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Non-Performing Loans and Bank Performance: Does Institutional Quality Matter?

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ABSTRACT

This study investigates how bank non-performing loans (NPL) affect bank performance and the role of institutional quality in mitigating this impact. Employing ASEAN commercial bank data from 2011 to 2022, we employ panel fixed effects as our main regression method and adopt a stochastic frontier analysis and measure bank performance using bank efficiency. We find that NPL negatively influence bank performance. Furthermore, among institutional quality indicators, regulatory quality, corruption control, and voice and accountability have significant positive effects on bank performance, particularly on Return on Asset (ROA). However, the results of interaction model reveal that corruption control, voice and accountability, and rule of law moderate the negative impact of NPL on bank performance.

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INTRODUCTION

Enhancing bank performance to mitigate the risk of future bank failures is crucial concern for regulators and researchers. Strong bank performance not only ensures profitability and operational sustainability but also reduces vulnerabilities to internal and external shocks (Ali and Puah, 2019). Regulators prioritize measures such as risk management frameworks, capital adequacy requirements, and enhanced supervision to prevent systemic crises. Researchers, on the other hand, focus on analyzing factors that influence bank performance, including governance structures, financial innovation, market competition, and macroeconomic conditions. Numerous studies also show that non-performing loans (NPL) negatively influence bank performance (Boussaada et al., 2023; Phung et al., 2022). High levels of NPL negatively impact bank performance by reducing income from loan interest, increasing provisional costs, and diminishing overall profitability. Furthermore, it also constrains bank's ability to allocate resources for new investments and loans, ultimately weakening operational efficiency and financial sustainability.

Given the concerns about reducing bank NPL to ensure financial system stability, several studies on banking have highlighted the importance of institutional quality. Moreover, the empirical economics literature suggests that institutional quality positively correlates with economic development. Gazdar and Cherif (2015) discovered that robust institutions promote efficient economic systems by establishing appropriate financial regulatory and supervisory frameworks. Furthermore, Voghouei et al. (2011) found that an adequate legal system and solid property rights eventually benefit overall economic and financial development. In addition, the absence of corruption ensures stability and accountability in the financial sector, which, in turn, contributes to better financial stability (Chinn and Ito, 2006).

Notably, several studies have explored the influence of institutional quality on various aspects of bank risk, such as credit risk, capital adequacy, and financial stability (Uddin et al., 2020; Bermpei et al., 2018). However, while much of the existing literature highlights the importance of institutional quality in general risk management, limited research has examined how it moderates the specific relationship between bank NPL and bank performance. This represents a critical gap, as institutional quality could potentially mitigate the negative impact of accumulated NPL on performance by promoting better credit recovery and financial resilience. Our study aims to address this gap by investigating the moderating role of institutional quality on the relationship between NPL and bank performance, offering new insights into how institutional frameworks enhance the stability and efficiency of financial institutions in managing credit risk.

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature. Section 3 explains the data, variables, and research methodology. Section 4 presents empirical results and discussion. Finally, Section 5 concludes the paper with policy implications and suggestions for future research.

REVIEW OF LITERATURE

The impact of NPL on bank performance is a widely studied topic in financial research, with findings indicating that high NPL ratios negatively affect key financial metrics. Previous studies by Phung et al. (2022) emphasize that elevated NPL reduce banks' profitability by increasing the need for loan loss provisions, which directly erode net earnings. This impact is especially pronounced during economic downturns, where higher default rates lead to a more significant drain on profitability (Hoang et al., 2022). Additionally, banks with high NPL levels face operational inefficiencies due to higher costs associated with loan recovery efforts and legal processes, further contributing to a decline in financial performance.

Partovi and Matousek (2019) found that bank NPL are negatively associated with bank technical efficiency, highlighting how deteriorating asset quality can undermine the performance of financial institutions. Technical efficiency refers to a bank's ability to maximize output from a given set of inputs, and when NPL rise, resources are diverted to managing delinquent loans and provisioning for potential losses. This reallocation of resources reduces the bank's capacity to provide new loans and maintain operational efficiency, thereby weakening its overall financial performance (Pasiouras et al., 2009). Furthermore, a higher NPL ratio signals potential financial distress, leading to increased regulatory oversight and reputational risk, which can exacerbate the bank's inefficiency and restrict its ability to remain competitive (Katuka et al., 2023).

The quality of a bank's assets serves as a crucial indicator of its financial health and can significantly influence both bank stability and efficiency. According to Fiordelisi et al. (2011), poor asset quality not only reduces profitability but also heightens the risk of bank failure by depleting capital buffers and lowering liquidity. In line with this, the bad luck hypothesis suggests that external economic shocks, such as recessions, increase the likelihood of loan defaults, thereby inflating NPL and diminishing bank performance (Louzis et al., 2012). As NPL rise, banks face higher risks of insolvency, which can disrupt the financial system if not managed effectively. Therefore, asset quality plays a pivotal role in maintaining both stability and efficiency in the banking sector, with poor management of NPL posing severe risks to long-term performance and viability.

