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Impact of Institutional Environment on Banks' Non-Performing Loans: Evidence from BRICS Countries

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ABSTRACT

The drivers of non-performing loans (NPL) and the possible effects of the institutional and business environments on the credit risk exposure of banks in the panel of BRICS countries and segregated models are analyzed in this paper. The **purpose** of the study is to identify the relationship between banking, macroeconomic and institutional factors of non-performing loans of banks at the BRICS level for the period 1996–2020. The panel ARDL approach is used for this purpose. The Panel Granger causality test is applied to verify the hypothesis of the relationship between economic development and NPLs. Panel co-integration tests examine the existence of a long-term link between the same two variables. The results of the study demonstrated that a decrease in the proportion of NPLs results from boosting performance metrics like the Z-score. Because the banking industry has more resources as a result of higher financial development and/or financial intermediation, the amount of NPLs is reduced. Finally, our study demonstrates how important the institutional environment is for raising the quality of bank credit. It was concluded that the low level of NPLs in BRICS countries was largely linked to more effective anti-corruption management, robust regulatory standards, increased application of the rule of law, freedom of speech and accountability.

Keywords: non-performing loans; NPLs; institutional environment; panel granger causality test; PCA; panel ARDL

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INTRODUCTION

NPLs are a sign of banks' loan portfolios with declining quality, which raises risk and has an impact on the stability and profitability of banks. According to the 90-day rule used by the BRICS nations, loans are considered non-performing if the principle or interest is not paid for three consecutive months. NPLs cause a loss in real economic activity in addition to having a negative impact on the banking system's financial soundness and profitability. Additionally, because of their detrimental impact on the financial system and economic activities, several experts have referred to NPLs as "financial pollution". Banks are regarded as the primary generators of the economy and any disturbance in banks generates ripple effects in the economy as well. One of the fundamental responsibilities of the central bank or any other banking regulatory authority is the preservation of a trustworthy and efficient financial system that safeguards the interests of all participating agents. Financial stability is supported by a robust banking system that efficiently transfers funds between savers and borrowers. When it comes to prudential banking oversight, bank stress tests are the most useful. Therefore, to restore overall banking stability and a sound banking system, the central banks and international regulatory bodies adopt a variety of policies and advice to reduce NPLs. However, a fuller understanding of the underlying causes of the NPL problem is necessary before any policy response by banking regulatory agencies can be made.

The BRICS economies have stood out during the past two decades by contributing significantly to the global economy. As a diverse group of emerging nations, the BRICS will account for over 23 percent of global GDP, over 48 percent of the world's geographical area, and almost 45 percent of the world's agricultural value added by the year 2020 (world development indicators). The BRICS nations can be identified by a wide range of characteristics and have enormous development potential. On the other hand, macroeconomic factors like the nation's growth rate, inflation, taxation, unemployment, etc. also have an impact on banks and the profitability of the banking industry.

This article aims to investigate the effects of particular macroeconomic factors and the strength of

the institutional environment on the NPLs of the BRICS nations. Brazil, Russia, India, China, and South Africa are known collectively as the BRICS (Brazil, Russia, India, China, and South Africa) bloc. This bloc gained prominence after the 2003 publication of a report by Goldman Sachs describing the BRICS as one of the world's emerging blocks that will significantly contribute to the global economy and trade by the year 2050 [1]. This study evaluates the impact of both institution-specific environmental variables and bank-specific economic environments on BRICS country NPLs. In the paper [2] also show that crises appear to be more likely to occur in nations with wet banking systems, as evidenced by the financial crisis of 2008 and several domestic financial collapses in countries around the world. The structural dependence of the economic system on banking and its interconnection may have negative implications for the stability of the banking sector. In view of these issues and the flimsy governance structures in emerging nations, it is vital to ascertain the causes of non-performing loans in those nations.

Our study differs from past ones in that it primarily focuses on the BRICS countries and that we are more interested in overall outcomes than the performance of single banks. We focus on the connection between credit risk and governance indicators to better understand the effect of institutional quality on banking NPLs in the BRICS countries. Among the explanatory variables we used were factors affecting bank performance, financial structure variables, macroeconomic variables, and institutional and governance quality indicators. We can identify NPL determinants for the countries of the BRICS region using this technique.

