Corruption, credit risk and economic growth: Global empirical evidence

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Abstract

This research investigates the intricate relationship between corruption, credit risk, and economic growth by analyzing data from 218 countries over the period 2000–2022. Employing the Control of Corruption Index and non-performing loan ratios, we examine how corruption influences banking sector health and, subsequently, economic stability. The study reveals a significant negative correlation, where higher levels of corruption are associated with increased credit risks, manifesting in higher non-performing loan ratios, which in turn dampen economic growth. These findings underscore the detrimental impact of corruption on financial systems and economic development. By highlighting specific pathways through which corruption erodes economic health, this study supports targeted anti-corruption interventions and robust financial regulatory

frameworks as critical to fostering sustainable economic growth. Looking forward, addressing corruption could unlock substantial economic potential, making a compelling case for enhanced transparency and governance reforms in financial institutions globally.

Keywords: corruption, credit risk, economic growth.

1. Introduction

Corruption, a significant hindrance to economic growth, particularly affects developing countries by obstructing efforts to improve citizens' quality of life (Tabish & Jha, 2012). This issue, which garners considerable attention from both academics and policymakers (Mauro, 1995), leads to the misallocation of rewards among stakeholders, often favoring the less deserving. Notably, corruption has been linked to the increase in credit risk in several countries (Hasan & Ashfaq, 2021; Park, 2012; Son et al., 2020). It can facilitate certain transactions through bribery, impacting economic growth in diverse ways. Furthermore, corruption indirectly influences economic growth through various channels, including impacts on private investment, foreign direct investment, public expenditure, and human capital (Song et al., 2021). Corruption is a significant concern for social scientists due to its adverse impact on society's social and economic aspects. To combat corruption, governments enact laws, with the law-making and enforcement processes incurring accounting costs (Hasan & Ashfaq, 2021). This effort aims to yield beneficial outcomes in terms of socioeconomic gains.

There are two perspectives regarding the role of corruption in economic development. The negative impact of corruption on economic development is well-documented, presenting a significant challenge. Studies by Mauro (1995) and Song et al. (2021) have consistently shown a detrimental correlation between corruption and economic progress. This view is further supported by the work of Khwaja and Mian (2005) and Charumilind et al. (2006), who note the adverse consequences of political connections in the banking sector. These connections often lead to higher default rates and increased risks for banks, as companies with such ties tend to require less collateral for long-term loans. This evidence points to

corruption's role in undermining the stability and efficiency of financial institutions, thus impeding overall economic growth (Hasan & Ashfaq, 2021)

On the other hand, there is a contrasting perspective that recognizes potential positive aspects of corruption in certain contexts. Huang (2016) observed that corruption could have a facilitative effect on economic development, particularly in the Asia-Pacific region. This is echoed in the findings of Chen et al. (2013), where more productive firms were seen to benefit from larger bank loans obtained through bribery. Additionally, global studies suggest that in countries with high levels of corruption and weaker governance structures, corrupt practices might "grease the wheels" of the economy (Adam et al., 2023; Asteriou et al., 2021; Cieślik & Goczek, 2018; Son et al., 2020). These instances highlight the complex, sometimes unexpectedly beneficial, role of corruption in accelerating certain economic processes, albeit with the caveat of needing strong governance to mitigate its negative impacts.

The hypothesis known as "sand the wheels" suggests that corruption can have a detrimental effect on the activities of the financial sector, potentially leading to financial crises (Cooray & Schneider, 2018; Park, 2012). It has been observed that corruption often causes a misallocation of resources, which can be harmful to the banking sector's development and lead to an increase in credit risk (measured by non-performing loans) (Bougatef, 2016; Hasan & Ashfaq, 2021). Such a decline in the quality of bank assets can adversely affect the efficiency of private investments, impeding economic growth (Park, 2012; Son et al., 2020). These insights underscore the intricate interplay between corruption, the stability of the financial sector, and overall economic progress, stressing the importance of

robust anti-corruption measures to foster a healthy economic and financial environment.

In the field of financial economics, the efficiency of the financial system plays a crucial role in maximizing stakeholder utility. This system is designed to redirect resources from markets with lesser marginal benefits to those offering greater returns, ensuring an effective and smooth flow of financial resources. Within this framework, particularly in banking, loan provision is a key function, serving as a major source of financing for firms (Hasan & Ashfaq, 2021). However, corruption presents a significant challenge in this area, leading to an uptick in bad loans and creating an adverse environment within the banking sector (Akins et al., 2017). This situation often results in loan officers exploiting loan agreements for their own gains, adversely affecting stakeholders, especially depositors. Uddin et al. (2020) highlight the critical need to combat corruption for the long-term stability of financial sectors, demonstrating that measures against corruption lead to reduced risky behaviors in banks and enhanced stability.

