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The impact of macroeconomic and institutional environment on NPL of developing and developed countries

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Abstract

The study investigates what causes non-performing loans (NPLs) in developed and developing countries. To identify the relationship between bank-specific, macroeconomic determinants, and institutional environment non-performing loans on country-level panel data of Developing nations for the period extending from 2010 to 2020, the author used panel system GMM methodology. The long-held hypothesis that NPLs contribute to economic growth is tested using the Panel Granger causality test. Further panel cointegration tests were run to see whether the two variables have a long-term relationship. According to the study, loan defaults frequently happen at a lower rate during a rapid economic expansion, resulting in lower levels of non-performing loans. If there is a robust regulatory framework for systemic risk, a larger banking sector should be more stable than a smaller one. The current study also demonstrates the institutional environment's importance in improving banks' credit quality. In developing and developed countries, NPLs are significantly reduced when the institutional environment is improved.

Keywords NPLs, Institutional environment, Panel Granger causality test, Panel GMM

JEL Classification G28, G32, F34, O16, E44, G01, G21

Introduction

The credit quality of the loan portfolio held by the banking sector in various countries and regions is indicated by non-performing loans (NPL). Loans classified as non-performing loans fail to make interest and principal payments for a set period; different nations have different time frames for this classification. NPL is a major banking threat for almost every country in the world because they adversely affect the financial stability and profitability of the banking system. NPL can weaken the balance sheets of banks and other financial institutions, reducing their ability to lend and increasing the cost of borrowing. It can lead to a credit crunch, where businesses and individuals find it difficult to obtain financing, leading to a slowdown in economic activity.

The country's government must spend inefficient tax money to save the banks and financial institutions from financial crises due to the high levels of non-performing loans (NPLs) in the banking sector. Such a wasteful use of tax money restricts government spending on development and has unfavourable indirect effects on the entire economy [1]. On the economic side, NPLs can have several negative effects. First, they can reduce credit availability, making it more difficult for businesses to invest in new projects and expand their operations. It can lead to lower productivity and slower economic growth. Second, NPLs can reduce confidence in the financial system, leading to capital flight and further tightening credit

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conditions. Third, NPLs can lead to a loss of trust in the banking sector, which can reduce the willingness of individuals and businesses to save and invest, further slowing economic growth.

The literature has not thoroughly examined the causes of non-performing loans in lights of institutional quality. Thus, this study adopts a comprehensive perspective to understand why these countries' banking institutions are frequently exposed to and susceptible to financial issues. According to Demirgüç-Kunt and Detragiache [2], regulatory authorities tend to emphasize micro–macro prudential regulatory frameworks for banking stability more than they do on institutional and governance factors that affect financial reporting quality. According to Brunnermeier et al. [3], the 2008 financial crisis and numerous domestic financial collapses worldwide showed that crises are more likely to occur in nations with wet banking institutions. The structural dependence of the economic system on banking and its interconnectedness may have adverse effects on its stability. In the light of these issues and the flimsy governance structures in emerging nations, this is necessary to ascertain the causes of non-performing loans.

This paper will contribute to the current literature on NPLs in many ways. First, in contrast to previous studies focusing on macroeconomic factors as determinants of NPLs, the author studied the effect of financial and economic development on NPLs and the institutional environment. Moreover, previous studies included one or two financial and economic variables [4, 5, 6, 7–10]. Therefore, this study takes a holistic approach to comprehend why these countries' banking institutions are usually vulnerable and susceptible to financial problems. The study sample comprises upper-middle, lower-middle, and low-income countries; thus, it is important to consider as many of these countries as possible.

Along with several countries, it is also essential to cover a more significant period so that any major happening concerning NPL or the banking sector can also be addressed. Including a larger sample size and longer period helps generalize the results. Thus, in the present study, 149 countries have been considered for 11 years (2010–2020). Second, from the standpoint of policy, the data from our study could help managers of financial regulatory agencies understand the significance of assessing not only defaulter safeguards and liquidity risks in the financial sector. Additionally, it helps to understand that governance indicators could impact the banking stability in developing and developed countries.

The rest of the paper is divided into the following sections. "Literature review" section summarises the related empirical literature on the determinants of NPLs; "Research methodology" section covers the data and the methodology used in this research and "Empirical analysis" section proceeds to present the results. Finally, the study's conclusion, findings and implications are summarised in "Result and discussion" section.

Literature review

Non-performing loans (NPLs) have been recognized as a major concern for financial stability and economic growth in many countries. Therefore, understanding the factors that cause NPLs is crucial for developing policy. In this literature review, we will examine the existing literature on NPL.

Macroeconomic factors

NPLs tend to be smaller during economic expansions and larger during recessions, so GDP growth is frequently linked to changes in the size of NPLs in earlier literature [11]. High unemployment is linked to high non-performing loans (NPLs) because it may affect borrowers' ability to repay loans [12, 13]. The literature has conflicting findings regarding inflation's effect on NPLs [12], and Beck et al. [4] independently verified this finding. Global risk factors might affect the recurrence of NPL. For instance, Espinoza and Prasad [14] examined 80 (GCC) banks and found that NPLs were positively correlated with increased global financial volatility, i.e., NPLs increased as global risk increased. Skarica [15] discovered a strong correlation between higher NPLs and the economy's recession, employment status, and inflation rate.

Nkusu [16] asserts that worsening macroeconomic circumstances, such as slower economic growth and higher unemployment rates, were to blame for the rise in non-performing loans. Klein [12] examines 16 CESEE countries between 1998 and 2011 using data at the national level and discovers that total NPLs are negatively correlated with credit growth, unemployment, GDP growth, and inflation. The factors influencing non-performing loans (NPLs) in the Greek banking sector are examined by Louzis et al. [17] for each loan classification—personal loans, corporate loans, and mortgages. They find that management effectiveness, GDP, unemployment, interest rates, and public debt significantly affect NPLs. According to Beck et al. [4], non-performing loans are significantly impacted by the economy's growth, stock prices, currency rates, and lending interest rates. Because NPLs are frequently lower during economic booms and higher during recessions, the GDP growth rate and higher NPLs have a negative correlation [4, 11, 15]. Additionally, higher unemployment has been associated with more non-performing loans because high unemployment levels lower borrowers' capacity to repay loans [12, 16]. However, there is disagreement in the literature regarding how inflation affects non-performing loans see. [4, 12].

