EJEM
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Economic Journal of Emerging Markets
Available at https://journal.uii.ac.id/jep

Impact of financial inclusion and institutional quality on banking stability: Lessons from the Asia region

Rindang Nuri Isnaini Nugrohowati[1*], Jannahar Saddam Ash Shidiqie[2]

[1,2]Department of Economics, Universitas Islam Indonesia, Yogyakarta, Indonesia
[*]Corresponding author: rindangnuri@uii.ac.id

Article Info

Article history:
Received 27 August 2024
Accepted 22 April 2025
Published 23 April 2025

JEL Classification Code:
G20, G21, G28, E52

Author's email:
jannahar.saddam@uii.ac.id

DOI:
10.20885/ejem.vol17.iss1.art2

Abstract

Purpose — This study examines the effects of financial inclusion and institutional quality on bank stability. It first examines the effects of banking on the whole Asian region and then the region according to income categories.

Method — We use aggregate data from 2013 to 2021 to investigate banking stability in 39 Asian countries and apply the generalized method of Moments (GMM), specifically the first difference GMM and system GMM. In addition, this research uses Principal Component Analysis (PCA) to measure the composite variables of the financial inclusion index and institutional quality index.

Findings — The findings demonstrate that overall financial inclusion has a favourable effect on Asian nations' banking systems. However, an examination based on income categories reveals some intriguing results: financial inclusion improves bank stability in lower- and upper-middle-income countries but does not affect high-income countries. In lower-middle-income countries, institutional quality has a detrimental effect on bank stability; in upper-middle-income and high-income countries, it has no effect.

Implications — The availability of financial services to households and small and medium-sized enterprises (SMEs) significantly impacts the stability of Asian banks. Several policy recommendations are feasible to implement, including the need for collaboration between banks and the government to broaden banking services to all communities, particularly in lower-middle-income nations.

Originality — Analyzing the differences in the impact of institutional quality and financial inclusion variables on banking stability in Asian countries according to income categories.

Keywords — bank stability, financial inclusion, institutional quality, Asia region

Introduction

First introduced in 2005, financial inclusion stole the attention of many researchers and policymakers. Financial inclusion can be understood to mean that any economic operator can access and use formal financial services. In other words, financial inclusion means that every adult, including the poor and low-income community, has access to a range of affordable financial services (Kumar et al., 2021). In addition, financial inclusion is also marked by changes and technological advances in the financial sector, such as new service products and payment methods. The phase of financial inclusion can begin with having a deposit account, making and receiving

P ISSN 2086-3128 | E ISSN 2502-180X

payments, and making transactions with a bank or other financial service provider. The next stage, financial inclusion, includes access to credit from formal financial institutions (Demirgüç-Kunt et al., 2020). In addition to boosting economic growth (Claessens & Perotti, 2007; Allen et al., 2016), financial inclusion contributes to increased investment (Dupas & Robinson, 2013), helps macroeconomic stability (Mehrotra & Yetman, 2015), and reduces income inequality and poverty (Demirgüç-Kunt et al., 2020). A more financially inclusive country will have better financial stability and more effective monetary policy (Mehrotra & Yetman, 2015).

With an emphasis on banks, several academics contend that account ownership via financial inclusion gives people access to a stable source of income, which boosts retail deposits at banks, lowers financing costs, and improves stability. However, opponents contend that financial inclusion would force banks to offer high-risk credit. According to Brunnermeier (2009). This may result in higher transaction costs, higher credit risk, and lower profitability. This reasoning is consistent with studies by Khan (2011) and Dupas et al. (2019) which discovered a negative link between bank stability and financial inclusion. However, according to Ahamed and Mallick (2019). There isn't any empirical data demonstrating a direct link between financial inclusion and bank stability. Therefore, questions remain regarding the contribution of financial inclusion to the economy and how it affects bank stability. These discrepancies in findings motivate scholars to conduct more research on the contribution that financial inclusion makes to the financial industry, particularly the banking industry.

In addition to financial inclusion, the quality of institutions is also seen to have an impact on improving bank stability (Bermpei et al., 2018). So far, research has focused only on the relationship between financial inclusion and bank stability. On the other hand, research that measures the correlation between financial inclusion, institutional quality, and bank stability (Ahamed & Mallick, 2019; Jungo et al., 2022). It is still quite limited. The study attempts to fill the gap by examining the influence of financial inclusion variables and institutional quality on the stability of banks in Asian countries. Good institutional quality indicates the proper implementation and formulation of policies, which can reduce the negative impact of economic shocks (Fazio et al., 2018). According to the literature on political economics, there is a positive correlation between institutional quality and economic development. Vigorous law enforcement and a corruption-free economy are some indicators of institutional quality that can guarantee accountability and stability in the financial sector. By implementing an adequate financial regulatory and supervisory framework, the quality of institutions can be ensured that the economic system can operate efficiently (Gazdar & Cherif, 2015; Uddin et al., 2020).

Research investigating the relationship between financial inclusion and financial stability is divided into two groups. The first type of research supports the notion that financial inclusion improves the banking sector's stability. In contrast, the second type of study endorses the idea that increased inclusion will disrupt banking stability. Feghali et al. (2021) researched various countries to determine the relationship between financial inclusion and bank stability. His study showed that financial inclusion positively impacted stability, including increased access to savings accounts and payments. On the contrary, financial inclusion in the form of extended access to credit could undermine stability if credit growth does not consider the ability of customers to repay. Studies conducted Vo et al. (2021), Elgharib (2024), Sethy and Goyari (2022), and Boachie et al. (2023) show empirical evidence that increased financial inclusion through access to banking facilities improves the banking sector's stability and resilience.