The prevalence of corruption in bank lending can significantly influence credit risk within the banking sector (Bahoo, 2020). Credit risk arises when borrowers are unable to meet their debt obligations, which can be reflected in various forms, not limited to non-performing loans. Such risk is often influenced by a range of factors, from wider economic conditions to specific issues like nepotism, political influence, and bribery, which can impair the borrowers' ability to repay their debts. This problem is more pronounced in developing countries, where financial systems are underdeveloped, and bribery is more common. Abuzayed et al. (2024) suggest that while corruption can increase bank lending, it also negatively affects profitability in both developed and developing countries.

In highly corrupt environments, banks often resort to income smoothing practices to maintain positive financial outcomes, underscoring the necessity for a deeper exploration of the link between corruption and credit risk in the banking sector (Ozili, 2019).

Furthermore, recent studies underscore the multifaceted impact of corruption on various sectors in Thailand, highlighting the urgent need for comprehensive research in this area. Yomnak and Ruckchart (2021) analyzed the network of Thailand's anti-corruption organizations, revealing a decentralized structure that compromises the effectiveness of collaborative efforts against corruption. Similarly, Chulaphan and Caceres (2021) demonstrated how relative corruption negatively influences international tourism, suggesting that the perception of corruption can deter tourist arrivals, thereby affecting the nation's economy. These studies reflect the complex dynamics of corruption and its pervasive effects across different spheres, emphasizing the importance of our investigation into the systemic impacts of corruption on economic health and governance. Our research aims to build on these findings by examining the broader implications of corruption within the banking sector, providing insights that could inform targeted policies to enhance transparency and economic stability.

The research aims to investigate the influence of corruption on the health of the banking sector, focusing on how it affects the quality of banks' assets. Additionally, the study will explore the indirect impact of corruption on economic growth, particularly through its relationship with banks' credit risk. This exploration will include an analysis of the interplay between financial development and corruption and its implications for economic growth and

development, as adopted from previous studies (Ahlin & Pang, 2008; Blackburn & Forgues-Puccio, 2010; Son et al., 2020).

To delineate the original contribution of this study, it is essential to recognize the unique compilation and analysis of an extensive dataset covering 218 countries over a period from 2000 to 2022. Unlike previous studies, which often focus on regional analyses or shorter time spans, our research provides a global perspective on the interplay between corruption, credit risk in the banking sector, and economic growth. This comprehensive approach allows for a more nuanced understanding of these relationships across varying economic and political contexts. Moreover, our study extends the existing literature by employing the Control of Corruption Index and non-performing loan ratios in a simultaneous equations model, offering new insights into the causal relationships that drive economic outcomes. By integrating these elements, our research not only fills a critical gap in understanding the global dynamics of economic integrity but also offers targeted recommendations for policymakers and financial institutions aimed at enhancing economic stability and growth.

2. Literature Review

The extensive body of research examining the connection between corruption and economic growth largely indicates that corruption has a detrimental impact on economic growth. The research primarily underscores the negative impacts of corruption on the financial system, particularly within the banking sector (Mauro, 1995). Key findings across various studies indicate that corruption significantly affects the quality of banks' assets and leads to an increase in

non-performing loans. This trend is observed in different contexts, from the impact of corruption on loan misallocation due to nepotism to its role in creating inefficiencies in the allocation of financial resources such as investment levels, the efficiency of public spending, the development of human capital, the inflow of foreign direct investments, and the effectiveness of international aid, all of which negatively impact overall economic growth (Akins et al., 2017; Bougatef, 2015, 2016; Cieślik & Goczek, 2018; Fan et al., 2008; Geletta, 2012; Gründler & Potrafke, 2019; Tabish & Jha, 2012; Uddin et al., 2020). Conversely, some researchers argue that corruption can be beneficial, proposing that it enables firms to bypass ineffective policies, thus fostering economic growth in countries with poor institutional frameworks (Chen et al., 2013; Dreher & Gassebner, 2013; Huang, 2016).

Several studies, including those by Tabish and Jha (2012), Uddin et al. (2020), and others, consistently demonstrate that corruption leads to a variety of adverse outcomes in the banking sector. Recent empirical research consistently indicates that corruption contributes to a rise in credit risk and a decline in the overall stability of the banking sector (Abuzayed et al., 2024; Bahoo, 2020; Kumar et al., 2018; Ozili, 2019; Park, 2012; Son et al., 2020). These include a decrease in the soundness of financial institutions, an increase in the risk-taking behavior of banks, and the deterioration in the quality of loans issued. For example, Bougatef (2015) finds a positive relationship between corruption and credit risk, and Akins et al. (2017) show that corruption correlates positively with loan loss provisions.

Barth et al. (2009) conducted a study on the influence of information exchange within financial institutions, discovering that sharing information in the banking system can lead to a reduction in credit risk. Similarly, Boudriga et al.

(2009) found that effective information sharing is a key strategy in decreasing the proportion of non-performing loans in bank statements. These studies contribute to the broader body of literature exploring the connection between credit risk and corruption, primarily using panel data analysis. Notably, existing research has not simultaneously incorporated the corruption perception index, credit risk, and interest rates or interest rate spreads to examine their interrelationship. The inclusion of interest rate spread could yield more insightful results, considering its significant role in influencing the level of credit risk.