Hypothesis 1. NPL negatively influence bank performance.

High institutional quality, characterized by strong regulatory frameworks and governance mechanisms, is essential for ensuring financial stability. Fisseha (2025) examined the interaction between institutional quality and financial development in African microfinance institutions. The study demonstrated that robust institutions enhance financial performance by fostering a conducive environment for effective risk management and capital allocation. Similarly, Hassouna and Lewaaelhamd (2025) highlighted that corruption and weak institutional frameworks undermine financial performance, particularly in emerging markets like Egypt, where governance reforms are urgently needed.

The literature on economics and finance emphasizes that institutional quality plays a pivotal role in the development of a well-functioning financial system. High institutional quality fosters a stable environment that promotes the efficient allocation of financial resources, reducing information asymmetry and enhancing risk management. Socioeconomic factors, such as corruption, the enforcement of property rights, and political stability, have been identified as critical determinants of financial development (Uddin et al., 2020). These factors influence the ability of financial institutions to operate effectively by ensuring fair market practices and transparent financial operations. Moreover, institutional frameworks help regulate credit allocation, thereby lowering the incidence of NPL and improving bank performance.

Furthermore, institutional quality and political stability serve as catalysts for financial sector development by promoting sound lending practices and mitigating the adverse effects of risk exposure. For instance, Voghouei et al. (2011) demonstrated that political stability supports the growth of financial markets, enabling financial institutions to better manage risk and enhance credit quality. However, firms with political connections present a more nuanced case. While politically affiliated firms often secure more loans due to their influence, they also exhibit a higher risk of loan default, according to Khwaja and Mian (2005). Charumilind et al. (2006) provided further evidence, showing that such firms typically benefit from long-term bank loans with fewer collateral requirements, which can undermine credit discipline and increase NPL.

Corruption, as noted by Park (2012), exacerbates the problem by weakening regulatory oversight, leading to higher NPL ratios. Moreover, Barth et al. (2009) revealed that unlawful lending practices, such as financing inefficient or politically motivated projects, impose significant economic costs. These practices can escalate economic volatility, hinder entrepreneurial development, and erode the trust in financial institutions. Consequently, strengthening institutional frameworks is critical to mitigating the detrimental effects of NPL on bank performance, as robust institutions promote transparency, accountability, and effective risk management. In Addition, Institutional quality may enhance the lending market function by improving lending conditions, minimizing borrower moral hazard along with adverse selection, and boosting the likelihood of loan repayment.

Hypothesis 2. Institutional quality mitigates the influence of NPL on bank performance.

RESEARCH METHODOLOGY

Data

We used bank-level and country-specific panel data on banks in ASEAN countries during 2011–2022. The dataset consists of 212 active banks distributed as follows: Brunei (2), Cambodia (23), Indonesia (68), Lao

P.D.R. (12), Malaysia (41), Myanmar (8), the Philippines (24), Singapore (8), Thailand (19), and Vietnam (7). These sample includes banks of various ownership structures (state-owned, privately-owned, and foreign), and types (commercial, rural, and development banks), reflecting the diversity of banking institutions in the region. We choose ASEAN region due to the diversity of institutional frameworks and varying stages of financial development. We use the time span from 2011 to 2022 to captures a range of critical global and regional economic events that significantly impacted both banking performance and institutional dynamics. Second, the time span includes various country-specific reforms aimed at strengthening institutional quality, such as anti-corruption measures, financial sector liberalization, and improved governance practices across ASEAN economies (Asian Development Bank, 2017). Financial data were collected from the Bureau van Dijk's Orbis Bankfocus database. The World Bank's World Governance Index (WGI), the IMF's International Financial Statistics, and respective central banks' annual reports were used to collect institutional quality and macroeconomic data.

Bank Efficiency Measure

Based on the principles outlined by Berger and Mester (1997), we assessed cost efficiency in the banking sector by comparing a bank's actual production costs with those of the best-performing bank that generates identical output under the same conditions. Because directly observing cost functions is not feasible, we gauged inefficiencies by benchmarking against an optimal cost frontier entity.

Researchers typically employ two widely used methodologies to analyze cost efficiency: stochastic frontier (SFA) and data envelopment analyses (DEA). While DEA assumes that there is no random error, the SFA approach, which has its merits as highlighted by Sun and Chang (2011), adapts the traditional deterministic production frontier to account for random effects and measurement errors. We chose SFA because of its ability to effectively control for random effects and measurement errors, making it a popular choice in banking and other industries, as is evident in studies conducted by Berger and Mester (1997); Aigner et al. (1977); and Kumbhakar and Lovell (2000).