Based on previous literature, the positive impact of financial inclusion on bank stability can be explained by several reasons. First and foremost, financial inclusion can allocate resources optimally. One of the main features of financial inclusion is low cost, wide coverage, and sustainability. It shows that individuals, such as small and micro enterprises and rural residents, can access and use financial services, enabling communities to allocate resources optimally and contribute to economic growth and justice (Hannig & Jansen, 2010; Hua et al., 2023). Second, risk diversification increases with financial inclusion. Financial inclusion offers basic services such as account opening, deposits, withdrawals, and regular payments. Later, gradually, formal financial institutions started offering credit services like loans. For individuals, financial inclusion increases

the depository base and the prospect of borrowers (Mehrotra & Yetman, 2015), so increased savings make banks more resilient to risk (Hannig & Jansen, 2011). For small and micro-businesses, an increase in the number of borrowers can improve financial stability by reducing the ratio of problematic credit and the rate of failure to repay financial institutions (Morgan & Pontines, 2018). Most of the users of financial inclusion are small savers who usually keep their money during times of crisis. Therefore, countries with broader coverage of financial inclusion have more stable financial conditions due to reduced savings when the crisis is relatively small (Han & Melecky, 2013). Thirdly, financial inclusion reduces the dependence of capital seekers on informal financial institutions. Informal funding is essential in distributing funds to small and micro enterprises, rural populations, and other groups. However, without proper regulation and supervision, an increase in credit transactions in informal financial institutions can lead to systemic risk (Hua et al., 2023). In other words, financial inclusion reduces dependence on the expensive informal financial sector and improves the health of the small, the household sector, and even the corporate sector. Fourthly, financial inclusion helps people switch from cash transactions to supervised bank accounts. It contributes to preventing money laundering because banks can monitor and report suspicious transactions related to financial transactions in the economy (Khan, 2011).

On the other hand, several researchers have found several possible causes of the adverse effects of financial inclusion. First, financial inclusion allows financial institutions to innovate, such as digital finance backed by artificial intelligence. Fintech innovations not supported by proper regulation and supervision can jeopardize financial stability, especially if innovations are carried out with a bad motivation to pursue profits and ignore existing regulations (Financial Technology Board, 2017). Second, increased financial inclusion can lead to excessive credit expansion. Excessive credit is when the funds given to the borrower exceed their needs. The financial institution may have given loans to specific borrowers several times so that the client's rating matrix works better. Excessive credit to those who can't pay the loan will spoil the financial system and increase the risk of failure to pay (Jia et al., 2021). In addition, Drehmann et al. (2012) financial risks could spread from individual to industry if all financial institutions lowered the borrowing threshold, ultimately accumulating systemic risk and triggering a financial crisis. In addition to financial inclusion, institutional quality factors can affect bank stability. Malik et al. (2022) investigated how the quality of governance affects financial stability and increased financial inclusion. His research shows that the quality of institutions contributes negatively to financial inclusion but positively impacts bank stability. Nguyen et al. (2018) conducted a growing state study from 2002 to 2013, his research found that good institutional quality drives higher credit rates in banking. In this context, the quality of institutions reduces the problem of information asymmetry, which means that banks will give credit to qualified customers and tend not to engage in risky projects. Therefore, improved institutional quality can reduce the risk of moral hazard and improve bank stability (Ho et al., 2019).

Similar findings were reported by Jungo et al. (2022), who confirmed that the reduction of credit risk and bank stability was mainly attributed to the financial inclusion and strengthening of institutional variables, including corruption and the rule of law. The financial impact of inclusion is more pronounced in countries with strong governance, as stated by Saha and Dutta (2020). Focus on developing countries Wang and Luo (2022) They also conducted the same study and found that the relationship between financial inclusion and bank stability depends on business cycles, financial systems, governmental intensity, and policy environments. Sayılır et al. (2018) investigated the great benefits of institutional quality to the economic progress of a country. His research confirms that the quality of institutions impacts financial growth and economic growth, where effective governance accelerates progress in the banking sector (Law & Azman-Saini, 2012). However, Hoinaru et al. (2020) found the opposite result: low governance, like corruption, benefited the country's development.

This research is focused on Asian countries, as the banking sector plays an important role in driving economic development in these countries. Asia has become the most significant economic and trade area in the world. Between 2015 and 2021, Asia contributed 57% of global GDP growth. Besides, Asia has a relatively large banking system that can be seen from the bank

credit markets, reaching 61%, twice as much as the United States' 31% (Seong et al., 2023). Although Asian banking has excellent prospects for strong growth, policymakers face the challenge of ensuring that economic and financial development is fair and inclusive, where small incomes and UMKM have access to financial services (Le et al., 2019). Demirgüç-Kunt et al. (2022) pointed out that there are significant differences in the level of bank account ownership across Asian countries. For example, account ownership in low-income countries ranges between 6%, in low-middle-income countries 21%, in upper-middle-income countries 96%, and in high-income countries 100%.

Research Method

Data Description

The study uses aggregate data from 39 Asian countries from 2013 to 2021. The variables used in this study are presented in the Table 1.

