Bangladesh Journal of Integrated Thoughts, 2024
DOI: https://doi.org/10.52805/ykkp3w33

Revisiting Bank Stability: Data Analysis from Four Regions of the Globe

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ABSTRACT
Following the global financial crisis of 2008, both academics and politicians have focused on enhancing financial inclusion and ensuring the stability of the banking industry. However, there is limited knowledge about the impact of financial inclusion on the stability of the financial services sector. This study examines the relationship between financial inclusion, economic freedom, the National Governance Index, bank profitability, and their impact on bank stability. This research examines the stability of banks across 42 countries in four major regions: Africa, the Americas, Asia, and Europe. The study analyzes data from 2004 to 2020, utilizing a fixed effect panel data regression on a well-balanced panel of regional banks from four different regions, covering a total of 42 countries. The findings suggest that financial inclusion is negatively correlated with bank stability; as financial inclusion increases, bank stability tends to decrease. Additionally, economic independence does not significantly affect bank stability, suggesting that changes in bank culture have minimal impact. However, the national governance score has a notably positive effect on bank stability. Moreover, bank profitability has a positive influence on bank stability, with higher profitability enhancing stability in various regions. The study examines bank stability by incorporating factors such as financial inclusion, economic freedom, the country governance index, and bank profitability, thereby providing a more comprehensive understanding of the existing literature. Overall, the authors' findings offer valuable new insights into the literature on bank stability. The recommendations provided could enhance the long-term performance of 42 banks across four different regions.

KEYWORDS
Financial inclusion; country governance index; heritage index; profitability; stability; Africa, America, Asia, Europe.

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1. Introduction

The global financial crisis (GFC) of 2008-2009 captured the attention of scholars, regulatory bodies, politicians, and other financial stakeholders, leading them to scrutinize financial stability mechanisms to prevent similar future crises. Beck (2009) emphasizes the importance of advancing research in financial stability. While both banking and non-banking financial institutions influence a country's economic health, banks play a particularly significant role in the developing world. Consequently, ongoing international research seeks to investigate the relationship between financial inclusion and bank stability, underscoring its significance.

In this study, we investigate the impact of financial inclusion, economic freedom, the National Governance Index, and profitability on bank stability. Ahamed & Mallick (2019) found a connection between financial inclusion and bank stability. Mendoza et al. (2009) suggested that financial inclusion and bank stability have a conditional relationship. Okpara (2011) identified a bidirectional link between bank stability and financial inclusion, suggesting that the two influence each other over the long term. Ardic et al. (2013) offered a new perspective on the relationship, indicating that it is not entirely nonlinear but rather involves data gaps. Regarding economic freedom, various discussions have taken place. Bjørnskov (2016) examined the impact of economic freedom on conflict risk, finding it significantly associated with lower apex proportions and shorter recovery periods, thereby suggesting enhanced stability in the banking system.

According to Roychoudhury & Lawson (2010), a decline in economic freedom can significantly increase government lending rates; however, the effects on bank performance are still unclear. Regarding the country governance index, Toader et al. (2018) argue that countries with higher levels of corruption can enhance bank stability by enforcing stringent governance regulations. Asteriou et al. (2021) also suggest that improving country-level administration heightens the value of anti-corruption measures in terms of stability. Boehmer et al. (2005), D'Souza et al. (2005), and Shen et al. (2014) all find that lower corruption levels and a stronger legislative environment have a positive impact on bank stability. Mehzabin (2022) also finds that the country governance index has a significant positive effect on bank stability. Regarding bank profitability, several studies have indicated a link to bank stability. Ali (2015), Borio (2003), and Mörttinen et al. (2005) suggest that bank profitability factors are connected to the stability of the banking sector. Mkadmi et al. (2021) find that the net interest margin (NIM) has a small but positive effect on bank stability. However, Muizzuddin et al. (2021) report that NIM has a significantly negative relationship with bank stability. Additionally, Molyneux & Thornton (1992) indicate that bank risk and profitability have a negative relationship. Other research, such as Le (2017) and Tan (2016), concludes that bank risk does not affect profitability, while Le & Ngo (2020) suggest a positive link between the two.

Empirical research often examines either financial inclusion or economic freedom, but rarely both together with the country governance index (CGI) and profitability, making it challenging to determine their combined impact on bank stability. Consequently, this study aims to investigate the influence of financial inclusion, economic freedom (measured by the Heritage Index), CGI, and bank profitability (measured by ROA and NIM) on the stability of banks across four different regions (Africa, America, Asia, and Europe), encompassing 42 countries. We utilize a comprehensive panel data set spanning from 2004 to 2020.

This research primarily focuses on the significant factors of financial inclusion, economic freedom, CGI, and profitability, examining their interrelationships. Previous studies have often examined the impact of these factors on specific countries or regions. Due to the limited scope of prior research, our study targets banks across four regions (Africa, America, Asia, and Europe), including 42 different countries. To evaluate the impact on bank stability, we employ a regression model that incorporates both cross-sectional and time-series data, unlike some studies that rely solely on cross-sectional methods. Thus, the goal of this study is to address the existing knowledge gaps.

The remainder of this paper is arranged as follows. The background and hypothesis development that underpin the investigation presented in this paper are described in Section 2. The methodology is presented in Section 3. The fourth section concerns data analysis. Finally, part 5 brings the study report to a close.

2. Background and Hypothesis Development

The recent global financial crisis (GFC) underscored the importance of bank stability. It highlighted how financial crises can negatively affect social welfare, economic development, and the overall stability of banking systems. Particularly in low-income regions, such as South Asia, people often struggle to cope with the systemic risks and disruptions caused by financial instability (Guyot et al., 2014; Ijtsma et al., 2017; Neaime, 2012, 2015, 2016; Neaime & Gaysset, 2017).

There are several perspectives on financial inclusion. According to the Asian Development Bank (2017), financial inclusion entails providing formal financial products and services to all individuals, regardless of their economic status. The World Bank (2013) defines it as the ability for individuals and businesses to access suitable, regulated financial products and services at a reasonable cost, meeting their needs for transactions, payments, savings, credit, and insurance responsibly and sustainably. The United Nations (UN, 2015) describes financial inclusion as access to a wide range of affordable financial services offered by various institutions, promoting sustainable development. The Centre for Financial Inclusion (CFI) views it as a state where everyone who could benefit from financial services has access to them in a manner that is affordable, respectful, and efficient within a competitive industry (CFI, 2013).

While the impact of an inclusive banking system on bank stability remains debated (Ahamed & Mallick, 2019), Nguyen & Du (2022) identified several pathways through which financial inclusion affects stability, notably via deposits and loans. Enhanced management and technical expertise can boost efficiency and revenues, while deposits and loans provide a stable funding source (Berger & DeYoung, 2001; Demirgüç-Kunt & Huizinga, 2010; Deng & Elyasiani, 2008; Saunders & Wilson, 1996). The literature suggests that retail deposits are stable, risk-averse, and provide a long-term funding source compared to more volatile and costly external financing (Calomiris & Kahn, 1991; Song & Thakor, 2007; Demirgüç-Kunt & Huizinga, 2010; Huang & Ratnovski, 2011; Poghosyan & Čihak, 2011). Huang & Ratnovski (2011) noted that wholesale bankers, wary of misinformation, prefer not to provide short-term funding. Studies have shown that banks reliant on deposits rather than wholesale funding were more stable during the last recession (Demirgüç-Kunt & Huizinga, 2010; Poghosyan & Čihak, 2011). Additionally, during the financial meltdown, a diversified retail deposit base protected banks from instability (Hannig & Jansen, 2010). Thus, diversifying funding sources in financial intermediation through financial inclusion could reduce bank risks and capital costs, thereby enhancing stability.

