries in Sub-Saharan Africa. Based on data accessibility on BRSS 2003, 2007, 2011, and 2019; and global financial development dataset, 26 (12 lower income, 9 lower middle income, 4 upper middle, and 1 higher income) countries have been used as a research sample among the 48 countries in the sub-Saharan Africa region. This made up 54% of all the countries in sub-Saharan Africa.

Angola, Burundi, Benin, Burkina Faso, Botswana, Cote d'Ivoire, Ethiopia, Ghana, Gambia, Kenya, Madagascar, Mali, Mozambique, Mauritius, Malawi, Namibia, Niger, Nigeria, Senegal, Sierra Leone, Seychelles, Togo, Tanzania, Uganda, South Africa, and Zimbabwe are the SSA countries chosen for the study.

Sampling techniques

Purposive sampling, which was chosen, based data accessibility on the global financial development database and the BRSS for the study period (2003–2021), is used for sampling.

Type and source of data

Secondary data gathered from all relevant materials such as books, journal articles, periodicals, and both published and unpublished research are used for better theoretical analysis. Secondary data is gathered from many surveys, research articles, and books in order to acquire enough data on this work.

Methods of data collection

The data on bank-regulation, stability, macroeconomics-specific variables and governance indictors come from different sources. The data on bank-regulation variables such as: bank activity restriction, bank capital regulation have been collected from World Bank (bank regulation and supervision survey). Bank stability (measured by Z-score) has been collected from the global financial development dataset and all the bank data here are consolidated and put at the country level. Similarly, the data on macroeconomics variables, namely GDP per capital and inflation has been taken from the World Development Indicators (WDI) database maintained by the World Bank. Governance indictor has been taken from worldwide governance indicators. Lastly, the outliers from the data set are removed in order to reduce their potential biased effect on estimated coefficients.

Model specification and measurement of research variables

Z-score popularity stems from the fact that it is inversely related to the probability of a financial institution‘s insolvency, i.e. the probability of assets value becoming lower than the debt value. The z-score has gained traction as a measure of an individual financial institution's soundness (Boyd & Runkle, 1993; Čihák & Hesse, 2010; Demirguc-Kunt & Honohan, 2008; Detragiache et al., 2008; Fu et al., 2014; Rashid et al., 2017)

In other words, if returns are normally distributed, the z-score measures the number of standard deviations a return realization has to fall to deplete equity. Even if μ is not normally distributed, z is the lower bound on the probability of default. A higher z-score, therefore, implies a lower probability of insolvency. Thus the study used country-based banking aggregate Z–score to measure banking sector financial stability.

The central bank’s financial regulation in terms of bank capital stringency was measured by the index which is a compound measure that aggregates multiple indicators; the higher the index, the higher the stringency of capital regulation. The first index which has 11questions evaluates the overall capital stringency by considering risk elements and deducting market value losses from capital before the minimum capital adequacy is determined. The second index which has 3 questions measures initial capital stringency by verifying the funds used for initial capitalization. The third index is an aggregation of the previous two indices and provides an overall picture of capital regulation in banks (all these questions are discussed in the result and discussion section).

Bank activity restriction is measured by an index of four components that gauge the restrictiveness of bank activities which is the national regulatory bodies allow banks to participate in fee-based activities instead of traditional interest-spread-based ones: (1) security underwriting, (2) insurance underwriting and selling, (3) real estate investment, and (4) non-financial activities. Each component is scored from 1 to 4, with higher values indicating greater restrictions on specific banking activities. Individual activity are combined and given to a single observation in this study. It goes from 4 to 16

Gross domestic product per capital or GDP per capital, is a measure of a country's economic production per person that is determined by dividing the total GDP by the total population. It allows comparing the average economic prosperity of various nations or areas.

Inflation refers to a general increase in the prices of goods and services in an economy over a period of time. It is measured by Percentage change in consumer price index.

Bank concentration is the amount to which a few major banks control a country's banking system, as measured by the proportion of total assets owned by the largest banks. It simply measures the extent of competition in the banking sector. Bank concentration is measured by the Assets of three largest commercial banks as a share of total commercial banking assets on this study. Boyd & De Nicoló, (2005) find a positive relationship between concentration and bank fragility.