Table 1. Research Variable

Variables	Definition	Sources
Financial stability	Z-score= (ROA + EA)/(σ(ROA)) With: EA is equity/total assets	World Governance Indicators
Financial Inclusion	Number of commercial bank branches per 100,000 adults	Financial Access Survey
Financial Inclusion	Institutions of Commercial Banks	Financial Access Survey
Financial Inclusion	Outstanding deposits with commercial banks (% of GDP)	Financial Access Survey
Financial Inclusion	Outstanding loans from commercial banks (% of GDP)	Financial Access Survey
Institutional quality	Government Effectiveness	World Governance Indicators
Institutional quality	Rule of Law	World Governance Indicators
Institutional quality	Control of Corruption	World Governance Indicators
Institutional quality	Voice and accountability	World Governance Indicators
Institutional quality	Regulatory quality	World Governance Indicators
Institutional quality	Government effectiveness	World Governance Indicators
Control Variable		
Mobile Phone	Mobile cellular subscriptions (per 100 people)	Financial Access Survey
Inflation (CPI)	Inflation as measured by the consumer price index	World Governance Indicators
Gross Domestic Product (GDP)	Annual GDP Growth	World Governance Indicators

Principal Component Analysis (PCA)

Principal Component Analysis (PCA) reduces extensive data sets to be represented by smaller variables (Bartholomew, 2010; Dray & Josse, 2015). This technique helps convert data groups that have high correlations into non-correlated indicators (Asongu & Nnanna, 2019). By doing that, the PCA reduces the data size for analysis. In addition, the additional advantage of PCA lies in its ability to identify the similarities and differences between the various models made (Yoshino & Hesary, 2015). This study uses the PCA technique to extract financial inclusion and institutional quality data. The financial inclusion index is measured using four indicators, namely the number of ATMs per 100,000 adults, the number of bank branches per 100000 adults, Outstanding deposits with commercial banks (% of GDP), Outstanding loans from commercial Banks (%), and institutional quality data consisting of Political Stability, Rule of Law, Control of Corruption, Voice and accountability, Regulatory quality, Government effectiveness. Before performing the PCA, the procedure is to measure Kaiser Meyer Olkin (KMO) with the condition that the PCA technique is considered appropriate when it has a value of KMO more than 0.5. The test results show that the

indicator of financial inclusion has a value of CMO 0.589, and the institutional quality has a value of 0.86; the figure is more than 0.5, so it is generally considered appropriate.

The next test is a rotation solution for four financial inclusion indicators, with the results shown in Table 3. A component can be retained when the Eigenvalue exceeds 1.0 or represents a cumulative variance of more than 60 percent (Banda & Kumarasamy, 2020; Malik et al., 2022). The financial inclusion indicator has two Eigenvalue components worth more than 1.0 and represents variations of about 56.29 percent and 26.68 percent, with a cumulative variation of 82.98 percent. The weight extracted for each indicator is shown in Table 4 (Malik et al., 2022; Jima & Makoni, 2023; Seifelyazal et al., 2023).

$$Fin_{it} = \big((0.4513 * \text{ICB}) + (0.0849 * \text{NCB}) + (0.6347 * \text{OD}) + (0.6215 * \text{OL})\big) + \big((-0.3907 * \text{ICB}) + (0.9129 * \text{NCB}) + (0.0516 * \text{OD}) + (0.1064 * \text{OL})\big) \quad (1)$$

Fin is the financial inclusion index of country i in Asia in year t, ICB is the Institution of commercial banks, NCB is the Number of commercial bank branches, OD is the Outstanding deposits, and OL is the outstanding loans.

Table 2. KMO and Bartlett's Test of Financial Inclusion

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.589
Bartlett test of sphericity	
Chi-square	717.261
df	6
p-value	0.000

Table 3. Result of Principal Component Analysis (PCA) Financial Inclusion

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.251	1.184	0.562	0.562
Comp2	1.067	0.475	0.266	0.829
Comp3	0.591	0.501	0.147	0.977
Comp4	0.089		0.022	1

Table 4. Principal component analysis: Eigenvectors (loadings) Financial Inclusion

Name	Comp1	Comp2	Comp3	Comp4	Unexplained
Institution of commercial banks	0.451	-0.390	0.799	0.068	0
Number of commercial bank branches	0.084	0.912	0.399	-0.010	0
Outstanding deposit	0.634	0.051	-0.271	-0.721	0
Outstanding loan	0.621	0.106	-0.357	0.688	0

Meanwhile, one component has an Eigenvalue of more than 1.0 for the Institutional Quality indicator with a cumulative value of 78.98 percent, as seen in Table 4. Next, build up the composite variable IQ that shows the institutional Quality Index with the weight given to the first component is 0.4390 for Government Effectiveness (GF), 0.3448 for Political Stability (PS), 0.4335 for Regulatory Quality (RQ), 0.4506 for Rule of Law (RL), 0.3182 for Voice and Accountability (VA), 0.4429 for Control of Corruption (CC).

$$IQ_{it} = (0.4390 * \text{GF}) + (0.3448 * \text{PS}) + (0.4335 * \text{RQ}) + (0.4506 * \text{RL}) + (0.3182 * \text{VA}) + (0.4429 * \text{CC}) \quad (2)$$

Table 5. KMO and Bartlett's Test of Institutional Quality

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.868
Bartlett test of sphericity	
Chi-square	2886.204
df	15
p-value	0.000

Table 6. Result of Principal Component Analysis (PCA) Institutional Quality

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.738	4.0463	0.789	0.789
Comp2	0.692	0.328	0.115	0.905
Comp3	0.363	0.243	0.060	0.965
Comp4	0.120	0.070	0.020	0.986
Comp5	0.050	0.016	0.008	0.994
Comp6	0.033		0.005	1

Table 7. Principal component analysis: Eigenvectors (loadings)

Name	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexplained
Government Effectiveness	0.439	-0.084	-0.363	0.050	0.806	0.125	0
Political Stability	0.344	-0.615	0.685	0.169	0.039	0.050	0
Regulatory Quality	0.433	0.072	-0.313	0.705	-0.436	0.143	0
Rule of Law	0.450	-0.026	-0.117	-0.252	-0.155	-0.833	0
Voice and Accountability	0.318	0.779	0.520	0.031	0.134	0.039	0
Control of Corruption	0.442	-0.041	-0.121	-0.637	-0.340	0.514	0