Furthermore, research indicates that government structure and policy, particularly in countries like China and Ethiopia, as studied by Fan et al. (2008) and Geletta (2012), respectively, play a significant role in influencing the level of credit risk in the banking system. Weak government institutions and poor credit policy assessments are identified as major contributors to the rise in non-performing loans. On the macroeconomic level, studies by Umar and Sun (2018) and others highlight that macro variables, including inflation and GDP, indirectly affect non-performing loans by altering market sentiments and associated risk factors. This linkage between macroeconomic conditions and bank loan performance further illustrates the broader impact of corruption on economic stability.

While these studies offer empirical insights into how corruption affects economic growth and development, particularly through its interaction with financial development, they largely overlook the combined effects of the banking sector and corruption on economic growth. Only a few studies (e.g., Park, 2012; Son et al., 2020; Hasan & Ashfaq, 2021) shed light on the role of the banking system as a conduit for the influence of corruption on economic growth.

Despite this abundance of research on the link between corruption and development, there is a lack of extensive literature that delves into the relationship between corruption and the financial sector, including the banking system. Moreover, existing studies exploring the connection between corruption and banking activities present varied and sometimes contradictory results.

This research not only investigates the direct influence of corruption on credit risk but also posits that corruption can indirectly impact a country's economic growth, especially through its effects on banks' credit risk. Building on the studies of Son et al. (2020) and Hasan and Ashfaq (2021), we extend the research to formulate the following hypotheses for testing:

Hypothesis 1: There is a positive correlation between corruption and the incidence of credit risk.

Hypothesis 2: The degree of credit risk in the banking sector is an indicator of the influence of corruption on the overall economic growth of a country.

This research advances the existing literature on corruption, credit risk, and economic growth by integrating a comprehensive dataset spanning 218 countries over more than two decades. Unlike prior studies, which often focus on regional analyses or specific country case studies, our global approach provides a broader, more comparative perspective. Additionally, we employ the Control of Corruption Index and non-performing loan ratios within a simultaneous equations model to uniquely elucidate the interdependencies between these variables. This methodological approach allows for a nuanced understanding of the causal relationships, distinguishing our analysis from others that may not account for such bidirectionality. Our study also extends the temporal and geographical scope

beyond that of most previous research, offering new insights into the evolving dynamics of corruption and its economic implications during periods of significant global change. By doing so, we contribute novel empirical evidence to the discourse on how robust financial systems and governance can mitigate the adverse effects of corruption, guiding policymakers in developing strategies that enhance economic stability and growth.

3. Methodology

3.1 Data

In this research, we comprehensively analyze the interplay between corruption and credit risk in the global financial landscape, utilizing an extensive dataset that encompasses 218 countries across various regions. The data, meticulously compiled for the period 2000–2022, is sourced from reputable and authoritative secondary sources, including the World Development Indicators (WDI) of the World Bank database, the International Monetary Fund (IMF) Database, and reports published by Transparency International.

Central to the analysis is the Control of Corruption Index derived from the World Bank, which serves as the primary proxy for corruption, similar to notable previous studies (Hasan & Ashfaq, 2021; Son et al., 2020). The Control of Corruption Index, with a range extending from -2.5 to 2.5, provides a nuanced measure of corruption perceptions, capturing the degree to which public power is exploited for private benefit. This includes various forms of corruption, both petty and grand, as well as the phenomenon of state "capture" by elites and private interests (Kaufmann et al., 2009). Complementing this, the principal proxy for

credit risk in our study is the non-performing loan ratio. This indicator is critical in assessing the health of the credit market and banking sector, reflecting the percentage of loans that have fallen into default or are close to it, thereby signaling potential vulnerabilities in the financial system.

This approach marks a departure from the narrow focus of Umar and Sun (2018), who concentrated on aggregate data, and instead emphasizes the most current country-level data available. In contrast to Bougatef's (2016) research, limited to a 22-country sample from 2008–2012, and Son et al.'s (2020) study covering 120 countries from 2004–2017, and as explored in Hasan and Ashfaq's (2021) study, this investigation casts a wider net, incorporating data from 178 countries up until 2017. By extending the temporal and geographical scope, this research overcomes the constraints of previous studies and contributes significantly to the broader understanding of the interplay between corruption, credit risk, and economic growth, thereby enriching the existing literature with more generalized and comprehensive insights.

Furthermore, this study incorporates the Corruption Perceptions Index (CPI) from Transparency International, which spans a range from 0 to 100. These indices are utilized as alternative measures of corruption when conducting robustness tests. The selection of these two indices for robustness analysis is particularly apt for this research topic. The CPI offers a broader, perception-based measure of corruption, aggregating views from various stakeholders, including businesspeople and experts. This wide-ranging perspective is essential for understanding the general perception of corruption and its implications on a global scale (Transparency International, 2021). By employing both indices, the research gains a comprehensive view of corruption, capturing both the political

intricacies and the broader perceptions that influence economic activities and risk assessments. This dual approach ensures a more thorough and nuanced understanding of corruption's impact on credit risk and economic growth, thereby strengthening the validity and reliability of the research findings.