Exchange rate depreciation tends to have an ambiguous impact on NPLs. Thus, exchange rate depreciation in economies that follow floating exchange rate policies and a large amount of foreign currency lending may positively affect NPL accumulation [4, 12], whereas Devaluation can increase the ability of export-oriented businesses to service their debt and reduce the NPL ratio. Some models also incorporate house prices and stock exchange indices, which may influence NPLs through the wealth effect [4]. However, the effect of stock exchange indices on NPLs is not apparent but relies on the assumption that share prices are correlated with house prices, on which data remain scarce [15]. These macroeconomic factors seem to influence non-performing loans as per the existing literature. Dimitrios et al. [18] demonstrated a strong impact of income tax on NPLs. [19] confirmed the findings of [3, 20, 21] identified the significant effect of macroeconomic factors and public finance/expenditure variables on non-performing loans.

Bank-level determinants

Granger-causality techniques were used by Berger and DeYoung [22] to test four banks' management-related hypotheses about the relationship between loan quality, cost-effectiveness, and bank capital. They concluded that moral hazard and poor management may be responsible for a sizeable portion of NPLs. While Ghosh [6] discovered that lagged leverage affects NPLs, Podpiera and Weill [23] also estimated a causal relationship between NPLs and cost efficiency (a sign of poor management). Ozili [8] states that NPLs and bank liquidity are antagonistic. For example, only a few studies have attempted to link capital adequacy to non-performing loans.

In contrast, Boudriga et al. [24] show that the banking industry experiences fewer losses with higher capital adequacy ratios and adequate loan loss provision. According to Klein [12], NPLs are inversely related to capital adequacy as measured by the equity-to-assets ratio. According to this finding, banks with lower capital are incentivized to make riskier investment decisions, which increases the occurrence of non-performing loans. [25] reveals that recapitalization reduces bank lending but significantly increases banking stability. Additionally, banks with positive cash flow appear to have fewer non-performing loans (NPLs), as higher interest income from fewer NPLs boosts overall profitability [12].

Since non-performing loans are a crucial indicator of bank performance, there is hardly any research on the relationship between bank growth/performance and financial development. Tanaskovic and Jandric [26] used the private credit to GDP ratio to control the financial sector's development. They found that NPL had a negative correlation with that development but a positive correlation with the ratio of foreign exchange loans and the exchange rate. Because it is frequently associated with laxer loan underwriting standards and higher NPLs, higher credit growth raises credit risk [12, 24]. By investigating a sample of ASEAN countries, Dang and Thi [27] revealed that financial inclusion affects banking stability. Ozili [8] used a graphical analysis to show how NPLs in segregated regions are negatively impacted by financial growth and profitability, same confirmed by Madugu et al. [7].

Few studies have attempted to connect NPLs to banking liberalization. For instance, [28] concluded that foreign participation from developed economies, higher credit growth rates, and favourable loan loss provisions help reduce non-performing loans (NPL) in host countries. Beaton et al. [29] highlighted essential banking practices that consistently help foreign-owned banks have lower non-performing loans (NPLs) than domestic banks, a finding that was also reached by Giannetti and Ongena [30]. Few studies have examined the relationship between NPLs, banking concentration, and competition concerning indicators of banking structure. A significant inverse relationship between increased banking competition and financial stability was demonstrated by Beck et al. [4]. Greater market power lowers bank bankruptcy risk and capital ratios generally, according to Yusgiantoro et al. [31] (charter value hypothesis). Fu et al. [32] investigated the effects of bank competition, concentration, regulation, and national institutions on the stability of specific banks. They concluded that greater concentration decreased financial stability, and lower pricing power increased bank risk exposure.

Institutional factor

According to some studies, institutional quality can affect a country's banking system's stability, and a country's governance can affect the regulation and supervision of the banking industry that aims to influence bank behaviour [33, 34]. Klomp and de Haan [35] investigate how bank regulations and oversight affect credit risk. Although it is well known that a functioning governmental system affects the performance of the financial system, there is little proof that well-functioning institutions and good governance are related to financial outcomes for banks like NPL [36]. These factors appear to affect how default risk varies across nations. For instance, many emerging countries suffer from an enormous amount of NPL. These countries have lax institutional control, ineffective legal systems, corrupt bureaucracy and weak political structures.

These characteristics make extending credit or control and recovering debt more difficult after a loan has been approved. More specifically, corruption lowers

market competition, which leads to ineffective loan offers. Decision-makers may be subject to unofficial connections and other pressures from groups looking to obtain illegitimate or illegal economic rents, according to Johnson and Wilson's [37] theory. In societies with weak democratic traditions and civil discipline, they may also face other risks. In this case, loan decisions are influenced by the degree of political pressure that various interest groups are applying. Loans will therefore be advantageous for companies with strong political ties, even though those loans may sanction unreliable companies and individuals, which might result in bad loans in future. Additionally, internal audit tends to be less.

The major issues identified from the literature include the concentration on a single economy, the focus on developed countries and the period of the study being overused. The past literature on NPL placed little emphasis on whether institutional quality variables influence the aggregate NPLs, concentrating mainly on macroeconomic and bank-level causes of NPLs in developing economies. Unlike earlier studies, ours diverges from conservative variables and examine the link between non-performing loans and institutional, macroeconomic, and financial sector growth.

Research methodology

Data and variable description

The factors that influence NPLs in developing and advanced economies worldwide are measured using panel data at the country level. The annual dataset from 2010 to 2020 is analysed from the World Bank's archived global financial development database. Many countries did not report data for total non-performing loans in this dataset of global financial development indicators. As a result, the final sample of 89 developing nations is chosen based on data availability. It is further divided into upper-middle, lower-middle, and low-income nations.

Additionally, it included 60 high-income nations with advanced economies. Data on macroeconomic variables were taken from the World Bank's compilation of development indicators. The World Governance Indicators created by Kaufmann et al. [36] provide information on the institutional environment at the country level. This project reports aggregate and individual, institutional quality indicators for over 200 countries from 1996 to 2021 for six governance dimensions. They are based on over 30 individual data sources produced by various survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms.

Variable under study

The dependent variable in the current study that indicates banks' credit quality is the NPL to Gross Advances Ratio (NPL). According to banks for international settlements, a default or non-performing loan is deemed to have happened for a specific borrower if any bank credit to any financial institution is past due for more than 90 days.

This study used six bank-level financial performance indicators that might impact the quantity of non-performing loans.