We provided two significant contributions to the literature. First of all, our research advances earlier studies on banking stability and regulation [2]. These studies try to identify the root reasons of the financial system's vulnerability as well as potential stabilizing elements. We contribute to the corpus of literature by examining the case of the BRICS countries. We show how the significance of NPL's drivers in the BRICS region varies depending on the choice of the banking stability proxy. Second, from a policy viewpoint, the information gleaned from our study can help bank regulators or/and supervisors in BRICS and other developing nations comprehend the importance of assessing more than only credit loss protection and insolvency risk in the banking system. Additionally, it examines how institutions' quality and the effects of similar occurrences and institutions would affect the stability of the financial system in the BRICS nations.

LITERATURE REVIEW

So far, the literature on NPLs focuses extensively on macroeconomic and bank-level determinants of non-performing loans with little or no focus on the question of whether certain financial development structures/characteristics drive aggregate non-performing loans.

Macroeconomic Factors

The literature on NPLs focuses on the macroeconomic and bank-level determinants of NPLs with little or no focus on the institutional environment in the persistence of NPLs. In the paper [3], we analyse NPL factors in the Greek banking sector and show that management quality, GDP, unemployment, interest rates, and public debt all have a substantial impact on NPLs.

In previous literature, because NPLs tend to be smaller during economic booms and greater during recessions, GDP growth is frequently linked to variations in the magnitude of NPLs [4]. Also, because high unemployment might damage borrowers' ability to repay loans, high unemployment is linked to high NPLs. In the literature, the effect of inflation on NPLs is equivocal, with mixed results. NPL persistence may also be influenced by global risk factors [5]. In the paper [6], bank type, risk-taking behaviour of banks, bank ownership, bank concentration, leverage and credit quality of banks and macroeconomic variables (GDP, effective interest rate, inflation, and foreign exchange rate) are responsible for variation in the NPLs of Chinese banks.

Bank-level Determinants

A country's degree of financial development is essential, and since NPLs are a measure of bank performance, a link between financial development and NPLs can be formed. However, the literature on the relationship between firm/bank performance and financial development has not looked into the impact of financial development levels on the persistence of NPLs; as a result, our understanding of how financial sector development influences NPLs is unclear. For example, the paper [7] argues that financial development is significant because it can influence the severity of a

financial or economic crisis, as well as the domestic mobilization of resources required to address a country's current crisis.

Few studies have tried to establish a link between NPLs and banking liberalization. For instance, in the paper [8], it was deduced that presence of foreign participation from developed economies; higher credit growth rates and positive loan loss provisions help in downsizing the level of NPL in host countries. The authors' paper [9] emphasized that foreign-owned banks have some important bank practices that systematically help them to have lower NPLs than domestic banks.

When it comes to bank-specific NPL determinants, [10] revealed that adequate capitalization, low credit quality, high liquidity risk, and lower cost efficiency tend to increase NPL, whereas greater bank profitability results in lower NPLs through examining determinants of NPLs for commercial banks and savings institutions in 50 US states and the District of Columbia.

Institutional Factor

According to some research, institutional quality can impact a nation's banking system's stability, and a nation's governance quality can impact banking regulation and supervision aimed at influencing bank behavior [11]. The institutional environment includes the legal and judicial framework, political stability, and the degree of corruption control. Although a well-functioning government system is known to influence the performance of the financial system, there is little evidence linking well-functioning institutions and good governance to banks' financial outcomes, such as NPL [12]. These factors appear to be important in determining cross-country differences in credit quality. For instance, in many developing countries, banks suffer from the significance of NPL. These countries are most characterized by inefficient judicial systems, corrupt bureaucracies or political institutions.