3.2 Variable Definition and Model Development

The investigation seeks to ascertain if the banking system functions as a channel through which corruption influences economic growth, paralleling the examination of the potential decline in economic growth attributable to an escalation in non-performing loans within the banking sector. The focal point of this analysis is to delineate the repercussions of corruption on non-performing loans and, consequently, the ramifications of these loans on economic growth. However, an inherent complexity emerges due to the bidirectional relationship between non-performing loans and economic growth, with the latter being an integral independent variable in the non-performing loans equation (Son et al., 2020). This bidirectionality introduces a simultaneity dilemma, typifying an endogeneity issue, thus presenting a challenge in disentangling the causal relationships between these intertwined variables. Thus, this study employs the following simultaneous equations models:

$$NPLR_{it} = \alpha + \beta_1 NPLR_{it-1} + \beta_2 CCI_{it} + \beta_3 CDI_{it} + \beta_4 CAP_{it} + \beta_5 LIQUID_{it} + \beta_6 INF_{it}$$
$$+ \beta_7 TRADE_{it} + \beta_8 GOV_{it} \tag{1}$$

$$RGDP_{it} = \alpha + \beta_1 RGDP_{it-1} + \beta_2 CCI_{it} + \beta_3 NPLR_{it} + \beta_4 CCI*NPLR_{it} + \beta_5 INF_{it} + \beta_6 TRADE_{it}$$
$$+ \beta_7 GOV_{it} + \beta_8 TRANS_{it} + \beta_8 PUB_{it} \tag{2}$$

where RGDP and NPLR are the endogenous variables.

The non-performing loan rate (NPLR) is the proportion of non-performing loans to total loans, consistent with previous studies of Park (2012), Bougatef (2016), Son et al. (2020), and Hasan and Ashfaq (2021). Real GDP growth (RGDP) serves as a measure of the overall economy. Economic growth tends to correlate with a decrease in the non-performing loan ratio (Louzis et al., 2012). This correlation is due to the enhanced ability of individuals and businesses to repay loans during times of economic prosperity. Conversely, economic growth might also lead to an increase in non-performing loans, as credit is often extended to riskier, lower-quality debtors during such periods (Damanhur et al., 2018).

The Control of Corruption Index (CCI) quantifies corruption on a national scale, with its range extending from -2.5 to 2.5. In this scale, an elevated CCI score is indicative of reduced corruption levels, establishing it as a frequently utilized barometer for assessing corruption (Hasan & Ashfaq, 2021). The Credit Disclosure Index (CDI) ranges between 0 and 8, where a higher score denotes greater availability and reliability of credit-related information. The availability of comprehensive and reliable credit information is crucial for assessing credit risk and has a direct impact on economic growth. Ben Saada (2018) showed that enhanced credit information sharing reduces information asymmetry between borrowers and lenders, leading to more informed lending decisions and, consequently, lower credit risk.

The ratio of bank capital and reserves to total assets, or capitalization (CAP), and the ratio of bank liquid reserves to bank assets (LIQUID) are widely used in the research of corruption and credit risk, in associating with "moral hazard" hypothesis, in previous studies (Bougatef, 2016; Hasan & Ashfaq, 2021; Park, 2012). The higher capitalization correlates with reduced risk-taking by banks,

thus inversely affecting the non-performing loan ratio; higher LIQUID is perceived as a sign of a bank's robustness.

Previous research in the field of credit risk has highlighted the significant role of macroeconomic variables such as inflation (INF), trade openness (TRADE), and government expenditure (GOV). In Model 2 (2), CCI*NPLR serves as an interaction term between corruption index and non-performing loans, with transparency (TRANS) and public debt (PUB). For example, Inflation is considered a control variable because its increase typically leads to higher nominal interest rates, which can raise the likelihood of defaults (Ghosh, 2015). The significance of the quality of capital information disclosure is its potential use by both public and private credit registries in mitigating credit risk (Bougatef, 2015). Increased trade openness is associated with a reduction in corruption, which in turn can lead to a decrease in credit risk (Dreher & Gassebner, 2013), and an overly high deficit spending can precipitate a sovereign debt crisis, potentially culminating in significant disruptions within the banking sector (Chen et al., 2018; Umar & Sun, 2018).

4. Results & Discussion

4.1 Descriptive Statistics

Table 1 provides a comprehensive overview of descriptive statistics for various economic and financial variables used in the study, shedding light on their characteristics and distribution. Credit Risk, measured by the NPLR to total gross loans, shows a mean value of 6.62 with a notably high standard deviation of 7.86, indicating significant variability across different contexts. The range of NPLR,

from a minimum of 0.09% to a maximum of 61.11%, reflects the diverse health of banking sectors in different economies. This wide dispersion underscores the varied nature of credit risk management across countries.

In terms of Corruption, three different measures are used, each providing a unique perspective. The CCI has a near-zero mean (-0.02), suggesting a balanced distribution of corruption perceptions across the sample. However, the standard deviation of 1.00 and a range from -1.94 to 2.46 indicate considerable differences in corruption levels among countries. The CPI, with a low average score of 20.08 and a high standard deviation of 25.00, highlights the generally poor perception of corruption globally, with some countries faring much worse than others.