The bank's cost-to-income ratio (CIR) is used to indicate cost-effectiveness. That quantifies the operational expenses of a bank as a proportion of net interest and other operating income. Ideally, increased cost-effectiveness in the banking industry would increase banking stability [13, 38]. As a result, it is anticipated that the efficient banking industry will have fewer NPLs than the inefficient banking sector [17]. Cost-efficient banks are said to handle their credit risk better than inefficient ones, According to 'skimping hypotheses' deducted by Berger and DeYoung [22] banks with lower expenses on monitoring lending risk are considered to be more efficient and suggested that cost-efficient banks manage their credit risk more than inefficient ones. However, it tends to have more NPAs in the future.

Bank profitability can be measured by return on assets (ROA) [8]. How ROA affects non-performing loans is still ambiguous. According to one theory, a link between bank profitability and NPL is unfavourable since profitable banks are less likely to lend to borrowers with a significant default risk [22]. Alternative explanations contend that banks' higher profitability results from lending to hazardous and subprime borrowers at higher interest rates, raising the likelihood of default. So, profitability and NPLs tend to be positively correlated.

The ratio of bank non-interest income to total income (NII) is used to measure banking diversification operations. The bank's non-interest income (NII) is a percentage of its overall income. Because banks do not only rely on interest income for their survival, banks with higher (NII) are anticipated to have fewer non-performing loans. However, in the long run, they can rely on income from fee and commission-based services and net gains from trading, derivatives, and other securities [13, 39]. It implies that a negative correlation between NII and non-performing loans is expected.

According to Boudriga et al. [24] and Klein [12], the bank regulatory capital ratio is critical in predicting bank success. We employ a risk-adjusted capital ratio and argue that having more regulatory capital helps banks experience fewer non-performing loans (NPLs). It may discourage banks from making high-risk loans as they

have a solid capital base and make them resilient against crises. Researchers believe the banking sector's NPLs should be lower with higher regulatory capital ratios, pointing to a negative correlation between NPL and CAR.

The amount of financial intermediation is measured using the private credit by domestic banks to GDP ratio (PCREDIT), which gauges the depth and breadth of the banking industry. If there is a robust systemic risk regulatory framework, a large banking sector should be more stable than a small one; hence, a negative association between NPL and banking sector size can be anticipated [40]. Furthermore, suppose excessive competitiveness drives banks to take risks and invest in risky credit portfolios without proper screening, which could make the banking system unstable. In that case, a strong banking sector is predicted to be associated with higher financial instability. A positive association between NPL and banking sector size should exist if this is the case.

Foreign bank assets among total bank assets (FGN) reflect financial sector development through ownership status/liberation in host countries [6, 13]. The presence of foreign banks may contribute to the technological development of the host nation and offer new financial services and products to its financial stakeholders, ultimately improving credit quality and lowering the risk of non-performing loans [30]. It follows that an inverse link between the presence of foreign banks and NPLs is anticipated. Finally, this study accounts for macroeconomic variables that affect the banking system's stability.

The crucial macroeconomic aspect that might affect the banking system's stability is economic growth (GDP) [41]. The Financial Accelerator Theory and the Life Cycle Consumption Model associate economic growth with NPLs. According to research focused on macroeconomic causes, borrowers have an adequate flow of earnings to service their loan during an expansionary phase of the economy. Bad loans are often lower when the economy grows rapidly, which benefits the banking industry's stability. Therefore, we expect a negative relationship between non-performing loans and economic growth.

According to Jokipii and Monnin [42], inflation (INF) accounts for macroeconomic factors that affect non-performing loans. Banks may charge their clients extra for banking and other financial services when there is inflation. Banks can boost their profitability by increasing price margins during inflationary periods. As a result, there should be a negative association between inflation and the amount of non-performing loans in the banking industry.

Borrowers are more inclined to apply for loans when unemployment is high; bad loans are more likely to occur. That is why we anticipated that borrowers might have trouble repaying the principal and interest on the loan facility due to the loss of jobs during periods of high unemployment. The following default on loan repayments could result in greater non-performing loans. So, we anticipated a positive correlation between non-performing loans and unemployment.

The strength of an institution's economic governance is determined using perception metrics with assigned values. It is logical to expect a negative relationship between NPL and institutional quality because good governance is associated with fewer NPL creations (PCA INST).

Econometric techniques

This research paper used the Generalized Method of Moments (GMM) estimation. We followed the methodology of Arellano and Bond [43], where we assessed the influence of other financial development variables on non-performing loans using the lagged value of non-performing loans. To capture the influence of persistent NPLs and exclude explanatory variables, the GMM estimator includes a lagged value of NPLs compared to other static panel estimators. Ordinary least squares (OLS) estimate becomes inaccurate and biased when dependent variable lag is present [43–47]. The current panel data are more likely to have heteroscedasticity and serial correlation, so system GMM sounds more appropriate for the analysis.

Further, the banking-specific variables are more tend to be endogenous with NPLs. It is critical to handle the model's potential endogeneity issue. Endogeneity is a scenario wherein the explanatory variables correlate to residuals [48–50]. We incorporated time-invariant country-specific fixed effects in this model, which causes OLS estimators to be inconsistent in their values. Furthermore, stringent exogeneity in the fixed-effect model prevents it from being used to manage unobservable heterogeneity [47]. Exogeneity is when changes in the dependent variable's past and current values are not associated with explanatory variables.

The baseline model specification we adopt is a modified model Ozili [8] and Fernández et al. [51]. The specified regression model used in the study:

$$\begin{aligned}(\mathrm{NPL})\mathrm{i,t} = {} & \alpha + \mathrm{B1NPL}i,t-1 + \beta 2\mathrm{CIR}i,t + \beta 3\mathrm{ROA}i,t + \beta 4\mathrm{NII}i,t + \beta 5\mathrm{CAR}i,t + \beta 6P\mathrm{CREDIT}i,t \\ & + \beta 7\mathrm{FGN}i,t + \beta 8\mathrm{GDP}i,t + \beta 9\mathrm{UNEM}i,t + \beta 10\mathrm{INFL}i,t + \beta 11\mathrm{PCA\_INS}i,t + \mathrm{F}i + \varepsilon i,t\end{aligned}$$

where time and country are represented by the subscripts t and i, respectively. Non-performing loans (NPL) are a dependent variable denoted by the letter *i,t*. The dynamic character of non-performing loans is represented by the lagged value of Gross NPLs to Gross Advances Ratio ($NPLi_{,t-1}$) in the preceding equations. The first lag of the predictor variable is utilized as an explanatory variable instead of new variables, and the first lagged variables are used as instruments. Second-order or longer delays are considered irrelevant because the best predictions can be produced using the predictor and explanatory variables' first-lagged values.