The governance indicator corruption is defined as the abuse of entrusted power for personal benefit. It comprises a wide variety of dishonest and fraudulent behaviors. Essentially, it undermines the integrity of systems and organizations by valuing personal gain over public good. It is measured by worldwide governance indexes.

Method of Data Analysis

To measure the effect of bank activity restriction and capital regulation on bank stability while controlling for the macroeconomic, governance, and financial environment in the sub-Saharan region, the following multiple regression analysis equation is estimated

$$IBS_{i,t} = \beta_o + \beta_1 BS_{i,t-1} + \beta_2 BCS_{i,t} + \beta_3 BAR_{i,t} + \beta_4 GDPpc_{it} + \beta_5 INF_{it}\ \beta_6 BC_{it}\ \beta_7 CC_{it}\ \eta i + e_{it} \quad \dots (\text{eq-1})$$

Where, $\beta_o - \beta_7$ indicates the coefficient of variables, the indices 'i' and 't' refer to country and time respectively. $IBS_{i,t}$ is the bank financial stability indicator of bank in country i at time t. $BS_{i,t-1}$ is its lagged value of bank stability. BCS Denotes bank capital stringency, BAR denotes bank activity restriction, GDP pc denotes GDP per capital income, INF_{it} denotes inflation, BC bank concentration, CC_{it} specific governance indicator corruption; ηi controls the variant behavior of fixed characteristics of countries (or country heterogeneity) and e_{it} is the independently and identically distributed (iid) disturbance term, which contains all factors that cannot be observed by the researcher.

Validity and reliability

In this paper panel data of 26 Sub-Saharan African countries have been used over the period 2003-2021. The total raw data from these countries during the sample period contain 494 observations. Data are checked for outliers, missing observation, inconsistencies and reporting errors and finally 459 observations used in this study.

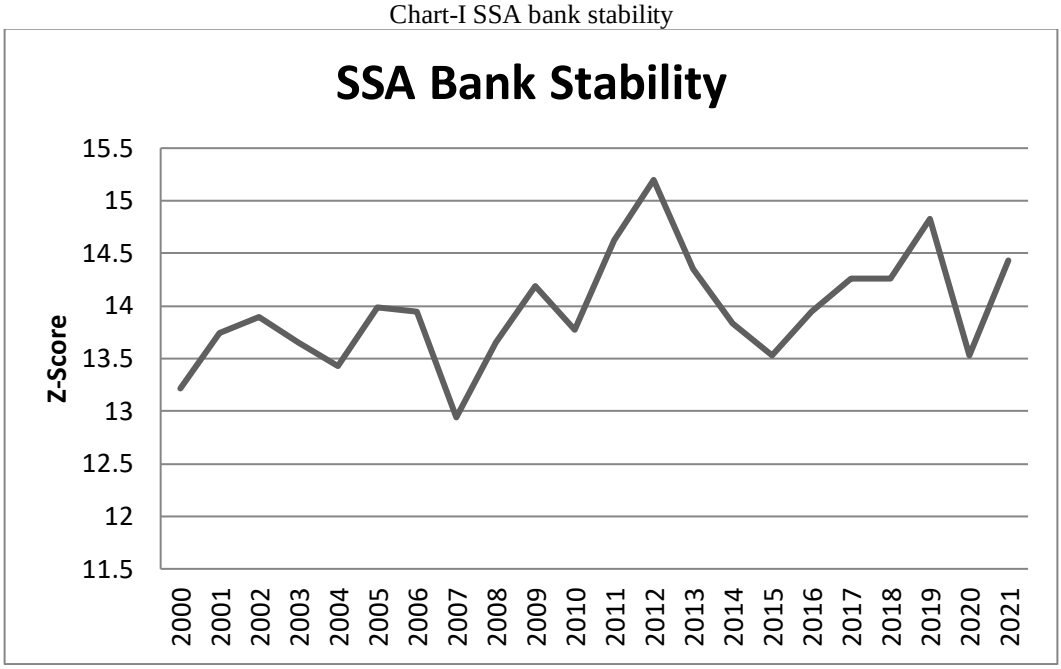
Results/ Findings

Descriptive Analysis

Bank stability in SSA

The ongoing debate surrounding the financial stability in SSA has been highly contentious, yet no definitive conclusion has been reached. One perspective argues that African financial systems are quite stable specifically regulations are improved over the last two decades. Contrary, the second group says SSA's banking and financial systems are instable emanates from weak implementation of financial liberalization policies. The line chart below depicts the trend of SSA financial stability over the preceding 22 years. There are ups and downs during the study periods. For example, the median lower point was registered in 2007 at 12.9, while the highest stability point was 15.2 in 2012.