Ahamed & Mallick (2019) argue that financial inclusion can help stabilize bank funding mechanisms. Research by López & Winkler (2019) on 189 economies from 2004 to 2017 indicates that countries with higher financial inclusion levels are less susceptible to drastic reductions in lending and borrowing, supporting the idea that effective financial inclusion contributes to a more resilient financial sector during crises. Okpara (2011) identified a long-term causal relationship between bank stability and inclusion. Neaime & Gaysset (2017) examined the impact of financial inclusion on financial stability, income inequality, and poverty in countries such as Tunisia, Egypt, Libya, Syria, and Yemen, which have experienced rapid economic growth alongside a stable financial system. Despite diverse and fragmented demographics, the study found that financial inclusion has a negative correlation with income inequality and a positive correlation with financial stability. Mendoza et al. (2009) noted a conditional relationship between financial inclusion and banking stability, observing a significant negative relationship between financial access (loans per 1,000 people) and non-performing loans (NPLs) and risk premiums. Dabla-Norris et al. (2015) developed a framework to examine constraints on financial inclusion, including GDP, NPLs, and inequality, using company-level data from six Asian and African countries at various economic development stages. Their findings showed that country-specific factors affect the trade-offs between financial inclusion and banking stability. Ardic et al. (2013) provided a novel explanation, suggesting that the relationship between financial inclusion and bank stability is not truly nonlinear, but somewhat limited by data constraints. Al-Smadi (2018) utilized time-series data and fully modified least squares to examine the negative impact of credit growth, income inequality, and financial integration on financial inclusion, thereby affirming the limited effect of financial inclusion on financial stability. Thus, the following hypothesis can be made:

H1: The impact of financial inclusion on bank stability is favorable.

Since the Global Financial Crisis of 2007/2008, there has been a surge of discussions among policymakers and bank regulators about the relationship between bank profitability and financial industry stability, drawing significant scholarly attention (Ali & Puah, 2019). The reasoning is straightforward: a more efficient banking sector is better equipped to handle financial crises. Fu et al. (2014) analyzed 1,500 observations from the Asia-Pacific region between 2003 and 2010 to identify factors affecting banking stability in various countries. Additionally, factors influencing bank profitability seem to be linked to the stability of the banking industry (Ali, 2015; Borio, 2003; Mörttinen et al., 2005). Mkadmi et al. (2021) found that the net interest margin (NIM) has a small but positive impact on bank stability.

In contrast, Martinez-Miera & Repullo (2010) describe the "margin effect," which suggests that lower interest payments on loans decrease bank profitability and increase bank risk. The impact of increased competition on stability depends on which factors are most dominant. However, Muizzuddin et al. (2021) found that NIM has a significantly negative relationship with bank stability in their study. Molyneux & Thornton (1992) also noted a negative correlation between bank risk and profitability.

Banks lacking effective risk management and holding a higher debt portfolio may experience a high proportion of non-performing loans (NPLs), which reduces their profitability. Other studies, however, have found that bank risk does not affect profitability (Le, 2017; Tan, 2016) or that there is a positive relationship between the two (Le & Ngo, 2020). A thriving banking system can absorb financial stress by increasing capital, thus enhancing the stability of the economic system (Athanasoglou et al., 2008; Le, 2018). Conversely, Hellmann et al. (2000) suggest that inadequate bank regulation and information asymmetries can increase profitability by raising risk premiums, which can lead to financial instability. Hence, our hypothesis can be indicated as:

H2: Banks' stability is enhanced by increased financial profitability.

Corruption is described by Bhargava (2005) as "the misuse of public and corporate position for private benefit." In the banking sector, corruption and fraud involve dishonest behavior by bankers, bank employees, and even bank regulators. Economists generally agree that corruption has a negative impact on the financial industry and the broader economy. On a macroeconomic scale, corruption can skew government spending, deter foreign investment, increase unproductive foreign debt, decrease economic efficiency, and result in lower national income and higher poverty levels (Asiedu, 2006; Gastanaga et al., 1998; Kunieda et al., 2014; Mauro, 1995). The primary factor affecting corruption levels is the effectiveness of the legal system; a more efficient judicial system typically results in lower levels of corruption. Beck et al. (2006) argue that a supervisory approach emphasizing private bank supervision, transparency, and accurate reporting can help reduce misconduct in lending. Barth et al. (2009) find that competition among

banks and information sharing are effective in lowering loan misconduct. Corruption is especially challenging in developing countries, where weak legislation, lack of judicial independence, inadequate prudential standards, and poor internal bank regulations complicate efforts to combat corruption. Toader et al. (2018) find that lower corruption levels are associated with fewer bad debts and more moderate loan growth in developing economies, highlighting the negative impact of corruption on individual banks. Ho et al. (2019) support these findings with a larger study of 26,865 banks across 40 developed and developing countries over 26 years, showing that strong shareholder protection and transparency mitigate the effect of corruption on bank stability. Some research highlights the positive role of regulation, particularly capital requirements, in preventing bank failures and protecting consumers and the economy from negative impacts (Dewatripont & Tirole, 1994; Gorton & Winton, 1995; Hovakimian & Kane, 2000; Rochet, 1992). Pelster et al. (2018) demonstrate that while higher bank capital levels may negatively impact short-term stock performance, they improve banks' ability to withstand crises. Alexander et al. (2013) report that increased capital ratios following the GFC reduced the likelihood of bank failures and improved overall banking system stability.

Regulatory changes may be insufficient if not enforced, suggesting the need for oversight (Asteriou et al., 2021). Corruption control is a component of the governance index. Toader et al. (2018) suggest that countries with high corruption levels can improve bank stability by implementing stringent governance requirements. Asteriou et al. (2021) argue that strong national governance elevates the importance of anti-corruption measures for stability. Research by Boehmer et al. (2005), D'Souza et al. (2005), and Shen et al. (2014) finds that lower corruption levels and a stable legal framework have a positive impact on bank stability. Mehzabin (2022) also finds that the country governance index has a significant effect on bank stability. However, Kamran et al. (2019) note that both conventional and Islamic banks in Pakistan suffer from increasing corruption, with Islamic banks being particularly affected by ineffective government, which reduces the stability of the banking sector.

H3: Better country governance improves bank stability.

While the impact of economic freedom on the broader economy has been extensively studied (e.g., Adkins et al., 2002; Altman, 2008; Bergh & Karlsson, 2010; Heckelman & Knack, 2009), its specific effect on the banking sector has only recently attracted scholarly attention from researchers like Chortareas et al. (2013), Claessens & Laeven (2004), Gropper et al. (2015), and Sufian & Habibullah (2010a, 2010b). Several arguments suggest that economic freedom can enhance bank stability. According to Claessens & Laeven (2004), allowing both local and international players to enter the market enhances efficiency and expands the range of products available, thereby boosting bank profitability and stability. Economic freedom also suggests that banks are likely to lend more due to increased competition within the economy, offering more opportunities to lend to international companies and financial institutions. This diversification in lending

activities can lead to a better risk-return balance for banks. Thus, higher economic freedom is expected to create a more favorable business environment and stimulate economic growth, thereby strengthening banking stability. Countries with higher levels of economic freedom tend to have higher income levels (Holmes, 2002), which can increase the demand for banking services. Gropper et al. (2015) find that bank performance in the United States is associated with state economic freedom and political connections. They argue that excessive regulation of banks restricts economic freedom and reduces growth opportunities. Similarly, Blau (2017) suggests that economic freedom reduces regulatory uncertainty and promotes free trade, which, along with a greater emphasis on property rights, lowers the risk of market collapses. Thus, economic freedom is expected to benefit bank stability by fostering greater competition, reducing inflation, and promoting a stable economic environment.