Other explanatory variables are as follows: cost-efficiency of the Bank (CIR), return on assets of the banks (ROA), non-interest income to total income (NII), capital adequacy ratio of the banks (CAR), private credit by domestic banks to GDP (PCREDIT), number of depositors with commercial banks per 1,000 adults (BAC), foreign bank assets among total bank assets (FGN), Gross Domestic Product (GDP), Unemployment (UNEM) Inflation (INFL) and World Governance Indicator (PCA_INS). Fi stands for the country-specific fixed effect, while Eit stands for the error term.

Empirical analysis

Appendix 1 shows the result of descriptive statistics for the variables under study. According to summary results, non-performing loans have increased at an average rate of 7.6854% of gross loans with a standard deviation of 7.128%. Minimum NPLs recorded at a level of 0% for the given sample of developing Asian economies.

To illustrate the strength and direction of correlations amongst some of the potential determinants and to assess if there is any problem multicollinearity across independent variables, Appendix 2 includes a Pearson's correlation matrix. As a general rule, the correlation value below 0.70 indicates no issue with multicollinearity between the variables. The greatest correlation of the study's variables, 0.2919*, is found between unemployment (UNEM) and foreign bank assets relative to total bank assets (FGN).

Recent development in the measurement of governance indicators suggests using the Principal Component Analysis (PCA), which requires forming an institutional quality index using as many measures as possible. PCA captures the effect of each institutional quality proxy in one variable, showing the effect of every governance indicator in its variability. The reason is that each proxy brings extra information not contained in the other, hence a better measure. In this study, we use Control of Corruption (COC), Government effectiveness (GE), Political stability (PS), Regulatory quality (RQ), Rule of Law (ROL) and Voice and Accountability (VAC) to construct the institutional quality index. Moreover, the financial development index obtained using the PCA approach presents some econometric advantages. First, using the index overcomes the problem of multicollinearity and overparameterization that would otherwise have arisen if the six adopted measures of Institutional quality were to be used separately in the same regression model.

Appendix 3 shows the Pairwise Correlation Matrix of world governance indicators that indicate a problem of multicollinearity among different governance variables. We used Principal Component Analysis (PCA) to address this problem to create a single institutional quality variable (PCA_INST). Appendix 4 shows the result of the principal component analysis that among 6 components, only comp1 has a higher value than 1. So, it is advisable to create only one variable. Comp1, Comp2, Comp3, Comp4, Comp5 and Comp6 show cumulative value of 0.7006, 0.8293, 0.9096, 0.9577, 0.981 and 1, respectively.

Table 1 Durbin–Wu–Hauseman test of endogeneity

Variable	Developing countries (Pooled)	Upper-middle income	Lower-middle income	Low-income	High Income
	F-test (*P*-value)	*F*-test (*P*-value)	*F*-test (*P*-value)	*F*-test (*P*-value)	*F*-test (*P*-value)
CIR	−0.038 (0.957)	−1.380(0.143)	−0.87 (0.043) ***	0.803 (0.031) ***	−0.654 (0.042) ***
ROA	56 (0.000) ***	9.640 (0.006)***	37.49 (0.026) ***	−8.225 (0.001) ***	4.677 (0.176)
NII	−3.04 (0.082)	0.453 (0.172)	−1.645 (0.068)	0.470 (0.340)	1.983 (0.565)
CAR	−0.23 (0.632)	12.89(0.145)	−2.128 (0.03) ***	−2.024 (0.78)	8.566 (0.675)
PCREDIT	25.4 (0.000) ***	−0.34 (0.017) ***	0.546 (0.048) ***	0.949 (0.028) ***	0.896 (0.0376)***
FGN	−0.23 (0.632)	−10.70 (0.00)***	−0.17 (0.097)	0.033 (0.109)	0.678 (0.007)***
GDP	0.03 (0.871)	−1.921 (0.194)	9.69 (0.11)	−2.018 (0.001) ***	−5.678 (0.5765)
UNEM	−6.3 (0.012) ***	3.68 (0.031)***	1.161 (0.066)	−3.329 (0.007) ***	−2.487 (0.008) ***
INFLATION	1.5 (0.221)	−0.03 (0.786)	21.920 (0.309)	1.456 (0.003) ***	0.048 (0.248)
PCA_INST	10.2 (0.001) ***	−11.16 (0.04)***	63.582 (0.297)	5.583 (0.274)	23.38 (0.0367) ***

*** denote significance at 5% levels respectively. Numbers in parentheses () are the *P*-values

As per Appendix 5, Comp1 represents a cumulative value of 70.06%. So, the researcher created only one variable. Table 1 represents eigenvectors of selected comp1 and unexplained part of each variable.

The Durbin–Wu–Hauseman endogeneity test was used in this study. If the null condition is that the anticipated residuals of endogenous variables have a coefficient of zero, the findings are shown in Table 1. According to the Durbin–Wu–Hausman test statistics, ROA, PCREDIT, UNEM, and PCA_INST are endogenous in developing countries. FGN is also endogenous for upper-middle-income countries because *P* values are statistically significant for the same variables in the model. A dynamic model incorporating instrumental variables is created to address the endogeneity issue. Due to the lack of exogenous factors to instrument the endogenous variables, including starting values of independent variables as instruments is not conceivable. Furthermore, it frequently results in data loss and incorrect estimates.

Another diagnostic test before running panel data regression is a test for Breusch-Pagan test for heteroscedasticity. This test examines whether the regression's error term depends on the values of independent variables.

Table 2 presents the result of the Breusch-Pagan test for heteroscedasticity for all the market valuation measures regression models. The test outcome for pooled, UMIC, LMIC and HIC shows that the chi-square value is significant at a 5% significance level which means that the null hypothesis for constant variance is rejected. Therefore, the study concludes that the models' error variances are not equal; hence, the problem of heteroscedasticity is present in the models. However, in the case of LIC, there is no heteroscedasticity problem in these two models.

Another diagnostic test before running panel data regression is Wooldridge test for serial correlation or autocorrelation. This test uses the residuals from regression in first-difference, and first-differencing eliminates the individual-level effect. The test assumes null hypothesis as H_0: no first-order autocorrelation i.e., the absence of autocorrelation and alternative hypothesis as H_1: first-order autocorrelation i.e., the presence of autocorrelation.