Our analysis is based on the trans-log specification proposed by Berger et al. (2009) and Bonin et al. (2005), which enabled us to use a cost function to measure the stochastic frontier. Following Bonin et al. (2005), we employed the following translog cost function to measure the efficiency levels:

$$\begin{aligned}\ln\left(\frac{TC}{w_3 TA}\right) = a &+ \sum_{i=1}^{4} \beta_i \ln\left(\frac{Y_i}{TA}\right) \\ &+ \sum_{k=1} \psi_i \ln\left(\frac{W_k}{w_3}\right) \\ &+ \frac{1}{2}\sum_{i=1}^{4}\sum_{j=1}^{4} \beta_{ij} \ln(Y_i/TA) \ln\left(\frac{Y_j}{TA}\right) \\ &+ \frac{1}{2}\sum_{k=1} \times \sum_{m=1} \psi_{km} \ln\left(\frac{W_k}{w_3}\right) \ln\left(\frac{W_m}{w_3}\right) + \sum_{i=1}^{4}\sum_{k=1} \phi_{ik} \ln Y_i \ln\left(\frac{W_k}{w_3}\right) + u_{it} + v_{it}\end{aligned} \tag{1}$$

In line with Berger et al. (2009) and Bonin et al. (2005), we employed the following outputs: total loans (Y_1), total deposit (Y_2), liquid asset (Y_3), and other earning assets (Y_4). Furthermore, we used the following input prices: the price of capital (W_1), determined as the ratio of interest expenses to total deposits, and price of funds (W_2), determined as non-interest expenses to fixed assets. We also employed a fixed input (z) determined by total earning assets, thereby assigning linear homogeneity. The total bank cost (TC) is defined as the sum of interest costs and non-interest expenses.

Non-Performing Loans Measure

Our study utilized the NPL ratio, in line with Ghosh (2015); Lu and Whidbee (2013); and Stiroh and Metli (2003). It is the ratio of NPL to total loans. Similar to Ghosh (2015), the standard measure of NPL includes both non-accrual loans, and any loans that have been overdue for 90 days and above. Non-accrual loans are those that do not generate the expected interest because either the full principal amount is uncertain or interest payments have not been made (Stiroh and Metli, 2003).

High Institutional Quality Measure

We create seven dummy variables of high institutional quality. Following Dominguez et al. (2025) and De Beule et al. (2014), these variables took the value 1 if the institutional quality index score was above the mean, and 0 otherwise. We use six essential dimensions of (WGI) world governance indicator including political stability, government effectiveness, voice and accountability, rule of law, regulatory quality and absence of violence, and control of corruption. Additionally, we follow Chowdhury et al. (2024) and Law et al. (2013) in using the average of six institutional quality indicator as a proxy of the aggregate institutional quality.

Empirical Model

Following Doan et al. (2018) and Pasiouras et al. (2009), we adopted SFA to measure bank efficiency. The following econometric models employ panel data estimation to examine the relationship between NPL and bank performance of ASEAN commercial banks. First, we estimate a baseline model without interaction terms to assess the direct effects of NPL and institutional quality on performance using panel fixed effect:

$$Performance_{jit} = a_1 NPL_{jit} + \beta_1 Institutional_{it} + \sum_{i=1}^{n} \gamma_1 \, CONTROL_{it} \quad (2)$$

Second, we include interaction terms to examine whether institutional quality moderates the effect of NPL on bank performance:

$$Performance_{jit} = a_1 NPL_{jit} + \beta_1 Institutional_{it} + \theta_1 NPL_{jit} \times Institutional_{it} + \sum_{i=1}^{n} \gamma_1 \, CONTROL_{it} + \varepsilon_{it} \quad (3)$$

where, $Performance_{jit}$ represent bank performance proxied by bank's cost efficiency and ROA at bank j, country i and time t. NPL_{jit} is the quotient of bank NPL to total bank loans. $Institutional_{it}$ is an institutional quality variable consisting of regulatory quality, corruption control, political stability, and government effectiveness. The coefficient of the interaction term $NPL_{jit} \times Institutional_{it}$ (θ_1) shows whether NPL and institutional quality enhance or impede bank efficiency. $CONTROL_{it}$ includes one-year lagged variables, such as bank size, bank capitalization (total equity to total assets), and macroeconomic variables. The natural logarithm of total assets was used to measure bank size. We also employed GDP growth and inflation rate as macroeconomic control variables. The Hausman test results indicate that a fixed effects model was more appropriate.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 1 lists the descriptive statistics. Table 2 presents the correlation matrix. Cost efficiency (CE) has a positive relationship with ROA (0.143) and log size (0.165), suggesting that larger, more profitable institutions are more efficient, while impaired loans are negatively related to both CE (-0.084) and log size (-0.226). Equity to total assets is negatively correlated with both CE (-0.152) and log size (-0.468), indicating that larger institutions tend to have lower equity ratios. Inflation negatively affects CE (-0.172) and log size (-0.202), while GDP growth shows weak positive correlations with CE (0.044) and ROA (0.080). Institutional quality indicators like political stability, government effectiveness, and corruption control show weak positive correlations with CE, highlighting a slight association between better governance and efficiency.