Bjørnskov (2016) examines the impact of economic freedom on conflict risk and its effects on the duration, severity, and recovery from 212 financial crises in 175 countries between 1993 and 2010. The study finds that financial freedom is closely associated with less severe downturns and quicker recoveries, thereby contributing to improved bank stability. Lin et al. (2016) investigate the impact of financial freedom on the relationship between ownership concentration and cost efficiency, concluding that foreign participation facilitated by financial openness enhances bank efficiency. Increased efficiency leads to higher profitability and a lower risk of bankruptcy, improving the overall quality of the banking industry. According to Roychoudhury & Lawson (2010), a decline in economic freedom can substantially increase government borrowing costs, though its effects on bank performance are unclear. While it might boost sector profits through higher net interest margins, it could also increase risk and costs for corporate borrowers, potentially weakening the banking sector's profitability and stability by increasing non-performing loans. Therefore, we can hypothesize that:

H4: The greater impact of economic freedom improves the stability of banks.

3. Methodology

In this study, we employed panel data estimation methods, drawing on models used in previous research (Ahamed & Mallick, 2019; Alvi et al., 2020; Banna & Alam, 2021; Nguyen & Du, 2022). Our analysis focuses on the stability of the banking sector across four regions: Africa, America, Asia, and Europe. The study spans 17 years from 2004 to 2020, utilizing a balanced panel data set with a total of 765 observations. Data for this research were obtained from several sources. The bank-level data set was constructed using Bank Scope, provided by Bureau van Dijk and Fitch Ratings. Macroeconomic data were sourced from the World Development Indicators (WDI) of the World Bank. Financial inclusion data were obtained from the Financial Access Survey released by the International Monetary Fund. Additionally, data for constructing the Country Governance Index (CGI) were

collected from the World Governance Indicators dataset, available from the World Bank.

3.1. Variables Descriptions

Table 1 outlines the explanatory variables utilized in the study, along with their respective estimates. The first independent variable is the Financial Inclusion Index, which is derived from multiple dimensions. Previous studies have constructed financial inclusion indices using various approaches. For example, Ahamed & Mallick (2019) and Vo et al. (2021) utilized two dimensions—access and usage—while Sha'ban et al. (2020) focused solely on depth. Mialou et al. (2017) used only the access dimension to create their index. In this study, we incorporate all three dimensions: access, usage, and depth. (i) The first dimension, access, pertains to the outreach or availability of financial services. It is measured by the number of commercial bank branches per 100,000 adults and the number of ATMs per 100,000 adults. (ii) The second dimension, usage, is assessed by the number of deposit accounts with commercial banks per 1,000 adults and the number of loan accounts with commercial banks per 1,000 adults. (iii) The third dimension, depth, is measured by outstanding deposits with commercial banks as a percentage of GDP and outstanding loans from commercial banks as a percentage of GDP. The data for calculating the financial inclusion index were obtained from the Financial Access Survey published by the International Monetary Fund (IMF). This comprehensive database is based on numerous surveys conducted over a 17-year period, from 2004 to 2020. It includes information on individuals' access to financial services, as well as their investment, borrowing, saving, and transactional habits.

Table 1: Variables Descriptions

Variables	Measures	Sources	Expected outcome
Dependent variable:			
Bank Z-Score	Measure of bank stability; ROA + Total equity to total assets/sd (ROA)	(Ahamed & Mallick, 2019; Alvi et al., 2020; Banna & Alam, 2021; Nguyen & Du, 2022)	
Independent variables:			
Financial inclusion index	Measured by three dimensions: Access, Use, and Depth Access: 1. Number of commercial bank branches per 100,000 adults 2. Number of ATMs per 100,000 adults Use: 1. Number of deposit accounts with commercial banks per 1,000 adults 2. Number of loan accounts with commercial banks per 1,000 adults Depth: 1. Outstanding deposits with commercial banks (% of GDP) 2. Exceptional loans from commercial banks (% of GDP)	(Khera et al., 2021; Sha'ban et al., 2020a)	+

Bank ROA	Measure of profitability (Net Income/Total Assets)	(Ali & Puah, 2019; Audi et al., 2021; Mkadmi et al., 2021)	+
Net interest margin	Measure of profitability (Net Income/Total Revenue)	(Mkadmi et al., 2021; Muizzuddin et al., 2021)	+
CGI	Country-level governance, computed by the average of six indicators (voice and accountability, political stability or no violence, government effectiveness, regulatory quality, rule of law, and corruption control) of governance	(Asteriou et al., 2021; Mehzabin, 2022; Toader et al., 2018)	+
Heritage index	The Heritage Index of Economic Freedom is a 0-100 scale that measures economic freedom across 12 aspects (property rights, government integrity, judicial effectiveness, tax burden, government spending, fiscal health, business freedom, labor freedom, monetary freedom, trade freedom, investment freedom, financial freedom), with a higher value indicating greater economic freedom.	(Asteriou et al., 2021; Bjørnskov, 2016)	+
Control variables:			
Bank cost-to-income ratio	Operating cost/Total income	(Kumar et al., 2021; Ozili, 2021)	+
Bank concentration	The market share of the five largest banks	(Chauvet & Jacolin, 2017; Owen & Pereira, 2018)	+
Macro-economic indicators:			
GDP growth	Annual growth rate of a country's GDP	(Alvi et al., 2020; Banna & Alam, 2021; Kumar et al., 2021)	+/-
Inflation	Annual inflation	(Alvi et al., 2020; Banna & Alam, 2021; Kumar et al., 2021)	+/-

To compute the financial inclusion index using three dimensions, the literature describes two primary approaches. The first is the parametric method, where weights are determined endogenously based on the data's structure (De Sousa, 2015; Sha'ban et al., 2020). The second method is non-parametric, which assigns weights to the index components based on subjective criteria (Chakravarty & Pal, 2013; Sha'ban et al., 2020). This study employs the non-parametric approach. Following the work of Park & Mercado (2021) and Sha'ban et al. (2020), we first use the non-parametric method to normalize the three dimensions of financial inclusion—access, use, and depth—so that they converge to a unified measure ranging from 0 to 1:

$$I^{n}_{(i,t,c)} = \frac{I_{i,t,c} - Min(I_i)}{Max(I_i) - Min(I_i)}$$

Where,

$I^{n}_{(i,t,c)}$ = value of financial inclusion indicator i; Period t; country c;

Min *(Ii)* = minimum value;

Max *(Ii)* = maximum value;

Within the range of 0 to 1, a higher value indicates greater financial inclusion. The three dimensions of financial inclusion—access, use, and depth—each comprise two indicators, totaling six, which are used to create three separate metrics: the access index, the use index, and the depth index. The average of the two indicators for each dimension is calculated to form these dimensional metrics. Finally, the geometric mean of the three-dimensional metrics is used to construct the overall inclusion index.

$$Financial\ inclusion\ index = (Use\ index\ \times Access\ index\ \times Depth\ index)^{(\frac{1}{3})}$$

In our study, return on assets (ROA) and net interest margin (NIM) are used as measures of bank profitability. ROA is calculated as net income to total assets, following the recommendations of Ali & Puah (2019), Audi et al. (2021), and Mkadmi et al. (2021). NIM is calculated as net income to total revenue, as suggested by Mkadmi et al. (2021) and Muizzuddin et al. (2021). In line with Asteriou et al. (2021), Mehzabin (2022), and Toader et al. (2018), we collect country-level data from the World Bank's World Governance Index (WGI), which is a comprehensive survey collection. Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption are the six indices of country governance, which range from approximately -3 (weak) to 3 (strong). The mean scores of these six variables are then combined to create an integrated index covering the years 2004 through 2020. As another independent variable, we consider the Heritage Index as a measure of economic freedom. It is a 0-100 scale that measures economic freedom across 12 aspects—property rights, government integrity, judicial effectiveness, tax burden, government spending, fiscal health, business freedom, labor freedom, monetary freedom, trade freedom, investment freedom, and financial freedom—with a higher value indicating greater economic freedom, as suggested by Asteriou et al. (2021) and Bjørnskov (2016).