These features hinder either the process of extending credit or the process of control and recovery once the loan is granted. More specifically, the existence of corruption negatively impacts the degree of market competitiveness and thus leads to inefficient loan offers. In the paper [13] suggests that in societies with few democratic traditions and civil discipline, decision-makers are exposed to informal connections and other pressures from groups seeking unjustified or illegal economic rents. In this context, loan decisions are affected by the intensity of pressure from political lobbying by various interest groups. Loans will thus be gained by enterprises with solid political connections but could be of lower quality (even in severe distress). Furthermore, internal control tends to decrease in countries with corrupt civil societies.

Our study, however, differs from previous research in that it departs from it to look at the relationship between NPLs and institutional, macroeconomic, and financial sector development.

DATA SOURCES AND METHODOLOGY

Data

To determine how certain financial sector development, economic growth, and institutional/governance variables relate to NPLs, In the current study's panel ARDL approach, time series data from Brazil, Russia, India, China, and South Africa (BRICS) were employed for the period 1996–2020. Data is retrieved for analysis from the World Bank's archived global financial development database, which is available. As a result, the final sample of 5 BRICS nations was chosen based on the availability of data. The World Bank gathered data on macroeconomic variables from global development indicators. The World Governance Indicators created by [14] provide information on the institutional environment at the national level. Based on 276 unique variables collected from 37 data sources created by 31 various organizations, this database is specifically, this database is utilized in the literature to examine how institutions influence economic results. In this study, we try to explore the relationship between stated variables by employing the given empirical model form:

$$NPL = \alpha_0 + \beta_1 PCREDIT_{it} + \beta_2 ZSCORE_{it} + \\ + \beta_3 LOG\_GDP_{it} + \beta_4 INF_{it} + \\ + \beta_5 PCA\_INST_{it} + u_{it},$$

where in the entire above model the explanation of the variables are as follows: NPL_{it} = Gross NPLs to Gross Advances Ratio of bank i at time t; $PCREDIT_{it}$ = private credit by domestic banks to GDP ratio of country i at time t; $ZSCORE_{it}$ = Banks stability of country i at time t; LOG_GDP_{it} = Gross Domestic Product of country i at time t; INF_{it} = Inflation, consumer prices (annual%) of

country i at time t; PCA_INST_{it} = PCA of 6 Institutional factors of country i at time t; u_{it} = the error term for a country i at time t.

Variable under Study

The NPL to Gross Advances Ratio (NPLR) is a dependent variable in the present study that reflects the credit quality of banks. According to banks for international settlements, a default or nonperforming asset is considered to occur in respect of a specific borrower if borrowing is overdue for more than 90 days on any kind of bank credit to any type of banking institution.

Private credit by domestic banks to GDP ratio (PCGDP), which measures the depth and breadth of the banking sector in an economy's financial system, is used to quantify the level of financial intermediation. A large banking sector should be more stable than a small banking sector if a strong systemic risk regulatory framework is in place; thus, a negative correlation between banking NPLs and banking sector size should be expected [4].

The Z-score index, which is defined as the ratio of the return on assets plus the capital ratio divided by the standard deviation of the return on assets in the literature, is frequently used to gauge banking stability [15]. As expected, a strong banking system should have fewer NPLs, and a greater Z-score indicates stronger banking stability, suggesting an adverse connection between NPL and Z-score.

Finally, we control for macroeconomic factors affecting the banking sector's stability. Inflation (INF) is used to control for macroeconomic factors influencing NPLs [16]. During inflationary periods, banks are able to charge higher prices for banking and financial services offered to customers. Banks can benefit from higher price margins during inflationary periods to increase their profitability, which contributes to greater banking stability; therefore, we anticipate a negative correlation between the NPLs in the banking sector and inflation.

Economic growth (GDP) is another macroeconomic factor that can potentially influence the stability of the banking sector. Loan defaults typically lower during periods of high economic growth, which consequently has positive effects on banking sector stability [16]; therefore, we expect a negative relationship between NPLs and economic growth.

Institutional quality is assessed using perception measures that are assigned values; higher values indicate stronger economic governance. Since excellent governance is linked to fewer NPL creations, it is reasonable to anticipate a negative relationship between NPL and institutional quality (PCA INST).