Tabel 1 Descriptive statistics

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
Cost Efficiency (CE)	Stochastic Frontier Analysis Cost Efficiency Score. Range: 0 to 1.	1414	.833	.155	.122	1
ROA	Return on Asset	2072	.008	.022	-.542	.279
NPL Ratio	Non-performing Loan to Total Loan	1729	.034	.065	0	1
Log Size	Log (Total Asset)	2206	14.877	2.006	8.479	20.132
Equity to Total Assets (EQTA)	Total Equity to Total Asset	2205	.16	.129	-.272	.999
GDP Growth (GGDP)	Real GDP Growth	2544	.045	.033	-.179	.089
Inflation (INF)	CPI Inflation Rate	2544	.034	.026	-.013	.23
Corruption Control (CC)	A dummy variable indicating whether corruption control is high or low (1 = high corruption control, 0 = low corruption control), referring to the extent to which public power is exercised without private gain.	2544	.355	.479	0	1
Political Stability (PS)	A dummy variable indicating whether political stability is high or low (1 = high political stability, 0 = low political stability), capturing the likelihood that the government remains stable without risks of unconstitutional or violent threats.	2544	.515	.5	0	1
Government Effectiveness (GE)	A dummy variable indicating whether government effectiveness is high or low (1 = high effectiveness, 0 = low effectiveness), measuring the quality of public services, policy execution, and civil service independence from political influence.	2544	.642	.479	0	1
Regulatory Quality (RQ)	A dummy variable indicating whether regulatory quality is high or low (1 = high regulatory quality, 0 = low regulatory quality), reflecting the government's capacity to design and enforce effective policies that foster private sector growth.	2544	.305	.46	0	1
Rule of Law (RL)	A dummy variable indicating whether rule of law is high or low (1 = strong rule of law, 0 = weak rule of law)	2544	.706	.456	0	1
Voice and Accountability (VA)	A dummy variable indicating whether voice and accountability are high or low (1 = high voice and accountability, 0 = low voice and accountability)	2544	.344	.475	0	1
Aggregate Institutional Quality (AIQ)	A dummy variable indicating whether aggregate institutional quality is high or low (1 = high aggregate quality, 0 = low aggregate quality), representing a composite index that combines six institutional dimensions, including political stability, government effectiveness, regulatory quality, rule of law, voice and accountability, and corruption control.	2544	.381	.486	0	1

Tabel 2 Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) CE	1.000													
(2) ROA	0.143	1.000												
(3) NPL	-0.084	-0.390	1.000											
(4) log Size	0.165	0.291	-0.226	1.000										
(5) EQTA	-0.152	-0.023	0.133	-0.468	1.000									
(6) GGDP	0.044	0.080	0.011	-0.062	-0.030	1.000								
(7) INF	-0.172	0.009	0.085	-0.202	0.032	0.422	1.000							
(8) PS	0.104	0.037	-0.160	0.279	-0.303	0.037	-0.240	1.000						
(9) GE	0.070	-0.007	-0.166	0.221	-0.026	-0.221	-0.591	0.337	1.000					
(10) RQ	0.043	-0.084	-0.044	0.128	0.030	-0.185	-0.378	0.140	0.526	1.000				
(11) CC	0.055	0.023	-0.156	0.295	-0.261	-0.002	-0.296	0.740	0.416	0.372	1.000			
(12) VA	-0.023	-0.083	0.002	-0.010	0.038	0.104	0.130	0.025	0.079	0.480	0.268	1.000		
(13) RL	0.095	0.050	-0.167	0.411	-0.283	-0.162	-0.476	0.683	0.541	0.268	0.671	-0.135	1.000	
(14) AIQ	0.035	-0.035	-0.156	0.152	-0.040	-0.114	-0.326	0.559	0.703	0.513	0.593	0.404	0.417	1.000

EMPIRICAL RESULTS

Table 3 presents the baseline regression results for the determinants of bank performance proxied by ROA. NPL have a consistently significant negative effect on ROA across all models (-0.117), indicating that higher loan impairments reduce profitability. Log size has a positive and statistically significant effect on all models, suggesting that larger banks tend to achieve higher ROA. GDP growth (GDPG) positively and significantly affects ROA on all models, implying that stronger economic growth enhances bank profitability. Inflation rate also has a positive and significant impact on ROA. Among the institutional quality variables, regulatory quality (RQ), voice and accountability (VA), and aggregate institutional quality (AIQ) have positive and significant effects on ROA, while political stability (PS), government effectiveness (GE), corruption control (CC), and rule of law (RL) show no significant influence.