As a control variable, we account for the bank cost-to-income ratio, which is measured as operating cost to total income, following the recommendations of Kumar et al. (2021) and Ozili (2021). Another control variable used in this study is bank concentration, which is estimated by the market share of the five largest banks, as suggested by Chauvet & Jacolin (2017) and Owen & Pereira (2018).

Table 2 summarizes the macroeconomic indicators used in this study, along with their corresponding computations. The first macroeconomic variable is the GDP growth rate, used to analyze the impact of annual GDP growth on bank stability (Alvi et al., 2020; Banna & Alam, 2021; Kumar et al., 2021). Additionally, we include the inflation rate as another macroeconomic variable, as recommended by Alvi et al. (2020), Banna & Alam (2021), and Kumar et al. (2021).

Table 2: Listed Countries with Regions

Africa	**America**	**Asia**	**Europe**
Algeria	Argentina	Armenia	Belgium
Cameroon	Bolivia	Bhutan	Bulgaria
Guinea	Chile	India	Estonia
Jamaica	Colombia	Indonesia	Hungary
Lesotho	Costa Rica	Japan	Italy
Madagascar	El Salvador	Mongolia	Latvia
Mauritius	Guyana	Pakistan	Malta
Namibia	Nicaragua	Thailand	Netherlands
Rwanda	Panama	Uzbekistan	North Macedonia
Seychelles	Peru		Portugal
Zambia			Spain
Zimbabwe			

In this study, we employ the Z-score as a dependent variable. The Z-score, often referred to as "distance to default," has gained widespread support in the finance and banking fields and is now regarded as an impartial indicator of bank volatility (Fang et al., 2014). Also, the Z-score is recognized as a standard indicator of bank stability (Diaconu & Oanea, 2014; Fang et al., 2014; Ghenimi et al., 2017; Karim et al., 2003; Rupeika-Apoga et al., 2018). The following equation could be used to get the Z-score:

$$\mathrm{Z-Score} = \frac{\mathrm{ROA} + \mathrm{E/A}}{\mathrm{sd(ROA)}}$$

Where,

ROA is the return on total assets or net income to total assets

E/A is the total equity to total assets (EQTA)

SD (ROA) is the standard deviation of return on total assets

We construct the following regression model:

$$\begin{aligned} Z - Score = \ & \beta_0 + \beta_1 Access_Index + \beta_2 Use_Index + \beta_3 Depth_Index \\ & + \beta_4 Financial_Inclusion_Index + \beta_5 Bank_ROA \\ & + \beta_6 Net_Interest_Margin + \beta_7 Bank_Cost_To_Income_Ratio \\ & + \beta_8 Bank_Concentration + \beta_9 Country_Governance_Index \\ & + \beta_{10} Property_Rights + \beta_{11} Government_Integrity \\ & + \beta_{12} Judicial_Effectiveness + \beta_{13} Tax_Burden \\ & + \beta_{14} Government_Spending + \beta_{15} Fiscal_Health \\ & + \beta_{16} Business_Freedom + \beta_{17} Labor_Freedom \\ & + \beta_{18} Monetary_Freedom + \beta_{19} Trade_Freedom \\ & + \beta_{20} Investment_Freedom + \beta_{21} Financial_Freedom \\ & + \beta_{22} Heritage_Index + \beta_{23} GDP_Growth + \beta_{24} Inflation \\ & + Year_Dummies + Country_Dummies + \varepsilon_{it} \end{aligned}$$

Where,

The Z-score assesses the stability of banks. Financial Inclusion is evaluated through three dimensions: the Access Index, Use Index, and Depth Index. Bank profitability is measured using indicators such as Return on Assets (ROA) and Net Interest Margin (NIM). The cost-to-income ratio of a bank is calculated by dividing operating costs by total income. Bank Concentration is generally determined by the market share held by the five largest banks. The Country Governance Index (CGI) is derived from six components: Voice and Accountability, Political Stability or Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. The Heritage Index of Economic Freedom, which ranges from 0 to 100, gauges economic freedom across 12 areas, including Property Rights, Government Integrity, Judicial Effectiveness, Tax Burden, Government Spending, Fiscal Health, Business Freedom, Labor Freedom, Monetary Freedom, Trade Freedom, Investment Freedom, and Financial Freedom. A higher score indicates greater economic freedom. GDP growth represents the annual rate of change in GDP, while Inflation measures the annual rate of price increase.

3. Data analysis

To estimate our results, we utilized both fixed effects and random effects models. We excluded pooled OLS regression because it is not suitable for an imbalanced dataset. In contrast, our panel data is highly balanced. The Hausman test, also known as the Durbin-Wu-Hausman (DWH) test, was employed to determine the appropriateness of either the fixed effects or random effects model for our analysis. The results of the Hausman test indicated that the null hypothesis was rejected for countries in the Americas and Asia, suggesting that the fixed effects model is more appropriate for these regions. Conversely, for countries in Africa and Europe, the results supported the use of the random effects model. Additionally, we conducted the Wooldridge autocorrelation test on our panel data to check for any first-order autocorrelation in our models.

4.1. Descriptive Statistics

Table 3 presents the variables examined in our research. The Z-score measures how close a financial institution is to bankruptcy, with a higher value indicating better stability. Our study shows an average Z-score of 12.265, which, with a standard deviation of 7.672, is higher than the mean reported by Rupeika-Apoga et al. (2018). The three dimensions of financial inclusion—the access index, use index, and depth index—have means of 0.220, 0.221, and 0.279, respectively, with standard deviations of 0.186, 0.171, and 0.190. The overall financial inclusion index has an average value of 0.231 and a standard deviation of 0.159. For profitability, we examined two variables: Return on Assets (ROA) and Net Interest Margin (NIM). ROA has a mean of 1.417 and a standard deviation of 1.322, while NIM shows a mean of 5.042 with a standard deviation of 6.252. Additionally, the Country Governance Index (CGI) has an average value of 0.509, indicating that stronger governance has a positive impact on bank stability.

Table 3: Descriptive Statistics

Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Bank Z-Score	714	12.265	7.672	0.000	48.517
Access index	693	0.220	0.186	0.002	0.905
Use index	652	0.221	0.171	0.000	0.736
Depth index	705	0.279	0.190	0.000	0.826
Financial inclusion index	637	0.231	0.159	0.000	0.633
Bank ROA	714	1.417	1.322	-5.977	13.466
Net interest margin (%)	714	5.042	6.252	-19.362	114.248
Bank cost to income ratio (%)	714	55.293	12.178	0.000	99.488
Bank concentration (%)	714	64.469	23.963	0.000	154.441
Country Governance Index (0-1)	714	0.509	0.126	0.232	0.788
Property Rights	704	48.255	20.901	5.000	90.000
Government Integrity	704	41.515	17.177	10.000	90.100
Judicial Effectiveness	168	46.570	16.577	11.200	83.900
Tax Burden	704	74.538	11.507	41.500	94.400
Government Spending	704	64.576	22.720	0.000	94.700
Fiscal Health	168	68.526	27.707	0.000	99.900
Business Freedom	704	67.048	12.303	30.000	93.700
Labor Freedom	664	61.289	13.235	21.900	91.400
Monetary Freedom	704	75.185	11.534	0.000	94.300
Trade Freedom	704	75.448	11.825	22.000	89.000
Investment Freedom	704	57.777	21.841	0.000	90.000
Financial Freedom	704	53.565	17.331	10.000	90.000
Heritage Index	168	1.126	0.088	0.904	1.291
GDP growth (annual %)	612	3.374	4.692	-17.945	43.480
Inflation	690	6.133	23.692	-18.109	557.202