Chart-I SSA bank stability



Source: Authors computation

Bank capital regulation in SSA

Bank regulation control bank activity and their practices are undoubtedly critical components of the financial system. The SSA banking capital stringent is one of the bank regulations that are detailed here (all data here are from 2019 BRSS)

In 2016, 85% of high-income countries implemented Basel III, while almost half of upper-middle-income countries and a third of lower-middle-income countries did the same. Nepal is the only low-income country that acknowledges the use of Basel III (World Bank., 2019). High-income countries accepted Basel III more quickly than middle- or low-income ones.

In SSA countries, Basel-I is implemented in 71% of the nation, Basel II in 33%, and Basel III in 17% (see *Table I*).

Table I. Basel-I, II, and III in SSA

	Mean
Basel-I	.7083333
Basel-II	.3333333
Basel-III	.1666667

Source: Authors computation

According to the findings, the majority of SSA countries were in the early stages of Basel Accord implementation, while the rest of the world was moving forward with the Basel Accord. Commercial banks in Angola, Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Madagascar, Mali, Niger, Senegal, Tanzania, and Togo are subject to Basel-I regulations.

Burundi, Malawi, Mozambique, Namibia, the Seychelles, and Zimbabwe all follow the Basel II guidelines. Basel III is only in force for all banks in Mauritius. However, certain nations, such as Kenya and Nigeria, apply Basel I, II, and III to their banks in varied degrees. Kenya applies Basel I and II to commercial banks, including state-owned and private. Several Basel III components are also firmly embedded in Kenya's central bank's rules and regulatory frameworks, which apply to all mortgage financing companies and commercial banks. Nigeria applies Basel II and III to commercial and

merchant banks, and Basel I to non-interest banks. Basel-III set the regulatory capital requirements for South African commercial banks, foreign banks, and bank-holding organizations, whereas Basel-I also applies to mutual banks. Nyantaky & Sy (2015) found that emerging countries apply more capital rules than wealthy countries. Furthermore, North Africa is identified as the region with the greatest amount of capital control internationally.

The Capital Adequacy Ratio (CAR) measures a bank's ability to provide reserves to cover risks such as credit risk, operational risk, and loss potential. Most SSA nations used market, operational, and other risks to calculate risk-weighted assets. 96% of SSA countries have regulatory minimum capital to handle credit risk (see Table II). However, 21% include in additional risks when determining the minimum regulatory capital required, while 54% deduct operational and market risks.

Table II. Proportion of credit, market, operational, and other risks deducted from minimum capital requirements in SSA (2019 BRSS)

	Mean
Credit risk	.9583333
Market risk	.5416667
Operational risk	.5416667
Other risks	.2083333

Source: Authors' computation

The Basel Capital Accord mandates a bank to have at least 8% of its risk-weighted assets (RWA) as "regulatory capital." In SSA, 40% are at the minimum capital required level of 8%, while the remaining 60% are implementing 9.75%-15% CAR (Capital Adequacy Ratio) (see Table III).

Table III. SSA with their respective CARs(Capital Adequacy Ratio)

CAR(in percent)	Countries (SSA)
8	10
9.75	1
10	6
12	3
14.5	3
15	2
Total	25

Source: Authors' computation

All of the sampled SSA nations subtract goodwill from Tier 1 regulatory capital. Deductions from Tier 1 regulatory capital include most SSA countries are deduct intangibles and capital investments in some banking, financial, and insurance businesses that are not subject to consolidation *(see Table IV below).*

Table IV. Deduction from Tier 1 regulatory capital
Mean estimation *Number of SSA countries = 20*

	Mean (%)
Goodwill	1
Intangibles	.95
Investment in the capital of certain banking, financial and insurance entities which are outside the scope of consolidation	.85
Deferred tax assets	.35
Shortfall of the stock of provisions to expected losses	.35
Unrealized losses in fair valued exposures	.3
Cash flow hedge reserve	.25
Investments in own shares (treasury stock)	.25
Gain on sale related to securitization transactions	.2

Source: Authors' computation

In all studied SSA countries, regulators or supervisory bodies decide the sources of money used to assess capital adequacy (see Table V below). Of the 26 SSA nations, 73% prohibit initial disbursements or future injections of capital with assets other than

cash or government securities, and 80% prohibit the use of borrowed funds as a source of capital.