Descriptive Statistics

Appendix Table 1 shows the results of the descriptive statistics for the variables under study. According to summary results, NPLs have increased at an average rate of 5.88% of gross loans with a standard deviation of 5.03%. Maximum NPLs were recorded at a level of 29.8% for the given sample of BRICS economies.

To illustrate the strength and direction of correlations amongst some of the potential determinants and to assess if there is any problem with multicollinearity across independent variables, *Appendix Table 2* includes a Pearson's correlation matrix. As a general rule, the correlation value below 0.70 indicates that there is no issue with multicollinearity between the variables. The greatest correlation of the study's variables, 0.4262*, is found between GDP and Z-Score.

Appendix Table 3 shows the Pairwise Correlation Matrix of world governance indicators that indicate a problem of multicollinearity among different governance variables. To address this problem, a single institutional quality variable (PCA_INST) is created through principal component analysis. *Appendix Table 4* indicates that PCA_INST explains 64.52% of all six variables. *Appendix Table 5* demonstrates Eigen vectors for the same.

Our analysis has adopted two steps: firstly, we applied the panel unit root test for the variables investigated. We have also employed Principal Component Analysis (PCA) in order to develop an institutional factor, index for analysis. Based on both results, the study has employed the Pooled Mean Group Autoregressive Distribution Model (ARDL) to capture short-run and long-run effects.

Econometric Techniques

Unit Root Test

To select the best model and conduct the necessary analysis to look at the order of the variables' integration, we used the Fisher ADF unit root test. Numerous panel unit root tests have been carried out to prevent the bogus regression issue. In the analysis, various panel unit root tests based on individual effects and combination effects have been carried out in order to evaluate the integration and unit root among the variables.

Pooled Mean Group (PMG) Panel ARDL Model

After determining whether a unit root exists in the data for our investigation, we move on to specifying the dynamic panel model. Panel Auto Regressive Distributed Lag (ARDL) is best used when few variables are stationary at levels and some of the first differences.

Homogeneous long-run coefficients are what the panel ARDL model anticipates. The PMG model presupposes that the error terms are serially uncorrelated and distributed independently of the repressors. The big sample size (N) and short-term (T) dynamic panels differ from the large sample size (N) and long-term panels in several ways (T). The use of fixed- or random-effect models, fixed-effect estimators, and instrumental-variable estimators, such as the generalized method-of-moments (GMM) approach, is required for panel estimation based on tiny T. These methods call for pooling distinct groups and allowing only the intercept to vary across the groupings. In any case, it is important to note that the large N and large T results show that it's generally incorrect to assume that the slope parameters are homogeneous. In the paper [14] have all made this point. An alternate Pooled Mean Group (PMG) estimator was provided by Pearson and Shin (1999) to address this issue. An intercept, short-run coefficients, and co-integration term are included in the advanced panel settings of the model, which has the ARDL basic form. Because each of the variables in the ARDL model stands as a standalone equation, the likelihood of endogeneity is relatively low [15, 16].

Panel Co-integration Test and Panel Granger Causality Test

We also applied the panel Granger causality test to check the long-held proposition of causality between NPLs and economic growth. We use the IPS test to test stationary data. While the alternative hypothesis proposes that the data are stationary, the null hypothesis of the IPS test asserts that the data include a unit root. Tests of panel co-integration look for a long-term link between the two variables. The Panel Co-integration test outcomes for Kao and Johansen There is no indication of co-integration between NPLs and economic growth factors, according to panel co-integration tests. So, in the absence of co-integration, we now examine the short-run causality between NPLs and economic growth. To observe short-run causation between the two, the Panel Granger causality test was used in conjunction with the Vector Autoregressive (VAR) framework.

RESULTS AND DISCUSSION

This section looks at the relationship between NPLs and economic expansion. The IPS test unit root test was utilized to test the stationary of the data. The unit root test's findings indicate that our variables are stationary at the first difference (see *Table 1*).

After establishing that all variables are stationary at the initial difference, we can use the Kao panel co-integration test and the Johansen panel co-integration test to examine the co-integration between the NPL and economic growth. There is no co-integration between NPL and economic development, as shown by the results of the Kao panel co-integration test, which are provided in *Table 2*.