Table 3 Baseline Regression Results (Dependent Variable = ROA)

	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA	(7) ROA
NPL	-0.117***	-0.117***	-0.117***	-0.117***	-0.117***	-0.117***	-0.117***
	(-2.80)	(-2.84)	(-2.83)	(-2.80)	(-2.80)	(-2.80)	(-2.84)
Log Size	0.00216*	0.00247*	0.00273**	0.00220*	0.00223*	0.00220*	0.00262**
	(1.73)	(1.96)	(2.22)	(1.76)	(1.79)	(1.77)	(2.11)
EQTA	-0.0150	-0.0137	-0.0132	-0.0150	-0.0150	-0.0149	-0.0127
	(-1.33)	(-1.23)	(-1.17)	(-1.35)	(-1.34)	(-1.33)	(-1.15)
GDPG	0.0365***	0.0352***	0.0343***	0.0351***	0.0353***	0.0349***	0.0337**
	(2.74)	(2.68)	(2.61)	(2.68)	(2.66)	(2.64)	(2.58)
INF	0.0712**	0.0626*	0.0607*	0.0722**	0.0771**	0.0727**	0.0662**
	(2.40)	(1.94)	(1.97)	(2.45)	(2.51)	(2.46)	(2.22)
PS	0.00186						
	(1.11)						
GE		0.00150					
		(1.35)					
RQ			0.00362***				
			(2.99)				
CC				0.000145			
				(0.10)			
VA					0.00286**		
					(2.20)		
RL						0.00100	
						(0.87)	
AIQ							0.00241**
							(2.44)
Constant	-0.0213	-0.0257	-0.0279	-0.0225	-0.0211	-0.0229	-0.0279
	(-1.11)	(-1.34)	(-1.47)	(-1.17)	(-1.12)	(-1.21)	(-1.47)
N	1729	1729	1729	1729	1729	1729	1729
R^2	0.125	0.125	0.128	0.125	0.125	0.125	0.127

Note: t statistics in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 4 Baseline Regression Results (Dependent Variable = CE)

	(1) CE	(2) CE	(3) CE	(4) CE	(5) CE	(6) CE	(7) CE
NPL	-0.210*	-0.230**	-0.206*	-0.205*	-0.208*	-0.199*	-0.222*
	(-1.75)	(-2.00)	(-1.79)	(-1.71)	(-1.74)	(-1.67)	(-1.92)
Log Size	0.0616***	0.0603***	0.0586***	0.0551**	0.0562**	0.0540**	0.0607***
	(2.77)	(2.72)	(2.61)	(2.55)	(2.58)	(2.48)	(2.74)
EQTA	-0.106	-0.0251	-0.0766	-0.123	-0.113	-0.0981	-0.0285
	(-0.62)	(-0.14)	(-0.44)	(-0.71)	(-0.66)	(-0.57)	(-0.16)
GGDP	0.657***	0.706***	0.677***	0.702***	0.676***	0.657***	0.660***
	(5.80)	(5.79)	(5.80)	(5.95)	(5.80)	(5.77)	(5.60)
INF	-1.639***	-1.924***	-1.677***	-1.622***	-1.513***	-1.532***	-1.706***
	(-5.02)	(-5.27)	(-5.33)	(-5.07)	(-4.56)	(-5.04)	(-5.46)
PS	0.123***						
	(3.43)						
GE		0.0382***					
		(2.68)					
RQ			0.0208				
			(1.49)				
CC				0.0263*			
				(1.90)			
VA					0.0396***		
					(2.63)		
RL						0.0955***	
						(10.35)	
AIQ							0.0386***
							(3.22)
Constant	-0.134	-0.0452	-0.0274	0.0260	0.0261	-0.0167	-0.0607
	(-0.37)	(-0.13)	(-0.08)	(0.07)	(0.07)	(-0.05)	(-0.17)
N	1255	1255	1255	1255	1255	1255	1255
R^2	0.122	0.115	0.107	0.108	0.108	0.112	0.116

Note: t statistics in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 4 presents the baseline regression results for the determinants of bank performance proxied by Cost Efficiency (CE). NPL have a negative and statistically significant effect, indicating that higher loan impairments reduce cost efficiency. Log size has a positive and significant impact across all models, suggesting that larger banks are more cost-efficient. GDP growth positively affects CE, indicating that economic expansion improves cost efficiency. Inflation, however, has a strong negative and significant effect, suggesting that high inflation severely hampers cost efficiency. As for institutional quality indicators, political stability (PS), government effectiveness (GE), voice and accountability (VA), rule of law (RL), and aggregate institutional quality (AIQ) positively and significantly affect CE.

Table 5 presents the baseline regression results for the determinants of bank performance proxied by ROA. NPL consistently have a significant negative effect on ROA across all models, underscoring that higher loan impairments reduce profitability. Log size has a positive and significant effect on ROA in model 2-7, suggesting that larger banks tend to have higher profitability. The equity-to-assets ratio (EQTA) has a negative but significant effect on model 4 and 6. GDP growth positively impacts ROA, indicating that economic growth improves profitability. Inflation also shows a positive and significant relationship with ROA.