Table 2 Results of Breusch-Pagan test for heteroscedasticity. Source: Author's Calculations (STATA 14)

Models	Chi-square	*P*-value
Pooled data	15.57*	0.0001
UMIC	13.21*	0.0003
LMIC	5.59*	0.0181
LIC	1.23	0.2677
HIC	7.89*	0.023

H_0—Constant variance, H_1—fitted values of dependent variables

* indicate value at 5% significance level

Table 3 Results of Wooldridge test for serial correlation. Source: Author's Calculations (STATA 14)

Models	*F*-statistics (1, 404)	*P*-value
Pooled	5.795*	0.0197
UMIC	5.952*	0.0216
LMIC	3.010	0.0981
LIC	9.044	0.0573
HIC	2.982*	0.0268

* indicate value at 5% significance level

Table 3 depicts the Wooldridge test results for Serial Correlation for all the market valuation measures regression models. The test findings for all the models except for LMIC and LIC reveal that F-Statistics is significant at a 1% significance level, indicating that the null hypothesis for no first-order autocorrelation is rejected. Thus, the research concludes that first-order autocorrelation exists in all the models expected for LMIC and LIC.

Multicollinearity is another assumption of regression analysis. If a high correlation exists between two or more independent variables, this refers to the multicollinearity problem. VIF is an indicator that calculates how much the variance of an average regression coefficient is increased because of collinearity. The VIF scores and all the independent variables are presented in Table 4 for all the models of market valuation measures. For multicollinearity to not exist in the data, the VIF scores criterion is that the values should be below 10. The results show that the mean VIF for models 1,2,3,4 and 5 is 1.34, 1.65, 1.66, 3.70 and 2.56, respectively.

Considering all the information, we adopted a two-step GMM dynamic panel data estimation. It uses lagged values instead of any new variables as instruments. Additionally, GMM estimates can account for simultaneity bias, missing variables, and unobserved nation variations that typically impact growth.

Table 4 Results of multicollinearity. Source: Author's Calculations (STATA 14)

Models	Mean VIF
Pooled	1.34
UMIC	1.65
LMIC	1.66
LIC	3.70
HIC	2.56

The reliability of GMM predictions is predicated on a set of assumptions, including exogenous instruments, the lack of second-order autocorrelation, and jointly significant variables in the models. With a set of presumptions where all instruments are exogenous, the Sargan test of over-identifying restriction is applied to determine the exogeneity of the instruments in the GMM model. If the null hypothesis is not accepted, the researcher must rethink the model and the estimating procedure. According to the Arellano Bond test for autocorrelation, the first-order AR (1) test must not accept the null hypothesis, but the second-order AR (2) test must accept the null hypothesis (H0: no correlation).

The Wald test must show that the variables included in the models are jointly significant, rejecting the null hypothesis that none of the variables is statistically reliable. The Sargan test's null hypothesis is not rejected, as shown in Table 5, indicating that the instruments used in all models are exogenous. Since the null hypothesis of no autocorrelation is denied at first-order AR (1) although not at second-order AR, the Arellano-Bond test for autocorrelation proves the existence of first-order autocorrelation and the absence of second-order autocorrelation in our GMM calculation (2). The Wald test demonstrates that none of the variables is statistically reliable, which means the null hypothesis is dismissed.

The long-held theory that there is a causal relationship between NPLs, financial development, and economic growth—which is either thought to be demand-following or supply-leading—was also tested using the panel Granger causality test. The anchor theory of causality suggests that the choice of anchor event can influence how people interpret the causal relationship between NPLs and macroeconomic factors. While empirical studies have identified a range of potential determinants of NPLs, the causal relationship between these factors is complex and multifaceted. It requires careful consideration of the choice of variables and the timing of events when making causal inferences. This paper tests the causal relationship between economic, financial development and NPL after considering past literature and further explanation has been given in the empirical analysis of this paper (Table 6).

All current economic data value is an accumulation of previous values. Data stationarity must be tested before using the Granger causality test [52]. Im, Pesaran, Shin (IPS) and Levin, Lin, and Chiu (LLC) were both used in this study to examine the stationarity of the variables (see Table 3).

However, the LLC (2002)'s fundamental drawback is that it assumes that the panel's unit root process is common or homogeneous. On the other hand, IPS (2003)

Table 5 Dynamic panel-data estimation, two-step system GMM. Source: Own Computation in STATA 14

Variables	Developing countries (Pooled)	UMIC	LMIC	LIC	HIC
	Coef. (*P* > z)	Coef. (*P* > z)	Coef. (*P* > z)	Coef. (*P* > z)	Coef. (*P* > z)
L1	0.6711 (0.000) ***	0.649 (0.037) **	0.202 (0.043)**	0.337 (0.003) ***	0.747 (0.023) **
CIR	−0.001 (0.684)	−0.008 (0.023) ***	−0.109 (0.052) *	0.066 (0.166)	−0.564 (0.026)*
ROA	−1.059 (0.000) ***	1.344 (0.794)	− 0.528 (0.017) **	−0.66 (0.000) ***	−1.583 (0.010) **
NII	0.0056 (0.441)	− 0.562 (0.081) *	−0.038 (0.069) *	−0.118 (0.04) **	−0.478 (0.02) **
CAR	−0.0526 (0.000) ***	−0.041 (0.01) ***	0.1474 (0.106)	0.164 (0.657)	0.1037 (0.389)
PCREDIT	−0.0080 (0.003) ***	− 0.036 (0.070) *	−0.121 (0.015) ***	−0.008 (0.007)***	−0.037 (0.047)**
FGN	−0.0309 (0.000) ***	−0.008 (0.001) ***	−0.033 (0.075) *	0.074 (0.014)*	0.467 (0.156)
GDP	−0.126 (0.000) ***	0.182 (0.010) ***	−0.133 (0.053) *	−0.255 (0.034) ***	−0.378 (0.017) ***
UNEM	0.0335 (0.060) *	−0.197 (0.700)	0.029 (0.745)	−0.118 (0.041) **	−0.381 (0.001) ***
INFLATION	−0.035 (0.000) ***	0.178 (0.045) **	0.010 (0.009) ***	1.05 (0.342)	0.673 (0.387)
PCA_INST	−0.693 (0.000) ***	−3.003 (0.053) *	−1.176 (0.001) ***	−0.041 (0.041) **	−0.067 (0.064) *
_cons	4.400 (0.000) ***	34.65 (0.65)	−5.309 (0.04) **	3.48 (3.24)	11.88 (0.034)**
Wald Chi^2	9214	3425	3433	2561	4567
Prob	0.001	0.006	0.012	0.018	0.018
Sargan Test	0.759	0.826	0.55	0.65	0.68
Arellano-Bond AR (1) (Prob.)	0.000	0.000	0.002	0.001	0.013
Arellano-Bond AR (2) (Prob.)	0.281	0.263	0.345	0.451	0.286