Test of Panel Co-integration Given that both Kao co-integration test results in *Table 2* accepted the null hypothesis that the variables are not co-integrated and that the P-values are greater than 5%, we can infer that the variables for BRICS, or Brazil, Russia, China, and India, do not have a long-term association with one another. In contrast, South Africa and Brazil have significant ADF test data. We now use a Vector Autoregressive (VAR) framework to test the short-run causality between the two.

The panel Granger causality test result, which looked for a short-run relationship between the NPL and economic growth, is shown in *Table 3*.

From *Table 3*, it can be deduced that there is a presence of unidirectional causality running from GDP to NPL for BRICS, Brazil, India and South Africa. Higher economic growth often leads to increased income and stability in different manufacturing and service sectors. So, the tendency of bad loans decreases during an economic boom, leading to a low level of NPLs in economies. But there is significant causality running from NPL to GDP for Brazil and South Africa. So, it can be deduced that NPL does significantly impact real economic growth in the same countries. The panel co-integration test only discusses the long-term relationships between variables; it does not give precise information regarding the relationship between the independent and dependent variables. To be more precise, the Granger causality test and PMG-ARDL model are employed to obtain these estimations because co-integration analysis does not provide any information regarding the postulated signs and magnitudes of the coefficients.

Table 1

Panel Unit Root Test Results

Countries	BRICS		Brazil		Russia		India		China		South Africa	
Variables	Im, Pesaran, Shin IPS test		Im, Pesaran, Shin IPS test		Im, Pesaran, Shin IPS test		Im, Pesaran, Shin IPS test		Im, Pesaran, Shin IPS test		Im, Pesaran, Shin IPS test	
	Level	First Difference	Level	First Difference	Level	First Difference	level	First Difference	Level	First Difference	Level	First Difference
NPL	0.188	0.000***	0.114	0.000***	0.627	0.000***	0.084*	0.000***	0.157	0.001***	−2.890*	0.022**
PCREDIT	0.058*	0.000***	0.060	0.000***	0.971	0.000***	0.061*	0.000***	0.117	0.001***	−1.070	0.007***
ZSCORE	0.060*	0.000***	0.766	0.000***	0.054*	0.049**	0.644	0.014**	0.124	0.045**	−1.684*	0.000***
LOGGDP	0.050*	0.000***	0.110	0.000***	0.077*	0.000***	0.451	0.000***	0.061*	0.003**	2.861	0.000***
INFL	0.058*	0.021**	0.197	0.045**	0.822	0.000***	0.000***	0.000***	0.000***	0.000***	−3.874	0.000***
PCA INST	0.188	0.000***	0.106	0.000***	0.400	0.002***	0.406	0.000***	0.018**	0.000***	−1.368	0.000***

Source: Authors' calculation.

Note: *, ** and *** denote significance at 10, 5 and 1% levels respectively.

Table 2

Kao Panel Co-Integration Test Results

Countries	Null Hypothesis (No Co-integration)	P (Value)	Test Statistics
BRICS	ADF	0.1202	−3.60
Brazil	ADF	0.034	−2.656*
Russia	ADF	0.167	4.78
China	ADF	0.0645	−3.89
India	ADF	0.0897	−1.78
South Africa	ADF	0.0567	−1.67*

Source: Authors' calculation.

Note: * denotes significance at 5% level.

Table 4 presents the outcomes of the PMG-ARDL model. Economic growth (GDP) and inflation (INF), two independent variables, are positively and statistically significant in the BRICS panel and other nations, according to the panel results for the long term. NPLs are inversely related to the long-run coefficients of financial development (PCREDIT) and financial stability. The institutional quality long-run coefficients, however, are negative, as predicted. The examined variables' negative coefficients imply that when institutional quality improves in Brazil and India, a greater proportion of students will be considered nonperforming.

Whereas in *Table 5*, the panel results for the short run show that the independent variables, i.e. economic growth (GDP) are statistically negatively significant and inflation (INF) is statistically insignificant in BRICS countries and other models. The long-run coefficients of financial development (PCREDIT) and Financial Stability are negatively associated with NPLs for the BRICS panel and other models.