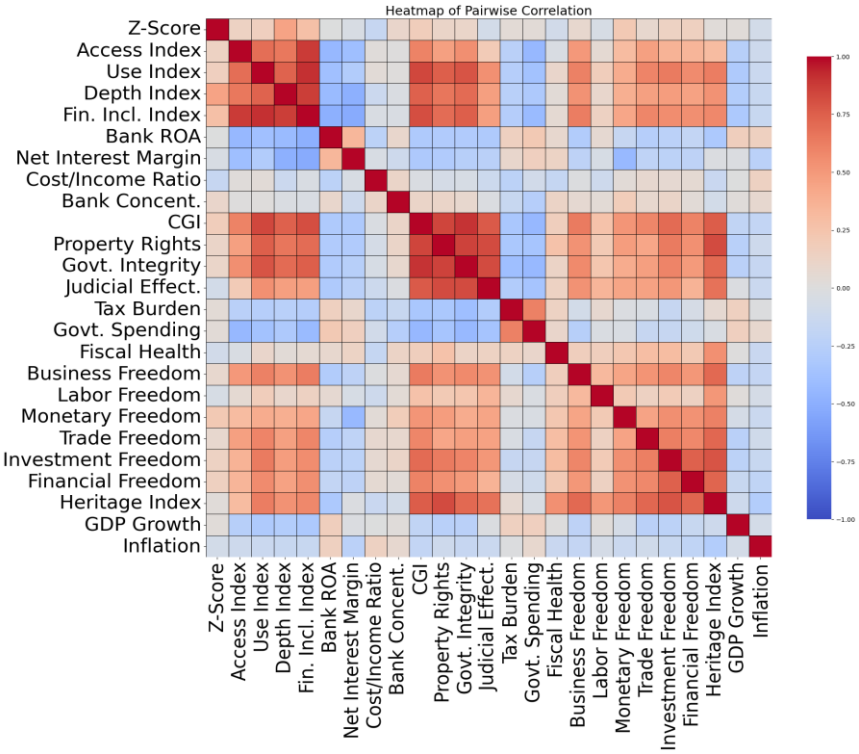
Note: The table presents summary statistics for default risk, financial inclusion index, profitability (proxied by ROA and Net Interest Margin), country-level governance index, and heritage index.

Additionally, the Heritage Index, which measures economic freedom across 12 different aspects, has an average value of 1.126 with a standard deviation of 0.088. Among these 12 aspects, monetary freedom and trade freedom exhibit the highest mean values, at 75.185 and 75.448, respectively, with standard deviations of 11.534 and 11.825. Conversely, government integrity has the lowest mean value at 41.515, with a standard deviation of 17.177. Regarding control variables, the bank's cost-to-income ratio, measured as operating costs relative to total income, has a mean of 55.293 and ranges from a minimum of 0 to a maximum of 99.488, with a standard deviation of 12.178, which is higher than reported by Alihodžić et al. (2020). Another control variable, bank concentration, has an average value of 64.469 with a standard deviation of 23.963. Finally, macroeconomic variables such as annual GDP growth and inflation rate have means of 3.374 and 6.133, with standard deviations of 4.692 and 23.692, respectively.

4.2. Pairwise Correlation

The pairwise correlations in our study are presented in Table 4. The analysis reveals that the access index, use index, and depth index are significantly positively correlated with bank stability. Similarly, the financial inclusion index shows a significant positive correlation with bank stability, suggesting that increased financial inclusion enhances the stability of banks across various regions. Additionally, the financial inclusion index exhibits a strong positive correlation with the access index, use index, and depth index. In terms of profitability, bank ROA and NIM are strongly negatively correlated with the financial inclusion index and its three dimensions. This suggests that greater financial inclusion may have an adverse impact on bank profitability. Conversely, NIM has a strong positive correlation with ROA, indicating that higher returns on assets lead to a wider net interest margin for banks. Regarding control variables, the bank's cost-to-income ratio shows a strong negative correlation with both the bank's Z-score and ROA, indicating that an increase in the cost-to-income ratio reduces both bank stability and profitability. Conversely, bank concentration has a strong positive correlation with the bank Z-score, implying that better bank concentration enhances bank stability.

Table 4: Pairwise Correlation



However, bank concentration also shows a positive correlation with ROA at the 5% level, meaning that more concentrated banks achieve higher returns on assets. The Country Governance Index (CGI) is strongly positively correlated with both bank stability and the Financial Inclusion Index at the 1% level, indicating that better governance improves bank stability. However, CGI exhibits a strong negative correlation with profitability measures (ROA and NIM), contradicting the usual notion that better governance enhances bank profitability. Among the 12 aspects of economic freedom, property rights demonstrate a strong positive correlation with bank stability, as well as with the financial inclusion index and CGI. Similarly, government integrity, monetary freedom, investment freedom, and financial freedom show a strong positive correlation with the bank Z-Score at the 1% level.

In comparison, business freedom and trade freedom are positively significant at the 5% level of significance. The Heritage Index, which measures economic freedom, exhibits a strong positive correlation with the three dimensions of financial inclusion and the overall financial inclusion index at the 1% significance level. Finally, the macroeconomic variables—annual GDP growth and inflation—show a strong negative correlation with the financial inclusion index. Additionally, inflation shows a negative correlation with the bank Z-Score at the 5% level, suggesting that lower inflation may enhance bank stability globally.

4.3. Regression Analysis

According to the Hausman test, the fixed effects regression model is most appropriate for the Americas and Asia regions, as detailed in Tables 6 and 7. In contrast, the random effects regression model is better suited for the Africa and Europe regions, as shown in Tables 5 and 8. Regarding the three dimensions of financial inclusion, the access index is positively and significantly correlated with bank stability in both Africa and Asia. However, it shows a negative significance in Europe and a positive, albeit insignificant, result in the Americas. The use index is positively significant at the 1% level in all cases except models 3 and 13 in Africa. It also shows positive significance at the 5% level in model 4 for the Americas, while it has an insignificant relationship with the bank Z-score in Asia. In Europe, the use index exhibits negative significance at the 1% level in models 6 and 13.

Table 5: Regression Analysis for Africa Region
Default Risk: Random Effect estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk
Access index	49.5389***	53.6886***	62.9224***	39.0227***	53.3496***	69.7141***	65.3960***
	(9.4452)	(9.3865)	(23.8118)	(8.9645)	(9.4346)	(23.1141)	(24.5364)
Use index	47.7667***	57.5373***	66.4470**	30.4531***	56.2281***	68.9704***	67.4593**
	(12.2299)	(11.8474)	(26.6230)	(11.7366)	(11.8582)	(25.5253)	(27.4384)
Depth index	86.4363***	92.6481***	98.2099***	68.0934***	91.8935***	99.8983***	99.9680***
	(12.9912)	(12.9218)	(35.3841)	(12.5599)	(12.9746)	(33.8675)	(36.5102)
Financial inclusion index	-190.7538***	-211.2908***	-240.8643***	-142.8368***	-209.2277***	-249.0442***	-244.4780***
	(34.5174)	(34.0297)	(85.6502)	(33.2573)	(34.1656)	(82.0695)	(88.8510)
Bank ROA	0.5822*	0.4924	-0.3026	0.7923**	0.4813	-1.3318	-0.7418
	(0.3527)	(0.3547)	(1.1449)	(0.3281)	(0.3577)	(1.2009)	(1.3185)
Net interest margin (%)	-0.1127	-0.1112	0.0314	-0.1548**	-0.1080	0.0518	0.0685
	(0.0785)	(0.0796)	(0.1179)	(0.0730)	(0.0804)	(0.1099)	(0.1188)
Bank cost to income ratio	-0.0867***	-0.0789***	-0.1472*	-0.0786***	-0.0820***	-0.1127	-0.1228
	(0.0239)	(0.0247)	(0.0871)	(0.0221)	(0.0251)	(0.0853)	(0.0982)
Bank concentration (%)	0.0006	-0.0020	0.0114	0.0088	-0.0068	0.0194	0.0112
	(0.0106)	(0.0106)	(0.0278)	(0.0099)	(0.0113)	(0.0270)	(0.0281)
Country Governance Index (0-1)	10.6276***	11.5514***	17.9241	7.1680**	15.8147***	13.9493	18.6743
	(4.0019)	(4.4109)	(15.0550)	(3.4949)	(3.6503)	(10.1627)	(23.2776)
Property Rights	0.0557**						
	(0.0252)						
Government Integrity		0.0507					
		(0.0380)					
Judicial Effectiveness			-0.0512				
			(0.0594)				
Tax Burden				0.2169***			
				(0.0399)			
Government Spending					-0.0099		
					(0.0166)		
Fiscal Health						-0.0416*	
						(0.0231)	
Heritage Index							-10.0320
							(20.2081)
GDP growth (annual %)	-0.0386	-0.0647	-0.0013	-0.1082*	-0.0716	0.0238	-0.0006
	(0.0623)	(0.0616)	(0.1436)	(0.0567)	(0.0624)	(0.1382)	(0.1479)
Inflation	-0.0076	-0.0071	0.0018	-0.0087	-0.0065	0.0028	0.0025
	(0.0063)	(0.0063)	(0.0082)	(0.0058)	(0.0064)	(0.0079)	(0.0084)