Table V. SSA sources of funds verification (yes=1 and No=0)

	Proportion
Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities?	
0	
1	1
Can the initial disbursement or subsequent injections of capital be done with assets besides cash or government securities?	
0	0.731
1	0.269
Can initial disbursement of capital be done with borrowed funds?	
0	0.808
1	0.192

Source: Authors' computation

In general, SSA's capital regulations are moderately stringent; Basel-I implementations do not progress quickly, nor do they accept Basel-II and Basel-III. Basel II and III's dependence on strong supervisory capacities and market discipline may harm the banking sectors in countries with weaker institutional structures (J. R. Barth et al., 2008).

Banking Activity restriction in SSA

The regulations governing securities operations, as shown in Table VI, specify the extent to which banks may participate in underwriting, brokering, dealing in securities, and other aspects of the mutual fund industry. The SSA's score of 2.03 (62% of the sampled SSA) is substantially equal to the score of 2.29 in Nyantaky and Sy (2015), showing that securities transactions are authorized but subject to some limitations. African countries have no more restrictions on securities activity than other rising economies. However, securities operations in developed countries are not heavily regulated (Nyantaky & Sy, 2015).

Table VI. Proportion of bank activities in SSA countries

Number of obs.=26	Mean
Security activity	2.038462
Insurance activity	2.846154
Real estate activity	2.807692
Nonfinancial activity	3.346154

Source: Authors' computation

SSA insurance operations have a greater limited score (2.85), and 42% of the sampled SSA permitted insurance activities with some limitations. Insurance operations in Africa are more restricted than securities activities (Nyantaky & Sy, 2015). Other banking activities, like real estate operations and nonfinancial activities, are subject to additional restrictions than security and insurance-related activities in SSA (Nyantaky & Sy, 2015). In SSA, 58% of nations bank real estate operations, and 3.34 (65%) of SSA are prohibited from operating in nonfinancial businesses such as debt collection, information technology, and so on. Sub-Saharan Africa's score of 2.03 (62% of the sampled SSA) is substantially equal to Nyantaky & Sy, (2015)score of 2.29, showing that securities operations are legal but subject to various limitations. According to Nyantaky & Sy, (2015), West African authorities impose the

fewest limitations on securities activities in Sub-Saharan Africa. However, Africa as a whole does not face greater restrictions on securities activity than other developing markets. However, in developed countries, securities operations are not subject to numerous limitations.

SSA insurance operations have a highly restricted score (2.85), 42% of the sampled SSA approved insurance activities with some limitations. Insurance operations are more limited than securities activities in Africa, notably in North Africa (Nyantaky & Sy, 2015). They further state that SSA is the only place, aside from Latin America and the Caribbean, where insurance businesses are still authorized at higher latitudes.

58% of SSA has limited regulation of real estate activity. Real estate operations in SSA territories have more restrictions than security and insurance-related activities. 3.34 (65% of SSA are prohibited from operating in nonfinancial businesses other than those that serve as an auxiliary to the banking industry. It means that most nations in SSA are either authorized or subject to restricted restrictions on banking participation into activities outside than the primary purpose of the banking company.

This data suggests that most countries in SSA restrict banks entrance for activities other than the principal purpose of banking operations. If we understand the basic regulations controlling SSA financial activity, we may proceed to the inferential statistic results in the next part.

The econometric approach

The next subsection presents the econometric approach and definition of variables used in the empirical modeling and findings of the study.

To ensure accurate estimations, the researcher established basic assumptions for the panel data analysis. Notably, outliers were meticulously removed from the dataset to reduce their potential effect on estimated coefficients. To further refine the dataset, the researcher winsorized some specific variables. The top 1% of Z-Score, top 1.4% of GDP, and top 0.9% of Inflation (INF) were winsorized. As well, Bank stability and GDP per capital is presented in the log form. This approach aids in minimizing the influence of extreme values on statistical analyses and allows for a more robust examination of bank stability.