Domestic credit provided by the home country (PCGDP) is a proxy of financial development and its coefficient is negatively associated with NPLs in long run as well as in the short run. This reflects that the depth and breadth of the financial sector in an economy result in a low level of NPLs. The long-run coefficients of financial development (PCREDIT) are negatively associated with NPLs. This finding countered the finding in the paper [7]

Table 3

Results of Panel VAR Granger Causality Test

Countries	TIP/GDP	
	Dependent variable: NPL	Dependent variable: GDP
BRICS	19.67***	28.78
Brazil	17.98***	8.95**
Russia	3.56	2.78
India	9.75***	8.74
China	7.56	6.93
South Africa	9.87***	10.95**

Source: Computed by the authors.

Note: *, ** and *** denote significance at 10, 5 and 1% levels respectively.

Table 4

Long Run PMG ARDL Estimation

Countries	BRICS	Brazil	Russia	India	China	South Africa
Short run	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
PCREDIT	−0.1125***	−0.038**	−0.217	−0.086**	0.086	−0.046***
ZSCORE	−0.1437*	−0.353**	−3.461**	−0.105**	−0.105	0.137
LOGGDP	−7.9687***	3.038	−4.871***	−6.018**	−10.018**	9.387***
INFL	−0.53503***	−0.112***	−2.452*	0.567	−0.875**	−0.733*
PCA_INS	−0.1516	−0.073*	3.907	−0.547*	.876	−0.367

Source: Computed by the authors.

Note: Critical value at the 1%, 5% and 0% significance level denoted by*, ** and ***respectively.

Table 5

Short Run PMG ARDL Estimation

Countries	BRICS	Brazil	Russia	India	China	South Africa
Short run	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
PCREDIT	−0.03333***	−0.060***	−0.119	−1.125*	−0.0389	1.966
ZSCORE	−0.30938***	−1.23**	−18.75*	0.187	−0.767***	1.817
LOGGDP	−5.71646**	0.036	−1.241**	0.086	−7.748*	0.437
INFL	−0.15397	−0.444*	1.184	0.241	−0.5365	−1.362*
PCA_INS	−0.818252**	0.064	−3.713**	−2.072***	−.76478**	−1.179

Source: Computed by the authors.

Note: Critical value at the 1%, 5% and!0% significance level denoted by*, ** and ***respectively.

on the link between financial sector development and NPL. This finding supported the hypothesis that a large banking sector should be more stable than a small banking sector if a strong systemic risk regulatory framework is in place [12].

The coefficient of GDP shows a positive correlation between real economic activities and NPLs. It implied that NPLs were lower during the economic boom due to increased financial activities and stability. Likewise, the coefficient of inflation shows a positive relationship between the banking sector's NPLs and inflation in the long-run but in the short run, inflation is negative but insignificant and associated with NPLs. In order to boost lending during prosperous economic times, banks lowered loan-screening standards and used loose lending criteria. This increased the probability of rising NPLs when unforeseen circumstances occurred that affected borrowers' capacity to repay [7].

Institutional quality variables (PCA_INST) coefficient shows a negative but insignificant link between NPL and governance indicators in the long-term. The (PCA_INST) coefficient is significantly negatively associated with NPLs. That proves the findings of the paper [2], which 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 as well as numerous national banking crises in various nations around the world.

However, the short-run coefficients of INFLATION are negative, which is the opposite of long-run estimation. Finally, the institutional environment index is negative but statistically significantly associated with NPLs, which clearly indicates countries with a better institutional environment are more likely to have lower amounts of NPLs.

CONCLUSION AND IMPLICATION OF STUDY

The causes of NPLs in the BRICS countries are investigated in this paper. Prior research without a focus on the institutional setting of the BRICS countries has shown the importance of systemic risk and bank-specific shocks to the stability of the financial system. Our findings suggest that the size of the banking sector, GDP, and inflation rates are important long-term predictors of financial stability in BRICS nations. In contrast, the size of the banking sector, the Z-score, and the levels of institutional quality indicators are important short-term predictors of financial stability in BRICS nations. Although there is a causal relationship between the GDP and NPLs.