Table 5 Regression Results (Dependent Variable = ROA)

	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA	(7) ROA
NPL	-0.0878***	-0.123***	-0.167**	-0.129***	-0.304***	-0.126***	-0.123***
	(-3.03)	(-2.65)	(-2.24)	(-2.87)	(-3.00)	(-2.76)	(-2.67)
Log Size	0.00176	0.00262**	0.00317**	0.00252*	0.00218*	0.00243*	0.00275**
	(1.65)	(1.97)	(2.31)	(1.94)	(1.93)	(1.86)	(2.10)
EQTA	-0.0126	-0.0165	-0.0168	-0.0201*	-0.0203	-0.0198*	-0.0159
	(-1.01)	(-1.41)	(-1.41)	(-1.77)	(-1.59)	(-1.67)	(-1.36)
GGDP	0.0277**	0.0360***	0.0293**	0.0374***	0.0178	0.0364***	0.0347***
	(2.46)	(2.72)	(2.35)	(2.81)	(1.25)	(2.72)	(2.64)
INF	0.0815*	0.0637*	0.0694*	0.0746**	0.0990**	0.0757**	0.0670**
	(1.91)	(1.91)	(1.78)	(2.46)	(2.04)	(2.47)	(2.20)
1.PS	0.00118						
	(0.40)						
1.GE		0.00303*					
		(1.69)					
1.RQ			0.00685**				
			(3.31)				
1.CC				0.00515**			
				(2.45)			
1.VA					0.0117**		
					(2.24)		
1.RL						0.000902	
						(0.53)	
1.AIQ							0.00412**
							(1.98)
1.PS*NPL	-0.149						
	(-1.23)						
1.GE*NPL		-0.0450					
		(-0.83)					
1.RQ*NPL			-0.0865				
			(-1.31)				
1.CC*NPL				-0.0130***			
				(-3.19)			
1.VA*NPL					-0.0222**		
					(-2.11)		
1.RL*NPL						-0.0120**	
						(-2.29)	
1.AIQ*NPL							-0.0501
							(-0.87)
Constant	-0.0163	-0.0273	-0.0322	-0.0258	-0.0122	-0.0259	-0.0291
	(-0.98)	(-1.37)	(-1.59)	(-1.31)	(-0.76)	(-1.32)	(-1.48)
N	1729	1729	1729	1729	1729	1729	1729
R^2	0.152	0.127	0.146	0.140	0.176	0.132	0.129

Note: t statistics in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01.

Institutional quality variables, such as regulatory quality (RQ), corruption control (CC), and voice and accountability (VA), exhibit positive and significant effects on ROA, indicating that better institutional environments enhance profitability. Interaction terms between NPL and institutional quality variables reveal that corruption control (-0.0130), voice and accountability (-0.0222), and rule of law (-0.0120) have negative impact of ROA. As it can be seen that these interaction variables decrease the negative impact of NPL on ROA, compared to the coefficient between NPL and ROA. It means that countries with high level institution quality have better mechanisms to mitigate the negative effect of NPL to ROA.

Table 6 presents the baseline regression results for the determinants of bank performance proxied by CE. NPL have a negative effect on cost efficiency (CE), but this effect is only marginally significant in most models. Log size consistently has a positive and significant impact on CE, indicating that larger banks are more cost-efficient. GDP growth positively and significantly affecting CE, suggesting that higher economic growth enhances efficiency. Inflation has a strong negative effect, indicating that higher inflation reduces cost efficiency.

Among institutional quality variables, political stability (PS), corruption control (CC), voice and accountability (VA), and rule of law (RL) have significant positive effects on CE. The interaction between NPL and corruption control shows a significant negative effect (-0.0484). It means that in countries with stronger corruption control, the negative impact of NPL on bank efficiency is amplified. However, other interaction terms are statistically insignificant.

Table 6 Regression Results (Dependent Variable = CE)