***, **, * indicate value at 1, 5 and 10% significance level

Table 6 Panel unit root test. Source: Author's Calculation

Sample	Variable	Levin Lin Chu Statistic (Adjusted t*)	IMPS W-t-bar
Developing countries (Pooled)	NPL	−12.37*	−1.59*
	PCREDIT	−15.72*	−2.99*
	GDP	−1.933*	−1.00*
UMIC	NPL	1.323*	−1.34*
	PCREDIT	−12.31*	−3.78*
	GDP	−1.238*	−1.78*
LMIC	NPL	−11.37*	−7.8*
	PCREDIT	1.767*	4.78*
	GDP	−1.393*	−2.36*
LIC	NPL	2.356*	2.67*
	PCREDIT	−11.17*	−4.78*
	GDP	3.783*	1.26*
HIC	NPL	3.56*	9.77*
	PCREDIT	−12.10*	−3.45*
	GDP	4.783*	2.24*

*indicate value at 5% significance level

allows for heterogeneous autoregressive coefficients. The variable's non-stationarity in both the LLC (2002) and the IPS (2003) was the null hypothesis that was investigated in the study (meaning it includes a unit root). The outcomes of panel unit root tests show that all test statistics for these variables rejected the null hypothesis following the initial differencing of each factor. In other words, when (NPL), (PCREDIT) and (GDP) variables are mixed in order one, they have a stationary initial difference (1). Based on the panel unit root's findings, we look for cointegration between the NPLs, financial development, and economic growth variables.

Tests of panel cointegration look for a long-term link between the two variables. The Pedroni heterogeneous panel estimate, which computes three statistics to test the non-cointegration null hypothesis, was used to conduct a cointegration test. We utilize this test because it accommodates panel member heterogeneity and has greater estimating power when there are fewer data points than conventional cointegration tests [53]. The findings of Pedroni tests reveal that NPL and financial development factors are cointegrated for all panels except for LIC countries. NPL and economic development factors are cointegrated for all panels except for LMIC and LIC countries (see Table 7).

Table 8 presents the Granger causality test results for developing economies. Results confirmed that bidirectional causality runs from NPLs to financial development (PCREDIT), economic growth (GDP), and vice-versa for all panels.

Results and discussion

The dynamic GMM coefficient estimates for the non-performing loan drivers are shown in Table 7 for the nations from 2010 to 2020. The lagged value of the dependent variable NPLs is positive and significant, indicating that NPLs are exacerbating the rise in the current year from the prior year ($t-1$). The findings of Ozili [8] and Ghosh [6], who discovered a strong positive impact on

Table 7 Panel Padroni residual cointegration test. Source: Author's Calculation

Sample		NPL and PCREDIT		NPL and GDP	
		Statistic	*P*-value	Statistic	*P*-value
Developing countries	Modified Phillips-Perron t	2.5564*	0.0053	3.6697*	0.0001
	Phillips-Perron t	−3.6084*	0.0002	−5.328*	0.0000
	Augmented Dickey-Fuller t	−3.6136*	0.0002	−1.947*	0.0257
(UMIC)	Modified Phillips-Perron t	4.7586*	0.000	4.9499*	0.000
	Phillips-Perron t	0.8012	0.2115	1.2024	0.1146
	Augmented Dickey-Fuller t	1.638*	0.050	3.0176*	0.0013
(LMIC)	Modified Phillips-Perron t	2.7063*	0.0034	3.5651*	0.0002
	Phillips-Perron t	−3.2441*	0.0006	−1.3552	0.0877
	Augmented Dickey-Fuller t	−3.0473*	0.0012	0.0173	0.4931
(LIC)	Modified Phillips-Perron t	2.222*	0.0131	2.0589*	0.0198
	Phillips-Perron t	−0.5495	0.2913	−0.4121	0.3401
	Augmented Dickey-Fuller t	−1.3158	0.0941	−0.6633	0.2536
(HIC)	Modified Phillips-Perron t	1.631*	0.002	2.782*	0.003
	Phillips-Perron t	−2.264*	0.0028	−2.278*	0.0378
	Augmented Dickey-Fuller t	−3.278*	0.0076	1.787	0.378

*Indicate value at 5% significance level

Table 8 Panel Granger cause test. Source: Author's Calculation

Null Hypothesis (H0)	Developing countries Test statistics Z-bar (*P*-value)	UMIC Test statistics Z-bar (*P*-value)	LMIC Test statistics Z-bar (*P*-value)	LIC Test statistics Z-bar (*P*-value)	HIC Test statistics Z-bar (*P*-value)
PCREDIT does not Granger cause NPL	19.88* (0.000)	19.54* (0.000)	12.13* (0.000)	6.68* (0.000)	16.56* (0.000)
NPL does not Granger cause PCREDIT	10.33* (0.000)	8.38* (0.000)	14.35* (0.000)	3.19* (0.001)	7.67* (0.002)
GDP does not Granger cause NPL	5.48* (0.000)	5.34* (0.000)	4.57* (0.000)	1.23 (0.216)	3.73* (0.000)
NPL does not Granger cause GDP	2.22* (0.02)	4.34* (0.01)	0.57 (0.56)	2.71* (0.00)	3.17* (0.000)

*Indicate value at 5% significance level

current-year NPLs from prior year's NPLs, are consistent with this result. The findings for impact lagged NPLs on NPLs are similar for Pooled, UMIC, LMIC and LIC countries, but the coefficient is much higher for developing and UMIC and HIC countries.

The CIR coefficient is discovered to be negatively correlated with NPLs, and the estimates are statistically significant for UMIC and LMIC countries, indicating that an efficient banking system is likely to have a high level of non-performing loans than inefficient ones. That suggests that banks need to be cost-efficient and use their funds wisely on credit screening and monitoring, whereas the CIR coefficient is positively significant for high-income countries, supported by 'skimping hypotheses deducted by Berger and DeYoung [22] Berger and DeYoung [22] findings that cost-efficient banks manage their credit risk more than inefficient ones. Because high-income countries have developed proper screening and monitoring processes so if they incur any cost, it will be used wisely by management.

Likewise, the coefficient of banking profitability (ROA) shows a statistically significant negative association between bank profitability and NPL for pooled, LMIC, LIC and HIC countries. Banks with higher profitability tend to involve with less risky portfolios because they have fewer incentives to involve in one [12, 22]. Here coefficient is much higher for high-income countries.