Generalized method of moments (GMM)

A dynamic panel data model was required due to the panel data's bigger cross-section and smaller time dimension. When evaluating traditional estimators such as pooled OLS (fixed effect and random effect), increasing the cross-section does not remove the correlation issue, and the estimator is biased upwards. Additionally, due to the presence of correlation among the regressors, random effects are not suitable (Blundell & Bond, 1998; Harris et al., 2008; Law, 2009; Okui, 2009; Hayakawa, 2019; Farzana et al., 2024). The study adopted an Augmented Solow Growth Model conducted by (Mankiw et al., 1992) which was further developed by (Knowles & Owen, 1995) to measure the impact of financial inclusion and institutional quality on bank stability. The research model is as follows:

$$BS_{i,t} = \alpha_0 + \alpha_1 BS_{i,t-1} + \alpha_2 Fin_{it} + \alpha_3 IQ_{it} + \alpha_4 MP_{it} + \alpha_5 GDP_{it} + \alpha_6 Inf_{it} + \varepsilon_{i,t} \quad (3)$$

Where $BS_{i,t}$ denotes Bank Stability, Fin_{it} is the Financial Inclusion Index, IQ_{it} represents Institutional Quality. The variable MP_{it} is a Mobile Phone, GDP_{it} refers to Gross Domestic Product (GDP), and Inf_{it} captures the inflation rate.

This study uses the Generalized Method of Moments (GMM) for some reason that appears in the estimates. Levine and Renelt (2016) criticized cross-sectional regression methods because they were susceptible to the independent variables included. In other words, the estimated parameter changes significantly when one or more variables are inserted or removed from the model. There are two commonly used GMM estimation models: the first difference GMM and the GMM system. Some model specification tests must be performed in GMM analysis to get a valid and consistent result. The first test assesses the validity of a model by looking at the results of the values of AR (1) and AR (2), which are the p-values for first and second-order autocorrelated disturbance. The test for AR (1) usually rejects the null hypothesis, but the vital indicator is indicated by the value of AR (2). The next test is the Sargant Test or Hansen Test against overidentifying restriction, which tests the validity of the instrument variable used by testing samples analogous to the control moment used. The null hypothesis of this test is a valid instrument variable used and distributed according to the chi-square. The validity of the research model is when the value of the probability of the Chi-square has a degree of significance greater than 0.1, 0.5, or 0.01 and then rejects H0, or, in other words, the variable of the instrument used is valid.

Results and Discussion

Descriptive statistics

Preliminary analysis explains the characteristics of the data by performing descriptive analysis to determine whether the data condition is valid and can produce the best conclusions. Table 8 shows the data conditions of average values, standard deviations, and minimum and maximum values for all variables used.

Table 8. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Government effectiveness (x1)	351	0.231	0.881	-1.320	2.285
Political Stability (x2)	351	-0.178	0.945	-2.609	1.599
Regulatory quality (x3)	351	0.182	0.929	-1.730	2.252
Rule of Law (x4)	351	0.053	0.903	-1.801	2.004
Voice and accountability (x5)	351	-0.466	0.865	-1.966	1.606
Control of Corruption (x6)	351	-0.009	0.993	-1.462	2.334
Institution of commercial banks (x7)	351	50.331	44.288	5	204
Number of ATMs (x8)	351	63.740	60.598	1.012	314.31
Number of commercial bank branches (x10)	351	16.742	12.511	2.694	71.917
Outstanding deposit (x11)	351	85.558	80.550	8.89	541.283
Outstanding loan (x12)	351	75.998	59.874	8.189	390.093
Bank Z-score (x13)	351	19.378	10.69	1.472	62.437
GDP growth (x14)	351	3.227	5.322	-54.336	23.536
Inflation (x15)	351	4.292	9.781	-3.749	154.756
Mobile cellular (x16)	351	11200000	290000000	544337	1750000000

The main variable average is bank stability, measured using a Z-score of 19,377 with a maximum of 62,437 and a minimum of 1,472. The Z-score value has a relatively large range of 60.965 (62.437-1.472), indicating that banks' stability in Asian countries is variable. The financial inclusion variables, consisting of the Institution of commercial banks, Number of ATMs, number of commercial bank branches, Outstanding deposits, and Outstanding loans, have averages of 50.3305, 63.7403, 16.7419, 85.5584, and 75.9975. Meanwhile, the institutional quality variables in each category have almost the same standard deviation. From the macroeconomic sector, average GDP growth and inflation in Asian countries have values of 3.227% and 4.2922%, respectively. The correlation matrix between variables is displayed in Table 9, which reveals that a few variables have relatively high correlation values, more than 0.9. The following variables have strong correlations: number of commercial bank branches and outstanding deposits, government efficacy and regulatory quality, government effectiveness and the rule of law, and the rule of law and control of corruption. If noticed, the variables with strong correlation are institutional quality and financial inclusion indicators. The Principal Component Analysis (PCA) approach must be used to address the possibility of multicollinearity between these variables.