Institutional quality has arguably been recognized as one of the most important drivers of GDP development in research on institutional economics. By imposing contextual controls, institutions create and enforce norms and regulations in front of the public. In general, strategies adopted by domestic institutions to establish the legal and cultural contexts for socioeconomic activities are connected with institutional quality. Consequently, this demonstrates the government's capacity to develop and implement laws and policies that support business, enhance contract execution quality, safeguard property rights, uphold a robust legal system, and ensure that institutions are independent of political influence. On the other hand, ineffectual institutions support the private sector inefficiently, which results in corruption, an inefficient bureaucracy, and lax environmental restrictions.

Our literary work will help society in two different ways. First, our analysis adds to the research on NPLs in banking and regulation that has already been done [2]. These studies make an effort to pinpoint the causes of financial system fragility as well as prospective influences on NPLs in banking. By examining the cases of developing and developed economies, we contribute to this body of scholarship. Investigating the effect of economic and stock market volatility on banking stability in various areas might be a valuable area for future research. Finally, as a follow-up to papers [6, 12, 13], future research might also look at how digital finance affects banking stability globally. Second, from the perspective of policy, this study will assist governments, policymakers, bank regulators, and supervisors in developing and underdeveloped countries to understand the significance of assessing not only credit loss protection and insolvency in the banking system but also the impact of institutional quality and the impact that such events would have on the NPLs of emerging economies. In order to protect societal interests, it will assist the government in gaining knowledge about policy-making, advice, and regulation in regard to non-performing and banking stability. This study will also examine how NPLs and banking instability impact a country's actual economy, assisting policymakers in understanding how these factors affect economic growth so that they can develop plans accordingly.

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APPENDIX

Table 1

Descriptive Analysis

Variable	Mean	Std. Dev.	Min	Max
NPL	5.889267	5.037413	0.953674	29.8
PCREDIT	76.51994	42.41389	16.83777	182.8681
ZSCORE	15.03053	4.611557	6.215393	24.11201
LOGGDP	2.05E + 12	3.01E + 12	1.29E + 11	1.47E + 13
INFLATION	7.245868	9.177997	−1.40147	85.74649
PCA_INST	−0.23371	0.363133	−0.85587	0.470056

Source: Author's calculation.

Table 2

Pairwise Correlation Matrix

Variable	PCREDIT	ZSCORE	LOGGDP	PCA_INST	PCA_INST
PCREDIT	1				
ZSCORE	0.3827*	1			
LOGGDP	0.4998*	0.5262	1		
INFLATION	−0.5143	−0.346*	−0.2185*	1	
PCA_INST	0.2427*	0.3375*	−0.2631*	−0.2152	1

Source: Author's calculation.

Note: *denotes significance at 5% level.

Table 3

Result of Pairwise Correlation Matrix of World Governance Indicators

	COC	GE	PS	RQ	ROL	VAC
COC	1					
GE	0.7556*	1				
PS	0.6382*	0.4995*	1			
RQ	0.8265*	0.6578*	0.7073*	1		
ROL	0.7746*	0.6113*	0.2744*	0.5203*	1	
VAC	0.5762*	0.2032	0.1337*	0.5224*	0.7*	1

Source: Author's calculation

Note: *denotes significance at 5% level.

Table 4

Result of Principal Component Analysis

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.87118	2.76994	0.6452	0.6452
Comp2	1.10124	0.505796	0.1835	0.8287
Comp3	0.595441	0.338036	0.0992	0.928
Comp4	0.257404	0.157352	0.0429	0.9709
Comp5	0.100053	0.0253677	0.0167	0.9876
Comp6	0.074685	.	0.0124	1

Source: Author's calculation.

Table 5

Principal Components (Eigenvectors)

Variable	Comp1	Unexplained
Control of Corruption	0.4891	0.07385
Government effectiveness	0.4029	0.3716
Political stability	0.3446	0.5402
Regulatory quality	0.4518	0.2097
Rule of Law	0.4119	0.3433
Voice and accountability	0.3254	0.5902

Source: Author's calculation.