The Coefficient of NII shows banking diversification activities and non-performing loans are negatively associated, and the result is significant for HIC, LMIC and LIC countries. This study concluded that banks with increased NII ratios need not depend on interest income for their reliance and tend banks do not need to be involved with risky portfolios for higher incentives to increase their profitability [54]. This finding indicates that diversification in the low-income countries' banking industry helps lower credit risk. So, it has been deducted that banks should strive to increase non-interest income so there will be fewer NPLs.

NPL and the (CAR) coefficient have a significant negative relationship for developing countries but not for developed ones. We can predict why having more regulatory capital helps banks experience fewer non-performing loans (NPLs). Risk-adjusted capital may help banks avoid issuing high-risk loans without proper screening, which would otherwise result in more NPLs in developing economies. Additionally, banks have enough cash to make adjustments in any unfavourable crises. These findings countered the 'too big to fail' hypothesis that banks with high capitalization take deliberate loose/poor credit policies, resulting in higher amounts of NPAs [22]. In contrast, for high-income countries CAR ratio coefficient is not significant.

Domestic credit offered by the home country (PCREDIT) is a relative measure for financial development, and all panels show a negative correlation between NPLs and PCREDIT's coefficient. It illustrates how a low number of NPLs results from the depth and breadth of the banking system in developing and developed countries. This finding countered the finding of Ozili [8] countered the 'too big to fail' hypothesis that bigger banks take deliberately loose/poor credit policies, resulting in higher amounts of NPAs [22]. A large banking sector should be more stable than a small one if a robust systemic risk regulatory framework is in place [40].

Financial liberation is measured through foreign bank presence (FGN). The result showed a significant negative association with NPLs in all panels except HIC countries. That indicated that FGN helps channel good quality loans and uplift new technology with low default risk, ultimately resulting in low non-performing loans in host developing countries. The high-income countries do not require foreign investment to have advanced technology and management practice. So, the result does not have a significant impact on developed countries.

According to the GDP coefficients for all panels, actual economic activity and NPLs have an inverse relationship. According to Laeven and Majnoni [41], increasing

financial activity and stability during an economic boom result in fewer NPL. The correlation between inflation and banks' NPLs is also negative per the inflation coefficient for developing countries but not for high-income countries. As wages and the cost of raw materials do not increase in the short term, the expansion would aid in accelerating company endeavours' incomes and benefits. As a result, NPL would decline. But for developed countries, NPL seems insensitive to the inflation level.

The findings suggest that greater unemployment levels should be correlated with higher NPL for pooled, low-income, and high-income economies. Loan defaults are more likely because borrowers are more likely to request loans when unemployment is high. Due to job loss during periods of high unemployment, borrowers may find it difficult to repay the principal and interest on the credit facility. The following default on loan repayments could lead to banking instability.

The institutional quality variables (PCA_INST) Coefficient shows a negative link between NPLs and governance indicators for all panels. But the coefficient is much higher for upper-middle and lower-middle-income countries, proving countries still in the emerging phase are more prone to corruption. And their NPL level is more sensitive to the institutional environment than high-income countries. Further, it proves the findings of Brunnermeier et al. [3], that pointed out that crises are more likely to occur in nations with lax institutional controls and systemic reliance on banks in the financial system. They cited the 2008 global financial crisis and numerous national banking crises in various nations worldwide as evidence. Either the process of issuing credit or control and recovery after the loan is approved is hampered by corruption. Decisions about loans in this situation are influenced by the degree of political pressure that various interest groups apply. Loans will therefore be advantageous for companies with strong political ties, even though they may result in lower-quality portfolios. An internal audit might highlight these institutional control shortcomings, but it tends to be less prevalent in countries with corrupt civil societies.

Findings indicated long-term cointegration between financial development, economic growth and NPL. It can be summarized from Table 5 NPLs does Granger cause economic growth (GDP) and financial development (PCREDIT). Likewise, economic growth (GDP) and financial development (PCREDIT) do Granger cause NPLs. So, it confirms the above findings of GMM analysis. Higher economic growth often increases income and stability in manufacturing and service sectors. Therefore, the tendency of bad loans is decreased during an economic boom, leading to a low level of NPLs in economies. Bank's ability to meet its financial obligations and maintain its integrity depends on the ability and desire of the customers to pay their loans.

In contrast, NPL negatively impacts financial development and economic growth [55]. The decline in asset quality negatively impacts the bank's economic activities and the soundness of its financial development. Reduced economic activity in emerging nations resulted from banks being obliged by increased NPL levels to accept risks and exercise greater care when lending to specialized industries and niche markets. That results in shrinking financial inclusion/development and economic growth. When the economy is growing, borrowers are more likely to be able to repay their loans, and therefore the level of NPLs is likely to be low. On the other hand, when the economy is in a recession or experiencing low growth, borrowers may struggle to repay their loans, increasing NPLs.

Conclusion

The primary responsibility of the central bank or any other banking regulatory entity is to maintain a reliable and efficient financial system that safeguards the interests of all involved agencies. Financial stability is based on a robust banking sector that efficiently transfers funds between depositors and debtors. Indeed, bank stress tests are beneficial for prudential banking oversight. Central banks frequently use NPL modelling as part of the stress test methodology to restore financial stability and public confidence in the banking sector in developing and developed countries.

This study examines the financial, macroeconomic, and institutional factors that affect non-performing loans in advanced and developing economies from 2010 to 2020. The results suggested that the level of NPLs is significantly and negatively correlated with the size and liberalization of the banking sector. Thus, it can be concluded that greater financial development through increased banking sector resources aids in lowering the level of non-performing loans. Financial liberalization aids banks in acquiring cutting-edge equipment and implementing new financial services and products in developing economies. According to the study, central bank authorities and regulators know the value of financial growth and credit monitoring practices in reducing non-performing loans.

Regarding bank-level determinants, non-performing loans negatively impact banking efficiency, profitability, diversification activities, and loan loss coverage ratios.

In contrast, regulatory capital positively impacts non-performing loans. Therefore, it is important to consider bank diversification efforts carefully because they will ultimately reduce banks' reliance on interest income and support from fee and commission-based activities. The importance of macroeconomic indicators like GDP, inflation, and unemployment on non-performing loans, where GDP and inflation have a negative correlation, is also acknowledged in this study. The empirical results of this study indicated that bad governance increases NPLs.