Table 9. Correlation Matrix

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15
X1	1														
X2	0.671	1													
X3	0.926	0.617	1												
X4	0.945	0.713	0.917	1											
X5	0.563	0.318	0.642	0.643	1										
X6	0.925	0.703	0.878	0.960	0.626	1									
X7	0.340	0.069	0.244	0.240	0.18	0.220	1								
X8	0.550	0.379	0.595	0.529	0.407	0.439	0.031	1							
X9	0.205	0.314	0.276	0.258	0.459	0.261	-0.098	0.334	1						
X10	0.512	0.297	0.515	0.503	0.235	0.464	0.487	0.181	0.115	1					
X11	0.683	0.527	0.691	0.699	0.331	0.660	0.417	0.279	0.147	0.906	1				
X12	0.214	0.231	0.234	0.292	0.214	0.311	-0.041	-0.096	0.146	0.243	0.263	1			
X13	-0.125	-0.084	-0.184	-0.159	-0.087	-0.134	0.045	-0.216	-0.105	-0.215	-0.202	-0.017	1		
X14	-0.263	-0.189	-0.230	-0.231	-0.086	-0.217	-0.062	-0.105	0.087	-0.095	-0.179	-0.095	-0.133	1	
X15	0.005	-0.163	-0.139	-0.081	-0.055	-0.097	0.701	-0.041	-0.132	0.047	-0.026	-0.044	0.138	-0.026	1

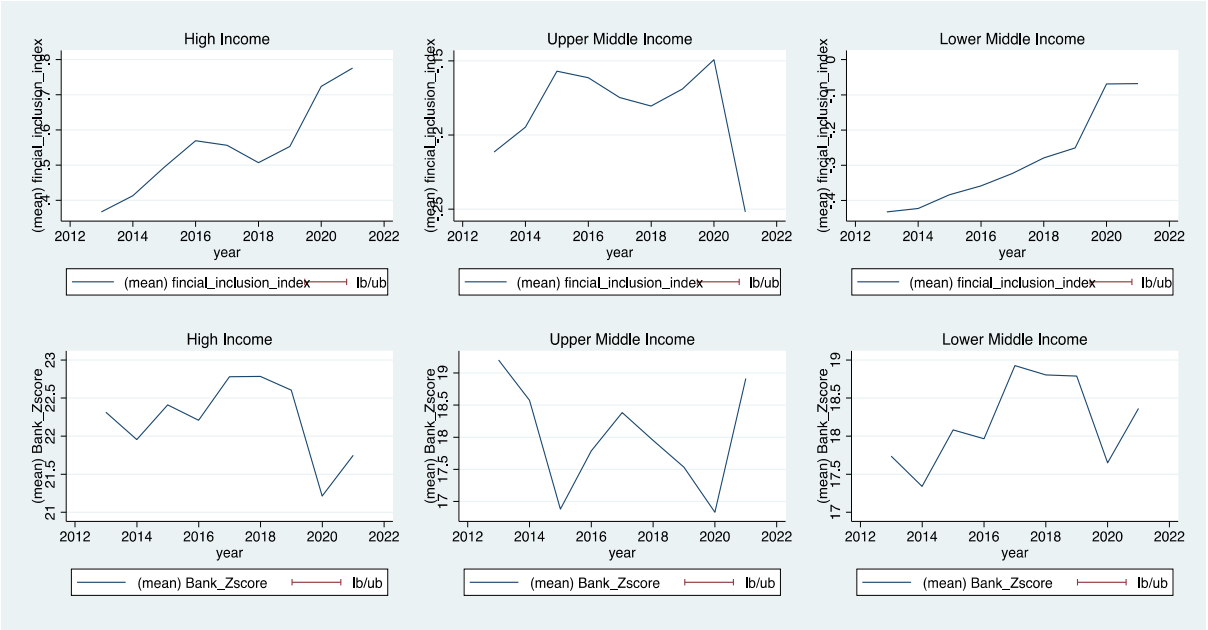

Figure 1. Bank Stability and Financial Inclusion in the Asian Region

This study analyzed Asian countries based on high-income, upper-middle-income, and lower-middle-income countries. The high financial inclusion index in high-income countries indicates that the development of national banking services is progressing faster than in developing countries. As is well known, financial inclusion indicates the extent to which the state provides banking services to all population levels. Improved access to banking, ease of use, and banking services that reach most people can drive financial inclusiveness in a country. Interestingly, high financial inclusion in high-income countries is also followed by high bank stability. The link between the two is also visible in upper-middle-income countries with a higher financial inclusion index and bank stability than in lower-income countries. The condition reinforces the initial hypothesis that the inclusion of financial variables significantly influences bank stability.

Dynamic aspects of the bank stability model

In economics and finance, the value of the dependent variable lag can usually describe the values of the running year and is used as an instrumental variable. A variable's lag value can produce better estimates (Arellano & Bond, 1991), so this study uses a dynamic panel model to estimate the bank's stability. The dynamic model means that another influences one variable in the present time and another in the past. In this study, the z-score bank lag value significantly influenced the bank's stability in the running year. There are two commonly used GMM estimation models: GMM's first difference and the GMM system. Model specification tests for GMM and GMM systems show that AR2 values have a higher probability value than alpha 5 percent, so it can be concluded that there is no autocorrelation series in the model. The next test is the Sargant Test or Hansen Test against overidentifying restriction, which tests the validity of the instrument variable used by testing samples that are analogous to the control moment used. The validity test of instruments using the Hansen Test shows that the one-step difference GMM and one-step system GMM models have a probability value smaller than the alpha 5 percent, so it is concluded that the instrument is not valid. Based on the model validity test, the model interpreted is a model that does not exhibit serial autocorrelation in errors and has valid instruments, namely the GMM two-step difference model and the two-step system GMM. The study chose the two-step GMM model, proposed by Blundell and Bond (2023) compared to other models because it reduces the strict exogeneity assumption for explanatory variables and helps insert the dependent variable lag into the model.