In order to ensure the validity of the findings, a battery of diagnostic tests was conducted. The normality of residuals, homoscedasticity, multicollinearity, endogeneity, serial correlation, and omitted variables were meticulously inspected. By addressing these aspects, the study aimed to enhance the credibility and reliability of the regression results.

For the purpose of running the regression analysis, StataMP 14 (64-bit) software is employed. This versatile software provided a comprehensive platform to perform the necessary computations and statistical analyses accurately.

Variable Description

In this article, we will delve into an in-depth analysis of the bank regulation and summary statistics of variables in SSA commercial banks. By examining key regulatory indicators and macroeconomic factors we aim to gain insights into the bank stability and regulatory landscape of these banks.

The variables chosen to see the effects of bank activity restriction and capital stringency are listed below.

Table VII: variables description

Variables	Category	Measurement	Data source
Log of Bank Stability (lBS_{it})	Dependent variable	log(Z-Score)	Global Financial Development
Lag of Bank Stability ($BS_{i,t-1}$)	Independent variable	BS(t-1)	Global Financial Development
Bank Activity Restriction (BAR)	Independent variable	indexed	World bank (Bank Regulation and

			Supervision Survey (BRSS))
Bank capital stringency (BCS)	Independent variable	indexed	World bank (Bank Regulation and Supervision Survey (BRSS))
lGDP per capital	Control variable	Log of GDP per capita (current US$)	World Development Indicators database
Inflation (INF)	Control variable	Percentage change in Consumer price index	World Development Indicators database
Bank Concentration (BC)	Control variable	Assets of three largest commercial banks as a share of total commercial banking assets.	Global Financial Development
Corruption (CC)	Control variable	Indexed -2.5 to +2.5	World Governance indexes

Source: authors' computation

The summary statistics of variables are provided in Table VIII below. The mean value of stability is estimated to be 13.65 and ranges from 2.73 to 25.76. Since Z-score is used as a proxy for bank stability, a higher rate implies a lower probability of insolvency. A higher rate means a lesser risk of bankruptcy.

SSA has an average bank capital stringency of 7.145 indicating intermediate capital restrictions. Furthermore, the average score of bank activity restriction is 10.624 showing that bank activities are permitted but subject to certain limitations.
An analysis of macroeconomic factors shows that lGDP per capita and INF have average values of 7.043 and 8.73% respectively. The average lGDP per capita and INF in 2021 were 7.86 and 12% respectively, which significantly deviate from the world averages of 9.42, and 3.48%. Notably, SSA exhibits a lower GDP and higher inflation than the global norm.

The bank concentration (BC) in the SSA averages 72%, with a low of 23% and a maximum of 100%. The assets of the three largest commercial banks as a percentage of total commercial banking assets in 2021 are 70%, above the global average of 67.43. This substantial concentration raises concerns about competition and market dynamics in the region's banking business.

When examining worldwide governance metrics, corruption (CC) has negative mean values -.506. The most current SSA CC index for 2021 is -0.37, whereas the world average is -0.04, indicating worse corruption control in the SSA region.

Table VIII: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
logBankStability (lBS)	494	13.65	5.02	2.73	25.76
Lag Bank Stability(BS_L1)	494	13.61	5.02	2.73	25.76
Bank Activity Restriction (BAR)	459	10.62	1.56	7	16
Bank capital stringency (BCS)	488	7.15	3.09	1	13
Log gross Domestic Product (lGDP)	494	7.04	1.1	4.74	9.46
Inflation(INF)	494	8.73	13.37	-3.23	98.55
Bank Concentration(BC)	494	71.91	18.53	23.41	100

Corruption (CC)	494	-0.506	0.593	-1.58	0.994

Source: authors' computation

Correlations Analysis: Pairwise Pearson's correlation matrix is performed to judge the potential multicollinearity concerns as follows:

Table IX: Pairwise Pearson's correlation matrix

Variables	1	2	3	4	5	6	7	8
(1) BS	1							
(2)BS_L1	0.939	1						
(3) BAR	0.031	0.026	1					
(4) BCS	0.052	0.057	0.021	1				
(5) lGDP	0.198	0.206	0.152	0.358	1			
(6) INF	-0.223	-0.244	-0.04	0.023	-0.095	1		
(7) BC	-0.108	-0.097	-0.165	-0.363	-0.144	-0.03	1	
(8) CC	0.088	0.104	0.297	0.105	0.642	-0.253	0.116	1