Constant	7.3299***	7.2025***	13.6285	-5.9618*	8.4123***	13.9601	20.9599
	(2.3248)	(2.3869)	(9.8896)	(3.3179)	(2.5467)	(9.3744)	(15.6245)
Observations	149	149	40	149	149	40	40
R-squared	0.111	0.108	0.0175	0.156	0.0941	0.00321	0.00802
Number of iden	10	10	10	10	10	10	10
Country-Year RE	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Table 6: Regression Analysis for the America Region

Default Risk: Fixed Effect estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk
Access index	2.7805	2.0956	5.6223	2.8942	0.9742	2.2762	0.5089	0.7396
	(5.4087)	(5.2081)	(5.1989)	(5.0858)	(7.8021)	(5.2528)	(5.4037)	(7.7968)
Use index	7.3858	5.1117	9.9167**	6.2132	12.3048	4.7351	2.6754	11.2837
	(5.1042)	(4.9109)	(4.8875)	(4.7699)	(10.2693)	(5.0241)	(5.3296)	(10.4613)
Depth index	5.0380	4.5988	7.3158*	2.8944	9.4250	3.9534	2.2254	8.6455
	(4.2641)	(4.0791)	(4.0932)	(4.0102)	(6.6389)	(4.1813)	(4.3037)	(6.4596)
Financial inclusion index	-17.1099	-10.9745	-22.9538	-11.7115	-10.5033	-10.4185	-7.2688	-8.8772
	(14.9447)	(14.3519)	(14.2366)	(13.9845)	(25.0702)	(14.4829)	(15.0456)	(25.0794)
Bank ROA	2.4804***	2.6821***	2.3540***	2.4285***	1.1125	2.5758***	2.3453***	1.0219
	(0.4774)	(0.4644)	(0.4532)	(0.4480)	(1.1377)	(0.4671)	(0.4704)	(1.1111)
Net interest margin (%)	0.3373***	0.3259***	0.3438***	0.2928***	0.0997	0.3689***	0.3636***	0.1236
	(0.0808)	(0.0755)	(0.0739)	(0.0749)	(0.1567)	(0.0761)	(0.0765)	(0.1378)
Bank cost to income ratio (%)	-0.0697*	-0.0790**	-0.0499	-0.0296	0.1415	-0.1068***	-0.0909**	0.1367
	(0.0363)	(0.0349)	(0.0349)	(0.0357)	(0.0882)	(0.0389)	(0.0366)	(0.0851)
Bank concentration (%)	-0.0092	-0.0106	0.0028	-0.0072	0.1390***	-0.0009	-0.0042	0.1274***
	(0.0206)	(0.0196)	(0.0195)	(0.0191)	(0.0371)	(0.0202)	(0.0200)	(0.0323)
Country Governance Index (0-1)	14.8045**	6.1916	9.0845	10.4489	-3.9143	17.0443**	13.8638**	-4.0858
	(6.9310)	(7.2694)	(6.7802)	(6.6079)	(9.6569)	(7.4951)	(6.8105)	(9.0857)
Property Rights	0.0141							
	(0.0161)							
Government Integrity		0.1138***						
		(0.0366)						
Tax Burden			0.2013***					
			(0.0559)					
Government Spending				0.0547***				
				(0.0140)				
Fiscal Health					-0.0096			
					(0.0178)			
Labor Freedom						-0.0214		
						(0.0248)		
Monetary Freedom							0.0854**	
							(0.0388)	
Heritage Index								-7.7911
								(12.0710)
GDP growth (annual %)	0.0131	0.0117	0.0204	0.0078	0.0382**	0.0064	0.0040	0.0372**
	(0.0256)	(0.0246)	(0.0244)	(0.0241)	(0.0161)	(0.0257)	(0.0253)	(0.0162)
Inflation	-0.1447***	-0.1050**	-0.1551***	-0.0974**	0.0469	-0.1307***	-0.1260***	0.0319
	(0.0475)	(0.0469)	(0.0451)	(0.0458)	(0.2452)	(0.0469)	(0.0469)	(0.2202)
Constant	7.9713*	7.9794*	-6.6916	3.9200	-2.8429	9.4459**	3.5670	6.5080
	(4.5238)	(4.3535)	(5.9275)	(4.3803)	(7.5174)	(4.6502)	(4.8811)	(13.4707)
Observations	132	132	132	132	36	129	132	36
R-squared	0.619	0.647	0.656	0.663	0.9018	0.638	0.632	0.903
Number of iden	9	9	9	9	9	9	9	9
Country-Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 7: Regression Analysis for the Asia Region