The estimates of the two-stage model of the GMM system show that the financial inclusion variable positively impacts the stability of banks in Asian countries. These results show that higher levels of financial inclusion can drive banks to become more stable, which means lower bankruptcy

rates. The results of this study reinforce previous findings Ahamed and Mallick (2019), Le et al. (2019), Vo et al. (2021), and Malik et al. (2022). Financial inclusion can improve the stability of the financial system for four reasons (Cull et al., 2012) First, financial inclusion attracts small savers. Given that the small number of subscribers is large enough, financial inclusion increases savings for individuals and households, strengthening banks' stability. Second, financial inclusions reach the healthier household and small business sectors so that they can drive macroeconomic stability. Third, financial inclusion can produce a more effective financial intermediation system. Good intermediation functions can generate large domestic savings and strengthen the savings cycle, as well as healthy domestic investment to enhance stability.

Table 10. Dynamic Model All Countries Using Difference GMM and System GMM

Variable	Diff GMM One Step	Diff GMM Two Step	Sys GMM One Step	Sys GMM Two Step
Lagged Bank Z-score	-0.079	-0.059***	0.947***	0.951***
	(0.144)	(0.019)	(0.021)	(0.004)
Financial Inclusion (Fin)	-1.075**	-0.987***	0.036	0.096***
	(0.464)	(0.113)	(0.106)	(0.024)
Institutional quality (IQ)	0.103	0.002	0.045	0.011
	(0.835)	(0.175)	(0.076)	(0.015)
GDP growth	0.018	0.019**	0.036	0.049***
	(0.022)	(0.008)	(0.024)	(0.007)
Inflation	0.017	0.013***	0.032**	0.031***
	(0.017)	(0.005)	(0.0129)	(0.001)
Mobile cellular	0.001	0.000***	0.000	0.000*
	0.001	0.000	(0.000)	(0.000)
Constant			0.753*	0.521***
			(0.445)	(0.103)
Hansen	84.62	26.68	98.14	31.08
Hansen P-Value	0.000	0.481	0.000	0.612
AR1	-0.624	-1.023	-5.082	-3.514
AR1 P-Value	0.533	0.307	0.000	0.001
AR2	-1.197	-0.889	0.638	0.824
AR2 P-Value	0.231	0.374	0.523	0.41

Notes: The models are regressed using the system GMM two-step method; *, **, and *** represent statistical significance levels of 10%, 5%, and 1%, respectively.

Fourthly, the diversification of customer service related to financial inclusion is expected to result in a more resilient economy. Reducing income disparities through financial inclusion will result in better social and political stability, which in turn can contribute to the financial system's stability. Yangdol and Sarma (2019) explain that the availability of financial services that are accessible to the public throughout the region can help individuals conduct financial transactions and manage risk, which can ultimately create opportunities to generate income. Le et al. (2019) reinforces the argument that a positive relationship exists between financial inclusion and bank stability. The positive impact of financial inclusion on the financial system is the diversification of assets that can reduce credit pressure and the possibility of default, and improve the stability of the public's savings base, thereby reducing the risk of liquidity and enhancing the transmission of monetary policy. Policies, regulations, and the performance of public institutions also affect the financial sector, including banks. Therefore, governance quality is another variable that influences bank stability. Unlike the initial hypothesis, the estimates show that governance Quality has no direct impact on the stability of banks across Asian countries. The study also uses macroeconomic conditions such as GDP and inflation as control variables, as economic development generally improves financial inclusion and bank stability. The results show that GDP has a positive impact on bank stability. According to a study conducted by Damrah et al. (2023), which revealed that growth in GDP supports financial stability by improving the quality of assets, lowering risk rates,

and reducing default. More specifically, Athanasoglou et al. (2008) it shows evidence that GDP growth can increase bank profitability, ultimately driving stability.

In the meantime, the impact of inflation on bank stability can be positive and negative, depending on the extent to which banks can divert increased operating costs due to rising inflation towards customers. Increased inflation will affect banks' cost-to-income ratio, so banks need to anticipate by adjusting interest rates (Bourke, 1989; Perry, 1992). In addition to macroeconomic conditions, the study included mobile subscription variables as control variables. Developments in the field of communication have prompted the use of mobile phone technology in the community, almost replacing the landline telephone. Besides, as the digital economy grows alongside mobile money-based activities, some researchers are studying the relationship between mobile cellular subscriptions and financial inclusion. Abor et al. (2018) and Alabi and Olaoye (2022) found evidence that cellular use promotes increased financial inclusion. The positive relationship between mobile cellular subscriptions and financial inclusion is also supposed to improve bank stability.

Dynamic model-based income group of countries

Asia has considerable diversity, especially in GDP, population, cultures, and languages, which vary widely across countries. Wang and Luo (2022) viewed that there was a considerable gap between financial inclusion in developing and developed countries; further, they argued that financial inclusion was seen as more of a problem in the developing world. The further analysis in this study looks at the influence of financial inclusion and governance quality in Asian countries classified by income, namely high-income, upper-middle-income, and lower-middle-income countries. After conducting a two-step model specification test, the GMM System obtained a probability value of AR2 and the Sargant test greater than alpha 5%, so it was concluded that the instrument did not exhibit autocorrelation series and the two-step difference GMM model was valid.