In the literature on institutional economics, institutional quality has possibly been acknowledged as one of the most crucial factors in GDP development. Institutions make and enforce rules and regulations in front of the public by enforcing contextual controls. In general, governance/institutional quality is linked to the tactics used by governance institutions to create the legal and cultural backdrop for socioeconomic activities. The ability of the state institution to create and carry out laws and policies that support the private sector, enhance contract execution quality, defend property rights, uphold the rule of law, and ensure institutions' impartiality and independence from political influence is thus demonstrated by this. Weak institutions support the private sector, which results in corruption, a disjointed bureaucracy, and inadequate environmental legislation, all placing a financial burden on the government. The current study has a few limitations. Firstly it has a two-year lag in data provided by the world bank. Secondly, Due to the vast differences between advanced and developing nations, it is hard to generalize the findings. Finally, this study takes a quantitative approach to analysing and taking employee perceptions regarding NPL drivers, providing scope for future research.

Implication of the study

From the perspective of policy, this research will help the government, lawmakers and monetary authorities in developing and advanced countries comprehend the significance of different drivers of NPL. It helps assess not only credit loss protection and insolvency in banking systems but also the impact of institutional quality and such events on the non-performing loans of developing economies. According to the findings, in addition to maintaining regulatory standards and other measures for handling issued loans, banks are advised to look at additional sources of income that are not dependent on interest revenue and borrowers' capacity to repay loans. To have effective asset management, bankers of developing and developed countries are advised to improve cost-effectiveness and managerial skills. Banks must not only be financially efficient but also efficiently managed.

Our findings suggest that institutional factors significantly impact NPL, so banks and governments are advised to have adequately defined and well-structured criteria and processes for awarding loans. These are essential for controlling NPLs because they can significantly minimize the number of problematic loans. Additionally, stricter credit screening procedures should be used before providing any loan and candidate data should be checked for correctness. The borrower's credit history must be considered when determining the security for any loan. So there will be less corruption while granting loans, whether in a developing or developed country.

Policymakers must understand how non-performing loans and banking instability affect countries' economic growth. Thus, controlling NPL and improving credit quality is imperative for the survival of banks and the overall economy. Present and past evidence also shows that NPLs are usually higher during recessionary periods with higher unemployment levels. Therefore, the government needs to create enough jobs to increase borrowers' paying ability, especially in post COVID era, where there are laying off and pay cuts in the labour force. During COVID, when there is an economic slowdown and reduction in financial activities, banks are more prone to have a high level of NPL as high economic growth and financial development help reduce NPL.

Appendix 1

Descriptive analysis. Source: Author's calculation

Variable	Mean	Std. Dev.	Min	Max
NPL	7.685431	7.128224	0	54.5413
CIR	56.0363	12.93429	19.92333	202.0408
ROA	1.9819	3.446915	−69.9938	29.34206
NII	34.7904	11.90344	7.734241	95.42103
CAR	18.22171	5.580964	1.75475	46.8205
PCREDIT	41.28221	31.57802	3.126284	182.4326
FGN	43.19262	31.58501	0	100
GDP	3.163061	4.526632	−36.392	20.71577
UNEM	7.965103	6.536757	0.13	32.02
INFL	5.151483	5.775824	−4.29848	84.86433
PCA_INST	0.055235	2.03673	−4.99338	4.897354

Appendix 2

Pairwise correlation matrix Source: Author's calculation

	CIR	ROA	NII	CAR	PCREDIT	FGN	GDP	UNEM	INFL	PCA_INS
CIR	1									
ROA	−0.0612	1								
NII	0.2635*	0.0485	1							
CAR	−0.0687	0.1716*	−0.0139	1						
PCREDIT	−0.2901*	−0.1206*	−0.231*	−0.2075*	1					
FGN	0.0861	−0.0082	−0.0086	0.2078*	−0.2331*	1				
GDP	0.0567	0.0961*	0.0291	−0.0888*	−0.0797*	−0.1946*	1			
UNEMP	0.0534	−0.0281	0.0962*	−0.0790*	0.0531	0.3524*	−0.1587*	1		
INFL	−0.0387	0.0890*	0.1819*	0.0167	−0.1598*	−0.0929	−0.0375	−0.0930*	1	
PCA_INS	−0.0314	−0.0194	−0.193*	0.0228	0.1478*	0.0154	0.0095	0.0678*	−0.1235*	1

*denotes significance at 5% level

Appendix 3

Result of Pairwise Correlation Matrix of world governance indicators. Source: Author's calculation

	COC	GE	PS	RQ	ROL	VAC
COC	1					
GE	0.7453*	1				
PS	0.6138*	0.4353*	1			
RQ	0.615*	0.817*	0.3266*	1		
ROL	0.8569*	0.8124*	0.6416*	0.7073*	1	
VAC	0.6466*	0.5321*	0.4775*	0.5681*	0.6883*	1

*denotes significance at 1% level

Appendix 4

Result of principal component analysis. Source: Author's calculation

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.20333	3.43113	0.7006	0.7006
Comp2	0.772192	0.289956	0.1287	0.8293
Comp3	0.482235	0.19354	0.0804	0.9096
Comp4	0.288695	0.148869	0.0481	0.9577
Comp5	0.139826	0.0260997	0.0233	0.981
Comp6	0.113726		0.019	1

Appendix 5

Principal components (eigenvectors). Source: Author's calculation

Comp1	Unexplained
0.4393	0.189
0.4284	0.2287
0.3317	0.5376
0.3965	0.3393
0.4615	0.1049
0.3787	0.3972

Abbreviations

CAR	Capital adequacy ratio of the banks
CIR	Cost to Income Ratio
ROA	Return on assets
COC	Control of Corruption
FGN	Foreign bank assets among total bank assets
GE	Government effectiveness
GDP	Gross Domestic Product (annual)
HIC	High-income countries
INFL	Inflation (Consumer Price Index)
LIC	Low-income countries
LMIC	Lower middle-income countries
NII	Non-interest income to total income
NPL	The ratio of non-performing loans
PCA_INST	Principal Component Analysis of 6 Institutional factors of a country
PCREDIT	Private credit by domestic banks to GDP
PS	Political stability

ROL	Rule of Law
RQ	Regulatory quality
UMIC	Upper middle-income countries
UNEM	Unemployment
VAC	Voice and accountability

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Author contributions
We declare that all listed authors (SG, NS, NM and SKV) have contributed immensely to the preparation of this manuscript. SG conceptualized the idea, wrote the literature review and analysed the data". "NS Interpreted the results of analysis". "NM have drafted the final paper". "SKV have help in revising the paper" All authors read and approved the final manuscript.

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Availability of data and materials
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Declarations

Ethics approval and consent to participate
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Consent for publication
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I declare that there are no conflicts of interest between authors regarding the publication of this paper.

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