Source: Authors' computation

In this work, we use the generalized method of moments (GMM) as a method for dealing with endogeneity. The researchers conduct general method of moment (GMM) estimation. Panel GMM model (Arellano & Bover, 1995; Blundell & Bond, 2000) is used to address potential endogeneity, heteroskedasticity and autocorrelation problems. Through the utilization of GMM, endogeneity issues can be effectively addressed, resulting in improved research results that are more accurate, unbiased, and normally distributed (Pham et al., 2021).

Table X: Result: Dynamic model; two step system GMM; dependent var. Bank stability

VARIABLES	2stepSystem GMM
BS_L1	0.0549***(0.0126)
BAR	0.0305*(0.0161)
BCS	-0.00904*(0.00476)
lGDP	0.104**(0.0468)
INF	-0.00176(0.00122)
BC	-0.000545(0.00135)
CC	-0.191*(0.112)
Constant	0.768(0.508)
Observations	459
Number of ID	
Year Dummies	26
F-statistics	yes
Groups/Instruments	4553.90
AR(1)	26/25
AR(2)	0.05
Hansen statistics	0.275
	0.611

Standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*
*Notes***, **, * are statistically significant at 1%,5% and 10%*
Significance level respectively; P-values reported for AR(1),AR(2) and Hansen statistic
Source: Autor's computations

The Generalized Method of Moments (GMM) regression technique provides a viable solution to account for several types of endogeneity, including unobserved heterogeneity, simultaneity, and dynamic endogeneity. GMM is the preferred method for treating endogeneity. Incorporating GMM allows researchers to improve the overall performance of their models while removing intrinsic faults. For this study, a dynamic panel data model using two-step system GMM estimation technique is employed.

As suggested by Bond et al., (2001) the POLS estimate is considered an upper-bound estimate for the regression coefficient Φ1, while the corresponding fixed effects estimate serves as a lower-bound estimate. In this scenario, the upper bound estimate POLS for the regression coefficient (BS_{t-1}) is 0.75, the corresponding lower bound FEM estimate is 0.39 and the Difference GMM is 0.26. Therefore if the coefficient of regression (BS_{t-1}) from the DGMM falls below the coefficient of POLS and FEM estimates, system GMM is preferred.

To evaluate the absence of endogeneity, several tests can be employed. Based on the results of tests such as the Hansen test (Prob > chi2 = 0.611), the Sargent test (Prob > chi2 = 0.912), and the AR(2) test (Pr > z = 0.275), it can be concluded that GMM is suitable for the model and effectively resolves endogeneity concerns.

The test result shows that regression co-efficient of bank capital stringency (BCS) is (-0.009), with significance at 10%. The result found by Kosmidou et al., (2005) also revealed this. This implies that there is a significance negative effect of capital stringent on bank stability. Higher capital regulation may undermine financial stability by pushing banks to take higher risks in order to recover earnings and franchises.

The test result for bank activity restriction (BAR) shows that there is a positive and significant effect of BAR on BS with a (0.0305) significant at 10%. The result found by (J. R. Barth et al., 2001; Fell & Schinasi, 2005; Fernández & González, 2005; Gondwe et al., 2023; Lee & Chih, 2013) also revealed this. Large financial conglomerates may diminish competition and efficiency, making it difficult to monitor and regulate broad financial activities. Governments can improve banking by restricting these activities.

From theoretical points of view Countries limit bank activity to avoid conflicts of interest, exacerbate moral hazard issues, and boost banking stability. This is because managing diverse activities such as securities underwriting, insurance underwriting, real estate investment, and non-business activities can be difficult for less developed institutions, and managing these activities within a single conglomerate can be difficult to monitor (J. R. Barth et al., 2004; Boyd & Smith, 1998; Laeven & Levine, 2005)

Previous year stability also has a significant positive effect on current year stability with a coefficient of (0.0549) at 1% significance level. Macro-economic variable lGDP is significant at 5% with a coefficient of (0.104). The worldwide governance indictors' corruption is negative and significant (-0.191) at 10%.
BCS coefficient is -0.009, significant at 10% level. This is inconsistent with our hypothesis 1. The outcome demonstrates that the capital stringent coefficient is significant and negative. The finding indicates to reject the null hypothesis that bank capital stringency (BCS) significantly reduces bank stability. The result of the regression analysis shows that the capital stringency imposed by the central bank on financial institutions had a noteworthy detrimental effect on the bank stability of commercial banks in Sub-Saharan African nations.