Economic Growth, measured by RGDP, has a mean of 3.31% and a wide range from -54.24% to 86.83%, reflecting extreme cases of economic contraction and expansion in the sample. This variability emphasizes the diverse economic conditions and growth trajectories of different nations. The CDI has a mean of 4.58, indicating a moderate level of credit information depth on average, with a complete range from 0 to 8.

Table 1. Descriptive statistics for variables

Variables	Description	Source	Reference	Mean	SD	Min	Max	Obs
Credit Risk	Bank non-performing loans to total gross loans (%) - NPLR	World Bank Database	Son et al. (2020); Hasan and Ashfaq (2021)	6.62	7.86	0.09	61.11	1,925
Corruption	Control of Corruption: estimate (-2.5 =totally corrupt to 2.5=not corrupt) - CCI	World Bank Database	Son et al. (2020)	-0.02	1.00	-1.94	2.46	4,392
	Corruption Perception Index (0=totally corrupt to 100=not corrupt) - CPI	Transparency International	Bougatef (2015); Hasan and Ashfaq (2021)	20.08	25.00	0.4	92	2,682
Economic Growth	GDP growth (annual %)	World Bank Database	Damanhur et al. (2018); Son et al. (2020)	3.31	5.75	-54.24	86.83	4,706
Credit Disclosure Index	Depth of credit information index (0=low to 8=high) - CDI	World Bank Database	Ben Saada (2018); Hasan and Ashfaq (2021)	4.58	3.18	0.00	8.00	1,330
Capitalization	Bank capital and reserves to the total asset (%) - CAP	World Bank Database	Park (2012); Bougatef (2015); Hasan and Ashfaq (2021)	23.60	5.82	0.01	17.23	1,520
Liquidity	Bank liquid reserves to bank assets ratio (%) - LIQUID	World Bank Database	Chen et al. (2018); Son et al. (2020)	23.42	16.44	0.20	390.11	3,096
Inflation	Inflation, GDP deflator (annual %) - INF	IMF Database	Ghosh (2015); Damanhur et al. (2018)	7.46	42.15	-30.20	2,630.12	4,705
Trade Openness	Sum of total exports of imports of goods and services (% of GDP) - TRADE	World Bank Database	Dreher and Gassebner (2013)	91.61	59.40	2.70	863.20	4,123
Government Expenditure	General government final consumption expenditure (% of GDP) - GOV	World Bank Database	Chen et al. (2018); Son et al. (2020)	17.15	9.42	0.95	147.72	3,921
Transparency	CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high) - TRANS	World Bank Database	Bougatef (2015); Hasan and Ashfaq (2021)	2.88	0.70	1.00	4.50	1,381
Public Debt	Central government debt, total (% of GDP) - PUB	World Bank Database	Umar and Sun (2018); Son et al. (2020)	57.00	37.56	0.00	252.52	1,302

Source: Compiled by authors.

Furthermore, CAP and LIQUID are particularly noteworthy due to their significant variability. This variation highlights the differences in the strength and stability of banking sectors across various countries, with some having more robust capital buffers and liquid assets than others. PUB, with an average of 57.00%, stands out as a critical indicator, reflecting the high debt levels prevalent in many countries in the sample. This high average suggests a common challenge of managing public debt across different economies, potentially impacting their fiscal policies and economic stability. INF also shows a remarkable range and high volatility, indicating diverse inflationary environments and monetary policies among the countries. This variability in inflation rates can have significant implications for economic growth and financial stability.

Table 2 describes the correlation matrix for variables in Model 1, where non-performing loans are the dependent variable, which reveals critical relationships between various financial and economic indicators. A noteworthy aspect is the negative correlation between the NPLR and CCI, which is -0.268. This suggests a significant association where improved corruption control correlates with reduced non-performing loans, highlighting the potential impact of governance on banking sector health.

Table 2. Correlation matrix for variables in Model 1

	NPLR	CCI	CAP	CDI	RGDP	INF	TRADE	GOV	LIQUID
NPLR	1								
CCI	-0.268	1							
CAP	-0.193	0.308	1						
CDI	-0.284	0.268	0.084	1					
RGDP	-0.108	-0.12	-0.016	0.01	1				

INF	0.023	-0.101	-0.122	-0.003	-0.019	1			
TRADE	0.032	0.334	0.49	-0.013	0.012	-0.047	1		
GOV	0.006	0.241	-0.127	-0.088	-0.147	-0.055	0.12	1	
LIQUID	0.112	-0.324	-0.145	-0.206	-0.009	0.151	-0.087	0.032	1

Source: Authors' calculation from dataset.

Another prominent relationship is the positive correlation between CAP and CCI, observed at 0.308. This implies that as corruption control improves, there is a tendency for increased capital adequacy in banks. Additionally, the negative correlation of -0.284 between the CDI and NPLR indicates that greater transparency in credit information is associated with lower levels of non-performing loans, underscoring the importance of information availability in maintaining banking sector stability.