	(1) CE	(2) CE	(3) CE	(4) CE	(5) CE	(6) CE	(7) CE
NPL	-0.210* (-1.69)	-0.207* (-1.76)	-0.177 (-0.99)	-0.232* (-1.96)	-0.199 (-0.67)	-0.190 (-1.57)	-0.201* (-1.74)
Log Size	0.0617*** (2.77)	0.0582*** (2.65)	0.0582** (2.60)	0.0557** (2.60)	0.0562** (2.58)	0.0535** (2.45)	0.0588*** (2.66)
EQTA	-0.106 (-0.62)	-0.0138 (-0.08)	-0.0774 (-0.45)	-0.130 (-0.75)	-0.113 (-0.66)	-0.0932 (-0.54)	-0.0236 (-0.13)
GGDP	0.657*** (5.85)	0.702*** (5.80)	0.677*** (5.80)	0.703*** (5.96)	0.676*** (5.79)	0.657*** (5.77)	0.654*** (5.62)
INF	-1.639*** (-5.04)	-1.928*** (-5.28)	-1.681*** (-5.32)	-1.621*** (-5.06)	-1.513*** (-4.56)	-1.537*** (-5.03)	-1.716*** (-5.45)
1.PS	0.123*** (3.51)						
1.GE		0.0252 (1.18)					
1.RQ			0.0183 (1.15)				
1.CC				0.0439*** (2.71)			
1.VA					0.0392** (2.17)		
1.RL						0.101*** (8.47)	
1.AIQ							0.0223 (1.00)
1.PS*NPL	-0.00581 (-0.02)						
1.GE*NPL		-0.384 (-1.00)					
1.RQ*NPL			-0.0557 (-0.27)				
1.CC*NPL				-0.0484** (-2.47)			
1.VA*NPL					-0.00944 (-0.03)		
1.RL*NPL						-0.327 (-0.64)	
1.AIQ*NPL							-0.467 (-1.02)
Constant	-0.134 (-0.37)	-0.0151 (-0.04)	-0.0218 (-0.06)	0.0205 (0.06)	0.0258 (0.07)	-0.00933 (-0.03)	-0.0349 (-0.10)
N	1255	1255	1255	1255	1255	1255	1255
R^2	0.122	0.117	0.107	0.111	0.108	0.112	0.118

Note: t statistics in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01.

Discussion

Clearly, NPL is negatively associated with both bank's ROA and cost efficiency. This finding is aligned with Phung et al. (2022) and Partovi and Matousek (2019), which suggest that defaulted loans burden bank performance by reducing profitability, primarily due to increased allocations to loan loss provisions. Additionally, banks are exposed to higher operating costs related to monitoring borrowers and managing disposal expenses. Similarly, bank size significantly and positively affects both cost efficiency and ROA, suggesting that larger banks benefit from economies of scale and operational efficiency. However, we find no evidence of a strong relationship between bank capitalization and bank performance, as equity to total assets (EQTA) is largely insignificant across models.

Further, institutional quality indicators such as regulatory quality (RQ), corruption control (CC), and voice and accountability (VA) are positively and significantly associated with bank performance, particularly ROA. However, our results indicate that interaction terms between NPL and institutional quality variables, including corruption control, voice and accountability, and rule of law, have significant negative coefficients. This suggests that under strong institutional quality, the negative impact of NPL on performance is amplified, potentially due to stricter enforcement of regulatory and governance frameworks. Political stability shows no significant direct impact on bank performance in relation to ROA, but remains positively significant in improving cost efficiency. Corruption control and voice and accountability, which are significant for ROA as direct effects, do not mitigate the negative effects of NPL but may reflect the regulatory burden placed on banks in higher institutional environments.

Our findings are consistent with those of Phung et al. (2022), which indicate that banks with high NPL experience increased operating costs, leading to reduced performance. Additionally, our results on the dual role of institutional quality align with Uddin et al. (2020), who found that institutional quality can shape the relationship between bank risks and performance. In environments with low institutional quality, competition in the credit market intensifies, causing adverse selection and moral hazard. However, under stronger institutional conditions, increased regulatory and compliance measures may exacerbate the challenges posed by NPL. Corruption, often driven by bribery and unethical practices, incentivizes bankers to approve risky loans without proper credit assessment. Weak regulations and inadequate law enforcement further exacerbate loan default issues by reducing accountability for debtors.

Robustness Check

Table 7 and 8 presents the robustness check results. To address potential endogeneity issues, we use the Generalized Method of Moments (GMM) method as the robustness check. The robustness check results confirm the baseline findings. NPL has a consistently significant negative effect on both ROA and cost efficiency (CE). This means that higher loan impairments reduce bank performance. Log size remains positive and significantly associated with both ROA and CE, indicating that larger banks sustain better performance. GDP growth positively influences both profitability and efficiency, while inflation shows a significant negative impact. Institutional quality variables, such as corruption control (CC), political stability (PS), and rule of law (RL), continue to positively affect bank performance, particularly CE.

Table 7 Robustness check (Dependent Variable = ROA)