Table 11. Dynamic model classified by income group of countries using Sys GMM Two Step

Variables	High Income	Upper Middle Income	Lower Middle Income
Lagged Bank Z-Score	0.772***	0.776***	1.009***
	-0.238	-0.116	-0.0667
Financial Inclusion (Fin)	-0.305	6.809**	1.133***
	-0.398	-3.378	-0.346
Institutional quality (Iq)	0.411	0.155	-0.449*
	-0.556	-1.025	-0.237
GDP Growth	0.137***	0.183***	0.0363**
	-0.0347	-0.0539	-0.017
Mobile cellular	-2.08E-08	-1.33e-08*	3.30e-09***
	-2.29E-08	-7.21E-09	-1.14E-09
Inflation	-0.127	0.103*	-0.0974*
	-0.15	-0.0528	-0.0546
Constant	5.737	4.629*	-0.365
	-6.552	-2.365	-1.579
Sargant Test	38.93	89.48	48.6
Sargant P-Value	0.258	0.7	0.05
AR 1	-2.268	-0.607	-2.703
AR1 P-Value	0.0233	0.544	0.00688
AR 2	1.493	-1.578	1.234
AR 2 P-Value	0.136	0.115	0.217

Notes: The models are regressed using the system GMM two-step method; *, **, and *** represent statistical significance levels of 10%, 5%, and 1%, respectively.

The estimates show an exciting finding that financial inclusion has a significant positive impact on bank stability in upper-middle-income and lower-middle-income countries. In contrast, variable financial inclusion does not contribute to stability in a high-income country. This result supports the research by Ahamed and Mallick (2019), who contend that inclusive finance is more

beneficial in low-income nations. Furthermore, the World Economic Forum discovered that upper-middle-income and lower-middle-income countries had stronger correlations between financial stability and inclusivity. This can be explained by the fact that some high-income countries with broad financial access face greater instability due to a lack of incentives to monitor risks. In contrast, banks in low-income countries have a higher ratio of capital to assets to meet regulatory requirements and caution given their requirements and less sophisticated capital structure. The phenomenon suggests that upper-middle-income and lower-middle-income countries respond to the regulatory framework more proactively and cautiously in responding to the crisis than high-income countries (Čihák et al., 2013). Sahay et al. (2015) and Saha and Dutta (2020) reveal that the relationship between financial inclusion and financial stability in high-income countries becomes more complex, worse, and ambiguous when there are conditions of financial crisis. This is in line with the findings of Han and Melecky (2013), which state that financial inclusion increases stability in upper- and middle-income countries. This is because increased financial inclusion can increase deposits in public banks, thus strengthening the resilience of the banking sector's reserve base in times of crisis. Meanwhile, Hannig and Jansen (2011) state that low-income societies that gained access to finance tended to be immune to economic cycle changes, thereby improving the stability of the savings and lending base. Furthermore, they found that financial institutions that serve lower-class societies could cope with the crisis and contribute to the resilience of local economies.

The group of high-income countries has the most extensive financial inclusion index due to greater bank penetration, lower information asymmetry, and better governance than middle-income countries. Countries with high GDP levels have a greater capacity to provide financial services and credit, as demonstrated by the higher number of commercial bank institutions, ATMs, outstanding deposits, and outstanding loans compared to upper-middle-income and lower-middle-income countries. This is why sufficiently mature financial inclusion in high-income countries has no significant influence on bank stability. On the contrary, developing countries are more dependent on public banks (Laeven & Valencia, 2013). Therefore, for countries heavily dependent on banking, the impact of financial accessibility on bank stability is more significant. Low-income countries face a situation where most citizens do not have access to banking services due to limited ATM and branch networks, and high savings and credit services costs (Morgan & Pontines, 2018). Kawai and Prasad (2011) pointed out that limited access to finance for small, labour-intensive enterprises harmed employment and could implicitly jeopardize financial and macroeconomic stability.

Furthermore, the institutional quality variable at alpha 10% was found to harm bank stability in lower-middle-income countries. This result is surprising because it differs from literature and theory studies, most of which show a positive relationship between institutional quality and bank stability (Bermpei et al., 2018; Saha & Dutta, 2020; Uddin et al., 2020; Ha & Nguyen, 2023). However, this research aligns with the findings of Canh et al. (2021), which shows that better institutional quality causes increased credit risk in lower-middle-income and low-income countries, thus endangering bank stability. Good institutional quality encourages increased economic activity in various sectors, which can increase the banking system's exposure to new risks. This is because the banking system for low-income and middle-class individuals is not yet mature regarding processes, regulations, bank diversification, and default risk as part of financial development. Hoinaru et al. (2020) stated the same thing, and the results of their research show that low governance increases economic development. Corruption is a way to circumvent the law to obtain greater economic benefits, increasing business growth. In addition, Williams and Kedir (2016) found that governance, such as easing regulations, is considered to increase business growth and productivity, and can increase company profitability (Jiang & Nie, 2014). On the other hand, the estimation results show that institutional quality in high-income and upper-middle-income countries positively impacts bank stability, but it is not significant. Thus, these findings indicate that the relationship between institutions and bank stability directly depends on the country's income level.

Additionally, the estimation findings demonstrate that while the mobile cellular variable hurts bank stability in upper-middle-income countries, it has a favourable effect on bank stability in lower-middle-income nations. The rise in mobile device users indicates the expansion of digital

services, particularly financial services, and is considered a measure of digital financial inclusion. Consumers accustomed to technology prefer digital financial services to conventional banking services (Ong et al., 2023). Antwi and Kong (2023) argue that the application of digital finance in the banking sector, especially in developing countries, raises the question of whether this can be a solution to achieving banking stability, because both can have a good or bad impact on financial stability. Digital finance expands the financial sector and creates opportunities for systematic harm. If digital financial technology changes, it could negatively impact banking risks. The widespread use of telecommunications technology and e-banking capabilities can change banks' overall risk levels. Various risks, including strategic, operational, legal, and reputational, have become more severe following the spread of e-banking activities (Buchak et al., 2018; Tang, 2019).