Table 3 shows the correlation matrix for Model 2, where RGDP is the dependent variable. The relationships between different economic and corruption indicators offer insightful observations. A key highlight is the positive correlation between RGDP and the CCI at 0.179, indicating that higher levels of corruption control are associated with stronger economic growth. Conversely, the NPLR shows a negative correlation with CCI at -0.268, reinforcing the notion that improved corruption control may lead to reduced levels of non-performing loans.

Table 3. Correlation matrix for variables in Model 2

	RGDP	CCI	NPLR	INF	TRADE	TRANS	PUB
RGDP	1						
CCI	0.179	1					
NPLR	-0.12	-0.268	1				
INF	-0.02	-0.101	0.023	1			
TRADE	-0.145	0.334	0.032	-0.047	1		

TRANS	-0.085	0.859	-0.137	-0.133	0.141	1	
PUB	0.241	0.293	0.15	-0.156	0.051	0.316	1

Source: Authors' calculation from dataset.

A particularly strong positive correlation at 0.859 between the CCI and the TRANS indicates a significant link between corruption control and transparency levels. Furthermore, there is a notable positive correlation of 0.293 between PUB and CCI, suggesting that increased government spending is often linked with improved corruption control. These correlations are crucial as they offer insights into the intricate relationships among economic growth, corruption control, and transparency, highlighting the vital role of governance in various sectors as examined in this study.

Because of suspected multicollinearity, performing a VIF (Variance Inflation Factor) test is necessary to assess the level of correlation between independent variables in the model.

Table 4. Performance of VIF test

Variables	VIF
RGDP	4.837
CCI	1.276
INF	1.045
TRADE	1.163
NPLR	1.082
GOV	1.063

TRANS	1.025
PUB	2.983

In summary, the low VIF values suggest that there is no significant multicollinearity issue among the variables in the model.

4.2 Regression Results

The regression results in Table 5 provide insightful data on how corruption, credit risk, and other economic indicators influence NPLR and RGDP. Starting with the NPLR as the dependent variable, the coefficients reveal significant relationships with several factors. Notably, the lagged NPLR (NPLR_lag) shows a strong positive relationship, suggesting that past credit risk continues to influence current levels. The CCI presents a negative relationship with NPLR, indicating that better control of corruption is associated with a reduction in non-performing loans. This is consistent across both models. Other variables like CDI, CAP, and LIQUID also show significant impacts. The negative coefficients for CDI and CAP suggest that improvements in credit disclosure and bank capitalization are associated with reduced credit risk. The positive coefficient for LIQUID indicates a somewhat counterintuitive relationship where higher liquidity ratios are associated with increased non-performing loans.

Table 5. Regression results

Dependent variable	NPLR	NPLR	RGDP	RGDP
Constant	6.654***	6.654***	0.334***	0.342***
NPLR_lag		0.982***		
RGDP_lag				1.41***

CCI	-2.498***	-0.351***	0.075***	-0.004**
NPLR			-0.036***	0.005***
CCI*NPLR				-0.104***
CDI	-1.099***	-0.189**		
CAP	-1.118***	-0.218***		
LIQUID	0.137	-0.084**		
INF	-0.124	-0.203**	-0.007	0.002**
TRADE	1.482***	0.141**	-0.078***	-0.001***
GOV	0.441**	0.045***	-0.038***	-0.002***
TRANS			0.116***	0.013***
PUB			1.143***	-0.022***
Observations	1849	1724	4591	4376
R2	0.156	0.844	0.645	0.916

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

Source: Authors' calculation from dataset.

When considering RGDP as the dependent variable, the lagged real GDP growth (RGDP_lag) shows a strong positive relationship, highlighting the momentum effect in economic growth. Interestingly, the CCI shows both positive and negative coefficients in different models, suggesting a nuanced relationship with economic growth. The interaction term CCI*NPLR is notably negative, implying that the negative impact of non-performing loans on growth can be mitigated in environments with better control of corruption. Other economic indicators like INF, TRADE, GOV, TRANS, and PUB also show significant relationships with GDP growth. The negative coefficients for INF and TRADE in some models suggest that higher inflation and increased trade openness may not always be conducive to economic growth. Conversely, positive coefficients for

GOV, TRANS, and PUB indicate that government spending, transparency, and public debt levels can positively influence economic growth under certain conditions.

The R-squared values for these models are quite revealing. For NPLR, the R-squared values are 0.156 and 0.844, indicating a considerable variation in explanatory power across the models. For RGDP, the R-squared values are 0.645 and 0.916, suggesting that these models have a high explanatory power in understanding the factors influencing GDP growth. It is noteworthy that the first model exhibits a significantly lower R-squared value compared to subsequent models. This discrepancy can be attributed to several factors. Firstly, the model's lower R-squared value may indicate that it includes fewer predictors or that the included predictors do not capture much of the variability in the dependent variable. It is also possible that this model is more simplistic, lacking interaction terms or polynomial terms that might capture the relationships between variables more accurately. Additionally, the initial model might be more generalized, as it is designed to provide a broad overview without delving into the complexities captured in more refined models. This foundational model sets the stage for further analysis, allowing subsequent models to incorporate additional variables or more complex relationships, thus enhancing explanatory power. The evolution of the model's sophistication is crucial for gradually building an understanding of the nuanced interplay between the studied factors.