Contrary, bank activity restrictions (BAR) has a (0.0305) significant at 10% coefficient. This is consistent with our hypothesis 2 that the BAR significantly improves BS.

The result reveals that bank activity restriction has a positive and substantial coefficient. This is also disclosed by the findings of (J. R. Barth et al., 2001; Fell & Schinasi, 2005; Fernández & González, 2005; Gondwe et al., 2023; Lee & Chih, 2013). The central bank's financial regulations have an effect on the bank stability of commercial banks in Sub-Saharan African nations. Consequently, the test outputs discussed below significantly increase the reliability of the findings, and the multiple regression equation that emerges is

$$lBS_{i,t} = 0.768 + 0.055(BS\_L_{it-1}) - 0.009(BCS_{it}) + 0.030(BAR_{it}) - 0.002(INF_{it}) - 0.104(lGDP_{it}) - -0.001(BC_{it}) + -0.191(CC_{it}) + \ldots v_{it}$$

For the past two decades, the global financial landscape witnessed a significant shift with the rise of financial deregulation and liberalization. This transformation greatly affected the operations of financial intermediaries, including banks and insurance companies. Traditionally, banks were prohibited from participating in non-banking services such as selling insurance products, real estate management, and securities underwriting. However, following deregulation, banks have substantially expanded their product offerings, competing with brokers, investment banking firms, and insurance companies. Economic theory suggests that increased competition within an industry enhances efficiency and prevents monopolistic behavior (Zhang, 2012).

Conclusion and Recommendations

The use of GMM estimating approach verifies and reinforces the underlying findings by demonstrating that bank capital stringency (BCS) has a negative and substantial influence on financial stability, but bank activity restriction (BAR) has a positive and significant effect. Given the results shown in Table X, we notice that, despite the advancement of estimate approaches; our variables of interest remain statistically significant, demonstrating that capital control and activity restriction influence bank stability. As for our control variables, GDP per capita and corruption has significant and retain the sign as expected.

It was recommended that central banks and commercial bank management in the Sub-Sahara Africa economies work on enhancing the degree of strictness on capital regulations to attain a more stable banking sector so as to build shock resistant financial industry.

While this study is intriguing, it has a few drawbacks. First, it is vital to emphasize that this study focuses primarily on Sub-Saharan Africa, ignoring other African nations that have suffered from financial instability in recent years as a result of several crises. Second, this analysis did not study at the bank-level data. Future research should investigate these relationships using bank level data and broaden the scope of the study to include all African nations.

Authors' contribution:

Kidist Jiffar: conceptualization, methodology, data collection, data curation, data curation analysis, writing first draft preparation and editing

Demissew Diro Ejara: Conceptualization, methodology, visualization, supervision and eviewing.

Habtamu Berhanu: Conceptualization, visualization, Supervision, reviewing.

Declaration of competing interest

I (the corresponding author) verify that this paper is original and is not currently under publication in another journal and all authors agree to publish in JBAS in Open Access Format. The author declares that there are no competing financial interests or personal relationships that may have influenced the work reported in this study.

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Appendix

1. Bank activity regulatory variable			
(a) Securities activities	The extent to which banks may engage in underwriting, brokering and dealing in securities, and all aspects of the mutual fund industry.	WBG(world Bank Guide 4.1 (higher values, more restrictive) Unrestricted = 1: full range of activities can be conducted directly in the bank; Permitted = 2: A full range of activities are offered but all or some of these activities must be conducted in subsidiaries, or in another part of a common holding company or parent,; Restricted = 3: Less than the full range of activities can be conducted in banks, or subsidiaries, or in another part of a common holding company or parent, and Prohibited = 4: None of these activities can be done in either banks or subsidiaries, or in another part of a common holding company or parent.	4. 1 What are the conditions under which banks can engage in securities activities? (the ability of banks to engage in the business of securities underwriting, brokering, dealing, and all aspects of the mutual fund industry?
(b) Insurance activities	The extent to which banks may engage in insurance underwriting and selling.	WBG 4.2 (higher values, more restrictive) Unrestricted = 1: full range of activities can be conducted directly in the bank; Permitted = 2: A full range of activities are offered but all or some of these activities must be conducted in subsidiaries, or in another part of a common holding company or parent,; Restricted = 3: Less than the full range of activities can be conducted in banks, or subsidiaries, or in another part of a common holding company or parent, and Prohibited = 4: None of these activities can be done in either banks or subsidiaries, or in another part of a common holding company or parent.	4.2 What are the conditions under which banks can engage in insurance activities? (the ability of banks to engage in insurance underwriting and selling)?