Default Risk: Fixed Effect estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk
Access index	-5.9910	-1.4039	21.6652	-2.0346	-3.1752	36.0196**	-2.2822	33.7054*
	(6.8412)	(6.5630)	(13.9865)	(6.6895)	(6.6719)	(15.8165)	(6.6710)	(15.5752)
Use index	-13.6141	-9.3696	20.8047	-10.9430	-10.6021	44.2479	-10.6309	37.2195
	(10.3393)	(10.2521)	(23.0959)	(10.4261)	(10.3465)	(26.4149)	(10.4166)	(26.4014)
Depth index	-5.9110	-4.6742	28.2447**	-5.9547	-6.0968	41.1986**	-5.4481	35.4986**
	(6.6868)	(6.6946)	(12.6720)	(6.8695)	(6.7658)	(15.4030)	(6.8062)	(14.8184)
Financial inclusion index	35.2311*	19.0818	-84.6187	25.4734	24.9919	-135.0792*	24.8051	-125.1110*
	(19.5736)	(19.0335)	(53.5564)	(19.2464)	(19.0320)	(62.2837)	(19.1534)	(60.8033)
Bank ROA	1.7117***	1.5906**	0.7326	1.5304**	1.3879**	1.3591	1.5872**	1.0198
	(0.6207)	(0.6143)	(2.0603)	(0.6259)	(0.6325)	(2.5508)	(0.6315)	(2.4764)
Net interest margin (%)	1.0520***	1.0668***	1.0157**	1.0959***	1.0997***	0.9499*	1.0835***	0.9076*
	(0.3388)	(0.3380)	(0.3958)	(0.3440)	(0.3415)	(0.4867)	(0.3449)	(0.4825)
Bank cost to income ratio (%)	0.0675	0.0524	-0.0592	0.0544	0.0418	-0.0614	0.0572	-0.0766
	(0.0489)	(0.0484)	(0.1695)	(0.0493)	(0.0499)	(0.2102)	(0.0495)	(0.2038)
Bank concentration (%)	0.0577***	0.0725***	0.0653**	0.0662***	0.0715***	0.0586*	0.0648***	0.0689**
	(0.0162)	(0.0157)	(0.0249)	(0.0159)	(0.0160)	(0.0311)	(0.0163)	(0.0310)
Country Governance Index (0-1)	25.7967**	12.4133	-8.8127	18.9948*	22.6547**	-9.5862	17.2988	-1.1102
	(11.3202)	(11.1144)	(25.1718)	(10.9503)	(11.2821)	(32.7558)	(11.1470)	(30.2589)
Property Rights	-0.0618*							
	(0.0317)							
Government Integrity		0.0882**						
		(0.0440)						
Judicial Effectiveness			0.0728**					
			(0.0296)					
Tax Burden				-0.0262				
				(0.0741)				
Government Spending					-0.0452			
					(0.0358)			
Fiscal Health						-0.0080		
						(0.0138)		
Business Freedom							0.0180	
							(0.0348)	
Heritage Index								11.3003
								(13.0662)
GDP growth (annual %)	-0.1157*	-0.0742	0.0198	-0.0984	-0.0989	-0.0105	-0.0893	-0.0042
	(0.0660)	(0.0660)	(0.0517)	(0.0668)	(0.0660)	(0.0615)	(0.0674)	(0.0610)
Inflation	0.0822*	0.0543	-0.0950*	0.0622	0.0654	-0.0667	0.0627	-0.0438
	(0.0444)	(0.0431)	(0.0476)	(0.0440)	(0.0436)	(0.0567)	(0.0439)	(0.0585)
Constant	-11.9771**	-10.3882*	12.9041	-8.4654	-7.9668	16.8564	-11.0524*	2.1538
	(5.5970)	(5.5279)	(10.8689)	(7.7396)	(5.9003)	(14.0044)	(5.7928)	(19.2109)
Observations	123	123	31	123	123	31	123	31
R-squared	0.4354	0.437	0.968	0.415	0.423	0.9514	0.4161	0.953
R-squared	0.435	0.4366	0.9677	0.4153	0.4235	0.951	0.416	0.9531
Number of iden	8	8	8	8	8	8	8	8
Country-Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Table 8: Regression Analysis for the Europe Region

Default Risk: Random Effect estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk	DefaultRisk
Access index	10.5816	3.4950	-36.0229	-9.9886	3.1137	-60.3706***	4.9326	-47.2576**
	(10.7973)	(10.8310)	(22.8545)	(10.3849)	(10.6809)	(21.4057)	(10.5504)	(23.6573)
Use index	5.2457	-0.3947	-23.9211**	-8.7291	-0.8094	-24.0062***	0.4064	-27.1464***
	(8.6851)	(8.6855)	(9.6456)	(8.2046)	(8.6078)	(8.4866)	(8.4835)	(9.8120)
Depth index	46.0169***	43.9973***	16.2504	33.4957***	43.8742***	11.3264	40.6377***	17.5336
	(8.0343)	(8.2552)	(17.9662)	(8.0101)	(8.2136)	(15.9675)	(8.2732)	(18.1222)
Financial inclusion index	-50.9318*	-36.0628	71.3241	-8.9040	-35.4358	87.6658**	-34.8604	78.1177
	(27.0130)	(27.1331)	(47.3476)	(25.8850)	(27.0650)	(41.9921)	(26.6546)	(47.7163)
Bank ROA	1.5901***	1.6570***	1.1479	1.2097***	1.6287***	-0.1540	1.5639***	0.5062
	(0.3520)	(0.3671)	(0.7323)	(0.3500)	(0.3615)	(0.7895)	(0.3578)	(0.8735)
Net interest margin (%)	-0.4713	-0.5175	-0.4683	0.4096	-0.5488	0.2352	-0.6007	0.1006
	(0.5432)	(0.5633)	(0.7129)	(0.5619)	(0.5580)	(0.6440)	(0.5502)	(0.7654)
Bank cost to income ratio (%)	0.0406	0.0622	0.1080	-0.0536	0.0361	-0.0254	0.0547	0.0317
	(0.0411)	(0.0415)	(0.0688)	(0.0470)	(0.0529)	(0.0739)	(0.0408)	(0.0842)
Bank concentration (%)	-0.0670**	-0.0656*	-0.1298*	-0.0338	-0.0638*	-0.1174*	-0.0742**	-0.1818**
	(0.0339)	(0.0349)	(0.0696)	(0.0331)	(0.0349)	(0.0617)	(0.0346)	(0.0790)
Country Governance Index (0-1)	-5.1310	15.2716	14.3418	-8.4292	11.0332	-20.1997	25.5657**	10.3064
	(13.7510)	(15.4012)	(19.6310)	(12.1046)	(12.3677)	(17.4563)	(12.9448)	(18.7820)
Property Rights	0.1132**							
	(0.0451)							
Government Integrity		-0.0085						
		(0.0715)						
Judicial Effectiveness			-0.1065					
			(0.0782)					
Tax Burden				-0.2068***				
				(0.0489)				
Government Spending					-0.0272			
					(0.0349)			
Fiscal Health						-0.1003***		
						(0.0367)		
Business Freedom							-0.1244**	
							(0.0634)	
Heritage Index								-33.0744
								(26.5328)
GDP growth (annual %)	0.1925*	0.1502	0.2401**	0.1519	0.1529	0.2364**	0.1214	0.1636
	(0.1045)	(0.1093)	(0.1195)	(0.0984)	(0.1061)	(0.1041)	(0.1058)	(0.1240)
Inflation	-0.3446**	-0.3122*	0.0669	-0.3372**	-0.3073*	-0.3535	-0.3112*	0.1382
	(0.1754)	(0.1825)	(0.7112)	(0.1665)	(0.1795)	(0.6414)	(0.1768)	(0.7222)
Constant	7.2475	0.5896	3.7676	34.7221***	5.5744	38.0290**	3.9788	48.1961
	(8.0107)	(8.6072)	(11.4111)	(10.7712)	(9.7678)	(14.9428)	(7.8484)	(34.7403)
Observations	118	118	31	118	118	31	118	31
R-squared	0.173	0.148	0.233	0.177	0.157	0.201	0.142	0.298
Number of iden	8	8	8	8	8	8	8	8
Country-Year RE	YES	YES	YES	YES	YES	YES	YES	YES

The third dimension, the depth index, shows positive significance across all four regions. The impact of the financial inclusion index on bank stability indicates that in the African region, a percentage increase in the financial inclusion index may decrease bank stability, ranging from 142.8368% to 249.0442% in models 4 and 6, respectively. Similar patterns are observed in the other three regions. For instance, the American region shows negative significance at the 10% level in model 11. Additionally, the Asian region also shows negative significance at the 10% level in models 6 and 13, while the European region displays negative significance at the 10% level in models 1 and 9. These findings suggest that financial inclusion can sometimes reduce bank stability, contradicting our hypothesis (H1) and opposing the findings of Ahamed & Mallick (2019) and López & Winkler (2019).

From a profitability perspective, ROA and NIM exhibit positive significance for bank stability across all four regions. For example, in Africa, ROA is positively significant at the 10% level in model 1 and at the 5% level in model 4. In the American region, both ROA and NIM show positive significance for bank stability at the 1% level in all models except models 3, 6, and 13. The European region shows positive significance for ROA in all models except 3, 6, and 13. In Asia, ROA is significantly positive at the 1% level in models 1 and 10, and NIM is significantly positive in models 1, 2, 4, 5, 7, 8, 9, 11, and 12 at the 1% level. These results support our hypothesis (H2) that bank profitability increases the stability of the banking sector, consistent with the findings of Ali (2015), Borio (2003), Le & Ngo (2020), and Mkadmi et al. (2021).