In summary, this table highlights the complex and multifaceted relationships between corruption, credit risk, and other economic indicators with respect to non-performing loan ratios and GDP growth. The results emphasize the importance of corruption control, credit risk management, and a range of other

economic policies in shaping economic outcomes. These findings are crucial for policymakers aiming to enhance economic stability and growth.

The broad dataset encompassing 218 countries provides a global overview of the interaction between corruption, credit risk, and economic growth. However, it is important to acknowledge that this aggregate analysis might mask significant differences between developed and developing nations. Developed countries often have more robust financial and legal institutions, which can mitigate some negative effects of corruption compared to developing nations, where such institutions may be weaker or less effective. Our findings suggest a general negative correlation between corruption and economic health across the sampled nations. Yet, this relationship may vary considerably when dissecting the data into developed and developing country groups. For instance, the impact of corruption on credit risk—particularly non-performing loans—might be more pronounced in developing countries due to less stringent regulatory frameworks and weaker enforcement mechanisms. Given the constraints of the current study, a separate in-depth analysis comparing these two groups was not conducted. Future research could, therefore, benefit from a segmented approach, examining how economic structures and institutional strengths influence the dynamics between corruption, credit risk, and economic growth in developed versus developing contexts. Such an analysis would not only refine the understanding of these relationships but also offer more tailored policy recommendations that address the specific needs and challenges of different economic groupings.

4.3 Robustness Test

To ascertain the robustness of the findings, we conducted the same analyses by replacing CCI with the CPI from Transparency International. The CPI index ranges from 0 (highly corrupt) to 100 (very clean), with higher values of the corruption index implying better control of corruption. In Table 6, CPI has a significantly negative relationship with non-performing loans. Using the alternative indicator of corruption has reinforced the argument that corruption reduces the soundness of the banking system, hence it decreases economic growth. As shown in Table 6, there is no significant change in the main results of the control variables.

Table 6. Robustness test: Replacing CCI with CPI

	NPLR	NPLR	RGDP	RGDP
Constant	6.654***	6.654***	0.334***	0.332***
NPLR_lag		0.702***		
RGDP_lag				0.015***
CPI	-0.985***	-0.238***	0.017	-0.01***
NPLR			-0.09***	0.019
CPI*NPLR				0.011***
CDI	-1.577***	-0.256***		
CAP	-1.121***	-0.108		
LIQUID	0.321*	-0.061		
INF	0.145	-0.169**	-0.005	0.002
TRADE	0.733***	0.037	-0.004	0.001
GOV	-0.072	-0.002	-0.031***	-0.001
TRANS			0.05***	0.001

PUB			0.008***	-0.027***
Observations	1849	1849	4591	4591
R2	0.105	0.844	0.781	0.996

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

Source: Authors' calculation from dataset.

While this study provides comprehensive insights into the relationship between corruption, credit risk, and economic growth, it does not specifically isolate the impact of significant global events such as the Hamburger crisis and the Covid-19 pandemic. These events represent exceptional economic conditions that could potentially skew the general trends observed under normal circumstances. Due to constraints related to data availability and the scope of this initial analysis, these factors were not separately analyzed.

5. Conclusion & Recommendations

The research conducted in this study, building upon the extensive literature review and the results from the regression analysis, offers significant contributions to the existing body of knowledge on the relationship between corruption, credit risk, and economic growth. The findings align closely with the dominant theme in literature that corruption adversely affects economic growth, primarily through its impact on the financial system, especially the banking sector (Mauro, 1995; Akins et al., 2017). The regression analysis conducted reinforces this perspective by demonstrating a significant correlation between corruption indicators (such as the CCI) and an increase in NPLR, which is a key indicator of credit risk in the banking sector. This empirical evidence supports the hypothesis that corruption leads to a

deterioration in the quality of bank assets and an increase in credit risk, thereby negatively impacting economic growth, a finding consistent with previous studies (Bougtaf, 2015; Cieślik & Goczek, 2018).

In contrast to the views of researchers like Chen et al. (2013) and Dreher and Gassebner (2013), who propose that corruption can have beneficial effects in certain contexts by allowing firms to bypass inefficient policies, our findings suggest that the overall impact of corruption is predominantly negative, particularly in terms of banking sector stability and economic growth. Corruption is corrupted by the observed negative relationship between CCI and NPLR in our regression models, which indicates that better control of corruption is associated with lower non-performing loans.