(c) Real estate activities	The extent to which banks may engage in real estate investment, development and management.	WBG 4.3 (higher values, more restrictive) Unrestricted = 1: : full range of activities can be conducted directly in the bank; Permitted = 2: A full range of activities are offered but all or some of these activities must be conducted in subsidiaries, or in another part of a common holding company or parent,; Restricted = 3: Less than the full range of activities can be conducted in banks, or subsidiaries, or in another part of a common holding company or parent, and Prohibited = 4: None of these activities can be done in either banks or subsidiaries, or in another part of a common holding company or parent.	4.3 What are the conditions under which banks can engage in real estate activities? (the ability of banks to engage in real estate investment, development, and management?
(d) Non-financial activities	The extent to which banks may engage in nonfinancial businesses except those businesses that are auxiliary to banking business (e.g. IT company, debt collection company etc.)	WBG 4.4 (higher values, more restrictive) Unrestricted = 1: Nonfinancial activities can be conducted directly in banks, Permitted = 2 Nonfinancial activities must be conducted in subsidiaries, or in another part of a common holding company or parent; Restricted = 3: Nonfinancial activities may be conducted in subsidiaries, or in another part of a common holding company or parent, but subject to regulatory limit or approval, and Prohibited = 4: None of these activities can be done in either banks or subsidiaries, or in another part of a common holding company or parent	4.4 What are the conditions under which banks can engage in nonfinancial businesses except those businesses that are auxiliary to banking business (e.g. IT company, debt collection company etc.) ?
2. Capital regulatory variables			
(a) Overall capital stringency	Whether the capital requirement reflects certain risk elements and deducts certain market value losses from capital before	WBG 3.1 + 3.2a + 3.2b + 3.2c+3.2d +3.18.3a +3.18.3b + 3.18.3c + 3.18.3d +3.18.3e + (1 if 3.18.2. < 0.75)	3.1. Is the minimum capital-asset ratio requirement risk weighted in line with the Basel guidelines? Yes/No

	minimum capital adequacy is determined.	Yes = 1; No= 0 Higher value indicate greater stringency	Yes- Basel-I/Basel-II/Leverage ratio No-other 3.2a. credit risks are covered by the current regulatory minimum capital requirements. yes/No 3.2b. market risks are covered by the current regulatory minimum capital requirements. yes/No 3.2c. operational risks are covered by the current regulatory minimum capital requirements. yes/No 3.2d. other risks are covered by the current regulatory minimum capital requirements 3.18.3a. are goodwill deducted from regulator capital? Yes/No 3.18.3b. are deferred tax assets deducted from regulator capital? Yes/No 3.18.3c. are intangibles deducted from regulator capital? Yes/No 3.18.3d. are Unrealized losses in fair valued exposures deducted from regulator capital? Yes/No 3.18.3e. are Investment in the capital of certain banking, financial and insurance entities which are outside the scope of consolidation deducted from regulator capital? Yes/No 3.18.2 What fraction of revaluation gains is allowed as part of capital?

(b) Initial capital stringency	Whether certain funds may be used to initially capitalize a bank and whether they are officially verified.	WBG 1.4.2: Yes = 1, No= 0: WBG 1.4.3 and 1.5: Yes = 0, No= 1. Higher value indicate greater stringency	1.4.2 Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? Yes/No 1.4.3 Can the initial disbursement or subsequent injections of capital be done with assets other than cash or government securities? Yes/No 1.5 Can initial disbursement of capital be done with borrowed funds? Yes/No
c. capital regulatory index	The sum of (a) and (b)	(a) +(b) higher value indicate greater stringency	