Regarding the Country Governance Index (CGI), it is observed that in Africa, a percentage increase in CGI leads to increased bank stability, ranging from 7.1680% to 20.2229% in models 4 and 11, respectively. A similar result is found for countries in the Americas. In Asia, an increase in CGI improves bank stability from 18.9948% to 34.3577% in models 4 and 9, respectively. The estimates are consistent for countries in Europe as well. Thus, the results across all four regions support hypothesis (H3), aligning with the findings of Boehmer et al. (2005), D'Souza et al. (2005), and Shen et al. (2014). Considering the 12 dimensions of economic freedom, in Africa, tax burden has a positive significance at the 1% level, and property rights and business freedom have a positive association with bank stability at the 5% level. However, fiscal health and investment freedom exhibit a negative association at the 10% level.

In the American region, government integrity, tax burden, government spending, and investment freedom show positive significance at the 1% level, while monetary freedom is significant at the 5% level. In Asia, bank stability is positively influenced by trade freedom, government integrity, judicial effectiveness, and investment freedom; however, monetary policy and inadequate protection of property rights can reduce bank stability. In the European region, monetary freedom, financial freedom, and property rights are positively associated with bank stability, while tax burden, fiscal health, trade freedom, and business freedom show negative significance. Overall, although each economic freedom

indicator affects bank stability to some extent in all four regions, the Heritage Index, which combines the 12 dimensions, shows no statistical significance for banking stability in any of the regions. Therefore, the results do not support hypothesis (H4).

Additionally, concerning bank-specific control variables, the cost-to-income ratio has adverse effects on the banking industries in Africa and the Americas. However, it is favorable for Asia and has no significant impact on Europe. Bank concentration has a positive relationship in the Americas and Asia, while it shows negative significance in all European models. Regarding macroeconomic indicators, higher inflation has a negative impact on the banking industry in the Americas and Europe, while annual GDP growth has a positive effect. However, higher GDP growth appears to decrease banking stability in Africa and Asia. Table 9 summarizes the contributions of this study.

Table 9: A synopsis of the differences between the current study and the similar earlier studies on financial inclusion, economic freedom, country governance index, bank profitability, and bank stability

Authors	**Study findings**	**Sector & observations**	**Study economy**	**Study gaps**			
				Financial Inclusion	**Heritage Index (12 dimensions of economic freedom)**	**Country Governance**	**Bank Profitability**
Ahamed & Mallick (2019)	A higher level of financial inclusion contributes to greater bank stability.	Banking sector (2600 banks)	International	Yes	No	Yes	No

Asteriou et al. (2021)	Banna & Alam (2021)	Alvi et al. (2020)	Nguyen & Du (2022)	**Authors**	
Greater economic freedom boosts profitability and banking stability.	Digital financial inclusion brings banking stability.	Statistically and empirically significant positive effect of financial inclusion on bank stability.	The index of financial inclusion has a positive relationship with Z-score.	**Study findings**	
Banking sector (326 banks)	Banking sector (574 banks)	Banking sector (88 banks)	Banking sector (102 banks)	**Sector & observations**	
Eurozone Area	Emerging Asia	South Asian Region	Association of Southeast Asian Nations (ASEAN)	**Study economy**	
No	Yes	Yes	Yes	**Financial Inclusion**	**Study gaps**
Yes	No	No	No	**Heritage Index (12 dimensions of economic freedom)**	
Yes	Yes	No	No	**Country Governance**	
Yes	No	No	No	**Bank Profitability**	

Our study	Danisman & Tarazi (2020)	**Authors**	
Financial inclusion has a negative relationship with bank stability. The country governance index and bank profitability show a positive association, whereas economic freedom does not exhibit any significant relationship with bank stability.	The banking industry is being stabilized by advances in financial inclusion, including increased account ownership and the adoption of digital payments.	**Study findings**	
Banking sector (42 countries' banks)	Banking sector (4168 banks)	**Sector & observations**	
Africa, America, Asia, and Europe Region	Europe	**Study economy**	
Yes	Yes	**Financial Inclusion**	**Study gaps**
Yes	No	**Heritage Index (12 dimensions of economic freedom)**	
Yes	No	**Country Governance**	
Yes	No	**Bank Profitability**	

5. Conclusions, implications, and limitations

Between 2004 and 2020, this study examines how financial inclusion, economic freedom, the Country Governance Index, and profitability affect the stability of banks across four regions (Africa, America, Asia, and Europe) encompassing 42 countries. While only a few empirical studies have explored the impact of financial inclusion or economic freedom on bank stability, our study uniquely assesses the combined effects of financial inclusion, economic freedom, the Country Governance Index, and profitability on bank stability across these regions. We also include the cost-to-income ratio and bank concentration in our analysis. Our findings indicate that financial inclusion, our primary variable, has a negative significance on bank stability, which is a novel result in this study. This suggests that the financial inclusion index can sometimes reduce bank stability.

Additionally, both the Country Governance Index and bank profitability have a positive impact on bank stability, indicating that higher profitability and improved governance contribute to enhanced bank stability across the 42 countries. Conversely, economic freedom shows an insignificant relationship with banking stability, which contradicts our hypothesis and represents a new finding in our analysis. Furthermore, the leverage ratio and long-term debt exhibit a negative significance with bank stability, indicating that higher total or long-term debt reduces bank stability in 12 Western Asian countries. Estimates reveal that the cost-to-income ratio negatively impacts the banking industries in Africa and America. At the same time, it is beneficial for Asian countries and has no significant effect on Europe. Additionally, our findings show a statistically positive relationship between bank concentration and bank stability in American and Asian countries, whereas a negative significance is observed in Europe.

Overall, our findings contribute to the existing literature by examining the impact of financial inclusion, economic freedom, the Country Governance Index, and profitability on bank stability, providing new and significant insights. Our study is notable for several reasons. First, it aligns with previous research on bank stability across 42 countries. Second, rather than focusing on a single country, we examine the effects on bank stability across 42 countries from four different regions (Africa, America, Asia, and Europe). Finally, our study spans the period from 2004 to 2020, encompassing some of the most significant developments in the global financial system in recent years.

The results of this paper reveal a negative impact of financial inclusion on bank stability, which is a new finding for our study. Banks across various regions should be aware of how financial inclusion can affect their stability. Measures of profitability, represented by return on assets (ROA) and net interest margin (NIM), show a significant positive association with bank stability, suggesting that banks should enhance their profitability to improve stability within the industry. Additionally, the Country Governance Index (CGI) shows a positive and significant association with bank stability across various countries, suggesting that banks should prioritize improving governance to maintain stability amid

competition. Conversely, the Heritage Index reveals no significant impact on bank stability, indicating that the cultural aspects of banks do not significantly influence their stability. There are also variations in results for bank-specific control variables. The cost-to-income ratio negatively affects the banking industries in Africa and America, while it is favorable for Asian nations and has no significant impact on Europe. This finding suggests that a higher cost-to-income ratio is associated with lower stability in African and American banks. Furthermore, a statistically significant positive relationship between bank concentration and stability is observed in American and Asian countries, implying that more concentrated banks in these regions tend to be more stable.

Despite the diverse regional sample of banks included in our study and the incorporation of key variables related to bank stability, our study has some limitations. First, our study utilized a broad definition of financial inclusion, deliberately excluding the digital aspect. Digital financial inclusion, such as advancements in online money transfers, is increasingly expanding banks' activities, particularly among younger users. Second, future research could benefit from examining how banks interact with BigTech companies and exploring whether banks enhance their digitalization, production, or service costs. Third, a more comprehensive comparative analysis would be valuable if the study included all countries within these regions and additional regions. This was limited in our study due to data availability. Finally, extending the analysis period would offer more robust insights, but this was not feasible due to data constraints.

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