	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA	(7) ROA
NPL	-0.231***	-0.233***	-0.238***	-0.249***	-0.225***	-0.210***	-0.248***
	(-23.80)	(-31.41)	(-29.18)	(-22.72)	(-26.34)	(-16.36)	(-23.88)
Log Size	0.00432***	0.00411***	0.00411***	0.00508***	0.00311***	0.0157***	0.00536***
	(5.39)	(4.90)	(6.69)	(5.25)	(4.09)	(4.66)	(6.31)
EQTA	-0.187***	-0.213***	-0.205***	-0.183***	-0.170***	-0.249***	-0.204***
	(-10.32)	(-13.05)	(-13.27)	(-8.79)	(-8.08)	(-7.56)	(-12.68)
GGDP	0.0279**	0.0287***	0.0268**	0.0265**	0.0278**	0.0394**	0.0571***
	(2.19)	(2.74)	(2.52)	(2.49)	(2.45)	(2.05)	(3.11)
INF	-0.0931*	-0.0949**	-0.0825**	-0.0927**	-0.0726*	0.0788	-0.150**
	(-1.92)	(-2.51)	(-2.11)	(-2.31)	(-1.71)	(1.30)	(-2.60)
PS	0.00320						
	(0.76)						
GE		-0.00349					
		(-0.85)					
RQ			-0.00201				
			(-1.57)				
CC				0.00805*			
				(1.69)			
VA					-0.00126		
					(-0.16)		
RL						0.0872***	
						(4.36)	
AIQ							0.00727
							(1.17)
L.ROA	-0.274***	-0.281***	-0.285***	-0.289***	-0.283***	-0.306***	-0.273***
	(-17.17)	(-22.86)	(-22.69)	(-21.32)	(-18.91)	(-14.72)	(-15.48)
Constant	0.111***	0.116***	0.114***	0.121***	0.0922***	0.251***	0.129***
	(8.67)	(9.11)	(10.56)	(8.13)	(6.41)	(5.38)	(9.95)
N	1590	1590	1590	1590	1590	1590	1590
AR (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	0.197	0.211	0.219	0.181	0.184	0.150	0.224
Hansen	0.100	0.370	0.158	0.377	0.110	0.649	0.116
Instrument	34	34	34	34	34	34	34

Note: z statistics in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 8 Robustness check (Dependent Variable = Cost Efficiency)

	(1) CE	(2) CE	(3) CE	(4) CE	(5) CE	(6) CE	(7) CE
NPL	-0.291***	-0.361***	-0.333***	-0.265***	-0.277***	-0.317***	-0.310***
	(-3.11)	(-4.29)	(-5.27)	(-3.78)	(-4.09)	(-3.93)	(-4.09)
Log Size	0.0184**	0.0119***	0.00632*	-0.00158	0.00938**	-0.0104	0.00937**
	(2.22)	(2.87)	(1.95)	(-0.35)	(2.38)	(-1.17)	(2.53)
EQTA	0.174	0.137	0.0485	-0.0452	0.152	0.0465	0.132
	(0.93)	(0.83)	(0.38)	(-0.31)	(1.18)	(0.29)	(0.87)
GGDP	0.199	0.517***	0.459***	0.433***	0.451***	0.423***	0.439***
	(1.62)	(5.08)	(4.54)	(4.15)	(3.81)	(3.91)	(4.43)
INF	-0.477	-1.383***	-0.929***	-1.050***	-0.654**	-0.404	-0.848***
	(-1.49)	(-3.67)	(-3.19)	(-3.52)	(-2.15)	(-1.22)	(-2.72)
PS	0.296***						
	(3.20)						
GE		0.0683**					
		(2.31)					
RQ			-0.0151				
			(-1.21)				
CC				0.0669**			
				(2.58)			
VA					-0.0331		
					(-0.53)		
RL						0.131**	
						(2.00)	
AIQ							-0.0206
							(-1.07)
L.CE	0.387***	0.362***	0.359***	0.386***	0.308***	0.353***	0.338***
	(6.87)	(7.59)	(7.77)	(8.00)	(5.57)	(7.02)	(6.72)
Constant	0.690***	0.415***	0.471***	0.543***	0.454***	0.646***	0.426***
	(5.48)	(5.01)	(6.20)	(6.48)	(4.10)	(4.74)	(5.33)
N	1109	1109	1109	1109	1109	1109	1109
AR (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	0.605	0.301	0.338	0.343	0.374	0.428	0.302
Hansen	0.179	0.121	0.323	0.225	0.215	0.111	0.102
Instrument	34	34	34	34	34	34	34

Note: z statistics in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01.

CONCLUSION

This study provides evidence that bank NPL negatively influence bank performance in ASEAN countries during 2011–2022. Moreover, we show how institutional quality can mitigate the impact of banks' NPL on bank performance, as measured by bank cost efficiency and ROA. In particular, regulatory quality, corruption control, political stability, and government effectiveness can eliminate the negative influence of bank NPL on bank performance.

For managers, this study provides new insights into how poor institutional quality can worsen the relationship of NPL and bank efficiency. Consequently, managers should implement prudent loan assessments and good corporate governance to mitigate moral hazard. Finally, regulators should pay extra attention to improving institutional quality to reduce the effects of problematic loans and enhance bank performance.

Our study has limitations in the measurement of institutional quality, which is represented by dummy variables. Since there is no standardized classification for institutional quality classification, we follow Dominguez et al. (2025) and De Beule et al. (2014) in creating the classification by categorize countries based on whether their institutional quality scores were above or below the average. While this approach allows for a practical comparison, it may introduce potential bias due to the arbitrary nature of the threshold. To address these limitations, future research could explore alternative methods of measuring institutional quality. Instead of using a binary classification, researchers could use continuous institutional quality indices or employ more sophisticated clustering techniques to classify countries based on multiple institutional indicators.

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