Several fairly extensive empirical studies try to explain why financial digitalization or financial technology harms bank stability (Claessens et al., 2018; Merton & Thakor, 2019; Murinde et al., 2022; Khan et al., 2023). First, implementing fintech causes new operational issues and disturbs traditional banking procedures. As a result, the bank's personnel, protocols, and infrastructure must be significantly altered. Second, credit risk management may be impacted by fintech use. Fintech loan processing has become more accessible and user-friendly, which has the potential for a relaxation of credit requirements, which could raise non-performing loan (NPL) percentages. A rise in non-performing loans could jeopardize bank stability and financial health. Third, fintech innovations frequently defy regulations. Fintech-using banks sometimes struggle with managing the risks involved, maintaining compliance, and navigating laws. Regulation violations may place you at risk for legal trouble, damage to your reputation, and increased credit risk. Fourth, strong security procedures are necessary to gather, keep, and use customer data since fintech presents new risks to data security and privacy. Data or privacy breaches can lead to increased non-performing loans (NPL) ratios and less stable banks by undermining client confidence, harming a company's brand, and raising the risk of loan default. Fifth, there are significant differences in the technology infrastructure and connectivity across upper-middle-income nations. Fintech integration and performance might be hampered by inadequate infrastructure and connection. A bank's efficiency, credit risk management, and overall financial health can be negatively impacted by systemic operational issues resulting from technological constraints, as demonstrated by a lower Z score and a larger NPL ratio.

The macroeconomic aspect is that GDP growth as a variable significantly impacts bank stability in high-income, upper-middle-income, and lower-middle-income countries. As previous research has shown, economic performance affects financial performance. In addition, rapid economic growth increases public confidence in banks, which generates greater liquidity due to abundant deposits (Boachie et al., 2023). Meanwhile, inflation positively impacts upper-middle-income countries but contributes negatively to the stability of banks in lower-middle-income countries. This suggests that lower-middle-income countries have not been able to anticipate inflation by adjusting the interest rates on loans charged to their customers. On the other hand, banks in upper-middle-income countries can predict inflation and adjust prices accurately, so rising inflation is positively linked to financial stability. The impact of inflation varies depending on how mature a country's economy is, so it can predict future inflation and how banks manage their operating costs. The extent to which inflation affects bank performance depends on whether inflation expectations are entirely predictable. The inflation rate fully anticipated by bank management implies that banks can adjust interest rates appropriately to raise income faster than costs, thus earning higher economic gains. Given the circumstances, it is logical that bank stability and inflation positively correlate in the upper-middle-income country because its economic conditions are stronger than those of the lower-middle-income country.

Conclusion

This research uses the GMM analysis tool to measure the influence of financial inclusion and institutional quality on bank stability in 39 Asian countries. The main finding of this research is that the financial inclusion variable positively influences bank stability. The results of this research strengthen previous findings that financial inclusion that reaches small entrepreneurs and low-

income communities can increase the stability of the deposit base, thereby reducing liquidity risk and increasing bank stability. The estimation results show that financial inclusion provides greater benefits for upper-middle-income and lower-middle-income countries. In contrast, high-income countries with broad financial access face greater instability due to reduced bank prudence.

Meanwhile, the direct impact of institutional quality on bank stability depends on the state income level. Lower-middle-income countries experience increased stability due to the low quality of governance. Better institutional quality directly causes higher credit risk in lower-middle-income countries because increased economic activity in various sectors causes banks to face new risk exposures. This fact cannot be separated from the fact that the economies of lower-middle-income countries are not yet mature in terms of processes, regulations, bank diversification, and default risk. Macroeconomic conditions as a control variable show that the GDP variable positively affects bank stability in all country classifications: high-income, upper-middle income, and lower-middle income. Interesting findings can be seen in the inflation variable, where increasing inflation positively affects bank stability in upper-middle-income countries but contributes negatively to bank stability in lower-middle-income countries. This finding implies that lower-middle-income countries cannot anticipate rising inflation by adjusting interest costs, as in upper-middle-income countries. Finally, the mobile cellular variable as an indicator of digital financial inclusion negatively impacts upper-middle-income countries because digital financial innovation creates new risks for banks, such as legal risks, bad reputation risks, and higher credit risks.

The results of this study imply that household and SME access to financial services greatly influences banking stability in Asian countries. Several policy recommendations can be implemented: banks and the government must work together to expand banking services to all communities, especially in lower-middle-income countries. Policies that can be implemented include expansionary monetary policy and creating a better investment environment. Policymakers must ensure that appropriate macroeconomic policies accompany efforts to encourage financial inclusion and bank stability. The government can realize financial exclusion by identifying the obstacles individuals and small businesses face in obtaining financial services. Then, the government can make appropriate policies to overcome these obstacles. Steps that can be taken include increasing financial literacy, improving financial infrastructure that reaches small areas, and encouraging financial inclusion for marginalized groups such as women and the poor. In addition, increasing financial literacy can help small communities make the right decisions about financial products and services, thereby reducing problem loans and moral hazards detrimental to banks. The government can encourage financial inclusion in stages, starting with basic financial products and services and then progressing to more complex financial products and services as consumers' knowledge of finance increases. The government must also implement more effective governance, such as comprehensive law enforcement and establishing friendly regulations, so that institutional quality contributes positively to bank stability. No less critical, macroeconomic policies also need to be directed at encouraging GDP growth and controlling inflation to maintain people's purchasing power, especially in lower-middle-income countries. The government must ensure consumer and investor protection through comprehensive regulations and supervision as digital financial innovation develops. In addition, developing countries should review their digital financial laws so that mobile phone use can support secure financial services and thus strengthen bank stability.

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