This research also aligns with the studies conducted by Barth et al. (2009) and Boudriga et al. (2009), which highlight the importance of information exchange in mitigating credit risk. The significant coefficients for variables like CDI in our models suggest that enhancing transparency and information flow in the banking sector is crucial for reducing credit risk and, by extension, corruption-induced negative impacts on economic stability. Moreover, the research findings confirm our first hypothesis that there is a positive correlation between corruption and the incidence of credit risk. The observed relationships in the regression analysis between corruption indices and indicators of credit risk provide empirical support for this hypothesis. However, the second hypothesis, which posits that the degree of credit risk in the banking sector is an indicator of the influence of corruption on overall economic growth, is more complex. While our results indicate a relationship between these factors, the interplay between macroeconomic conditions (like inflation and GDP growth) and credit risk

complicates the direct attribution of economic growth trends to corruption-induced credit risk alone. This complexity echoes the findings of Umar and Sun (2018), who underscored the indirect effects of macroeconomic variables on non-performing loans.

Considering the research findings on the impact of corruption and credit risk on economic growth, tailored recommendations for investors, managers, and policymakers are crucial to mitigate these risks and foster sustainable growth. Investors should exercise heightened due diligence, particularly in assessing the corruption levels of the markets they target. This involves scrutinizing metrics like the CCI to gauge potential risks. A critical analysis of the health of the banking sector, focusing on non-performing loans and overall credit risk, is essential before making investment decisions. Diversification is a key strategy, spreading investments across various sectors and regions to minimize exposure to high-corruption environments. Additionally, investors, especially institutional ones, should actively engage in governance and advocate for transparency and ethical practices in the companies they invest in.

Managers, particularly in the financial sector, must prioritize enhancing transparency and information disclosure. This approach aligns with the finding that improved information flow can mitigate credit risk. Implementing robust risk management practices to effectively identify and manage credit risks is imperative. Managers should also foster a culture of ethical business practices and enforce anti-corruption policies. Regular training and awareness programs for employees can underline the significance of ethical conduct and its impact on reducing corruption-related risks.

For policymakers, the research underscores the need for stronger anti-corruption legislation and effective enforcement mechanisms. Policies that promote transparency in the banking sector should be a priority, as they can significantly reduce credit risk and enhance sector stability. Given the indirect influence of macroeconomic factors on credit risk and economic growth, policies that ensure macroeconomic stability are also vital. Moreover, international cooperation in combating corruption, especially in financial transactions, is crucial to establishing a fair and corruption-resistant global economic environment.

In conclusion, our study contributes to the understanding of the detrimental effects of corruption on economic growth, especially through its impact on credit risk in the banking sector. It reinforces the predominant view in the literature about the negative consequences of corruption while also highlighting the importance of transparency and information sharing as mitigating factors. These findings have significant implications for policymakers, suggesting that efforts to control corruption and improve transparency in the banking sector can lead to a reduction in credit risk and, consequently, foster healthier economic growth.

Considering our findings on the pervasive impact of corruption on economic stability, it is advisable for investors to diversify their investment portfolios across various sectors as well as across different geographical regions. By spreading investments across multiple countries, investors can mitigate the risks associated with regional economic downturns, political instability, or high levels of corruption that might affect countries or regions. This strategy of geographic diversification helps reduce potential losses and leverage opportunities in different markets, thus enhancing the overall resilience of investment portfolios against corruption-induced uncertainties. Investors are encouraged to evaluate the

corruption levels, economic conditions, and regulatory environments of different countries to make informed decisions that balance risk with potential returns.

However, this research, while providing insightful findings on the relationship between corruption, credit risk, and economic growth, has certain limitations. Firstly, the reliance on secondary data sources such as the CCI and NPLR may not fully capture the nuanced realities of corruption and credit risk in different countries. Secondly, the regression models used, despite their robustness, might not account for all variables influencing the complex dynamics between corruption and economic growth. For instance, cultural, political, and legal differences across countries, which can significantly impact corruption and its economic effects, are not directly addressed in the models. Furthermore, panel data typically captures a sequence of observations at regular intervals, which may not fully capture the complexity of dynamic changes and interactions among variables. This limitation can constrain the ability to understand the underlying mechanisms driving the observed patterns and changes over time.

While this study leverages a cross-sectional analysis to provide insights into the relationship between corruption, credit risk, and economic growth, its time series nature also allows for the exploration of trends over a significant period. This highlights a key limitation: While able to depict broad trends, it may not fully capture the dynamic interplay of these factors over shorter, specific intervals or under rapidly changing conditions. Future research could extend this work by employing longitudinal methods to track changes in these variables over time, enhancing understanding of their dynamic and causal relationships. Investigating how cultural, political, and legal environments influence these relationships could yield deeper insights, particularly in comparative studies across diverse economic

settings. Moreover, exploring the impact of technological advancements like fintech and blockchain on mitigating corruption and credit risk could reveal important trends relevant to the modern financial sector. Qualitative approaches, including case studies and expert interviews, could further enrich these findings, providing a comprehensive view of the nuanced factors that influence economic and financial stability.

Given the scope and data constraints of the current study, we did not analyze the distinct impacts of major global disruptions like the Hamburger crisis or the COVID-19 pandemic. However, acknowledging the significant economic shifts these crises have triggered globally, future research should focus on these events separately. Analyzing how such crises interact with corruption and credit risk could yield crucial insights into the resilience and adaptability of financial systems under extreme conditions. This direction will be particularly valuable for developing more robust economic policies and crisis management strategies.

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