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UDC: 336.717.061:343.352(4-11)
DOI: 10.2478/jcbtp-2026-0005

Journal of Central Banking Theory and Practice, 2026, 1, pp. 93-118
Received: 27 March 2025; accepted: 19 May 2025

***Albulena Shala*[*], *Maria Iannario*[**], *Claudia Tarantola*[***], *Peterson K. Ozili*[****]**

Does Corruption Affect Non-Performing Loans in Central and Eastern Europe?

[*] Faculty of Economics, Department of Banking and Finance, University of Pristina

E-mail: albulena.shala@uni-pr.edu

[**] Department of Political Sciences, University of Naples Federico II, Italy

E-mail: maria.iannario@unina.it

[***] Department of Economics, Management and Quantitative Methods, University of Milan, Italy

E-mail: claudia.tarantola@unimi.it

[****] Central Bank of Nigeria, Abuja, Nigeria

E-mail: pkozili@cbn.gov.ng

Abstract: The objective of this study is to examine the effect of corruption on non-performing loans in 17 Central and Eastern European countries from 2004 to 2021. The study investigates the influence of corruption on the incidence of non-performing loans while controlling for macroeconomic, bank-specific, and governance-related factors. The analysis is based on panel data, and the fixed effects method is applied. The results indicate that several variables, including corruption, unemployment, loan-to-deposit ratio, voice and accountability index, and credit growth significantly affect non-performing loans. The findings contribute to the existing literature by examining the role of external factors in the persistence of non-performing loans, revisiting this issue in the specific context of the Central and Eastern European region.

Key words: Non-Performing Loans, Corruption, Unemployment, Loan-to-deposit ratio, Voice and accountability index, Corruption Perception Index, Credit Growth, Central and Eastern Europe.

JEL Code: C23, G21, G28, O16

1. Introduction

This study examines the effect of corruption on bank non-performing loans (NPLs) in Central and Eastern European (CEE) countries. Banks face a wide range of risks, including credit, market, operational, and liquidity risks. Among these, credit risk holds particular significance for banks and regulators, as it is directly associated with bank stability and bank failure. Consequently, managing credit risk has become one of the most critical aspects of risk management in the banking sector (Ghenimi, Chaibi, & Omri, 2017). Since the majority of banks' profitability emanates from their lending operations, prudent loan portfolio management is critical to the profitability and stability of banks. If the loan portfolio of banks is managed well, it should lead to low credit risk and fewer non-performing loans. Therefore, the NPLs ratio, commonly measured as the ratio of non-performing loans to total loans, is a crucial indicator that affects bank stability.

NPLs negatively impact the banking system's stability in several ways. First, high NPLs affect banks' ability to extend new loans. This will adversely affect banks' net interest margin and lower bank profits (Khan, Siddique, & Sarwar, 2020). Second, high NPLs lower bank profits. Third, high NPLs affect bank`s regulatory capital. This leads to higher risk weights, which raises the amount of capital that banks will set aside for credit risk. Fourth, a greater proportion of NPLs could weaken the lending channel of the implementation of monetary policy and diminish the performance of the banking system. Five, NPLs tend to increase during difficult economic times due to rising borrowers` loan default. Finally, managing huge NPL stocks can take valuable managerial resources away from core profitable functions (Huljak, Martin, Moccero, & Pancaro, 2020). High NPLs also have the potential to worsen bank performance by impacting their liquidity and profitability. In extreme cases, this could potentially result in banking crises and bank failure. Consequently, banks may tighten their lending criteria and/or loan programs, which could lead to a credit crisis and adversely affect economic activity (Bayar, 2019).

In CEE countries, where banks use the conventional business model focused on taking deposits and granting loans, credit risk is one of the main risks affecting financial stability in the region (Fabris & Vujanović, 2022). The average asset quality of banks in CEE declined significantly during the 2007-2009 global financial crisis that hit the global economy, even though the financial crisis began in industrialized economies (Jakubík and Reininger, 2013). Banks in CEE countries also have one of the highest non-performing loans ratios in the European region,

and this has led to calls for strong micro- and macro-prudential regulations to address rising non-performing loans in CEE countries.

Corruption remains a major challenge in developing countries, manifesting within institutions, political systems, and broader macroeconomic structures (Ahmad, 2013). Numerous studies have shown that corruption undermines institutional credibility, stability and hampers economic development (Ahmad, 2013; Goel and Hasan, 2011; Khwaja and Mian, 2005; Weill, 2011). It fosters organized crime, weakens legal systems, and erodes trust in public institutions. Additionally, it contributes to low voter turnout in parliamentary elections and distorts public spending, tax collection, and the allocation of EU funds. Corruption is also linked to increased vulnerable employment, gender inequality, and significant brain drain in countries unable to control it (Bąkowski, 2022).

Corruption is also widespread in CEE countries, where many corruption incidents remain unreported or underreported due to the often-concealed nature of corrupt practices (Bąkowski, 2022). In 2024, the Corruption Perceptions Index (CPI) reported an average score of 35 out of 100 for the CEE region, reflecting high levels of perceived corruption driven by weak democratic institutions, limited rule of law, and low accountability (Transparency International, 2023). This persistent corruption has significantly eroded public trust in institutions, particularly in the banking sector. Many banks are hesitant to trust public institutions, while borrowers may withhold trust from banks they perceive as corrupt. A lack of trust can lead borrowers to intentionally default on loan repayments and exploit corrupt channels to avoid accountability after defaulting on loan repayments. Such behaviour contributes to rising loan defaults, increase in non-performing loans, and greater instability of the banking sector in CEE countries.

Despite the potential for corruption to adversely affect banks in CEE countries, the existing literature has largely overlooked its impact on NPLs. This study fills this gap in the literature by examining the effect of corruption on bank NPLs in CEE countries, while controlling for other relevant factors such as GDP growth, inflation, unemployment, the loan-to-deposit ratio, credit growth, and the voice and accountability index.

This study is the first empirical analysis to use aggregate country-level data to investigate the impact of corruption on NPLs in CEE countries. Using the Corruption Perceptions Index (CPI) as a proxy for corruption, the findings reveal that corruption, along with unemployment, the loan-to-deposit ratio, the voice and accountability index, and credit growth significantly affect bank NPL ratio in CEE countries.

This research contributes to the existing literature by addressing the unexplored relationship between corruption and NPLs in CEE countries. It also advances the corruption literature by applying the CPI to quantify corruption levels in the region. Furthermore, the study informs ongoing policy discussions by highlighting the need for stronger institutional frameworks to combat corruption and reduce NPLs, thereby supporting financial stability and sustainable banking practices. This study also contributes to the ongoing policy discourse by highlighting the need for practitioners, policymakers, financial analysts, and regulatory agencies to establish robust policy frameworks aimed at curbing institutional corruption and reducing non-performing loans in the banking sector.

The remainder of the study is structured as follows. The next section presents a review of the relevant literature. This is followed by the methodology section. The subsequent section presents a discussion of the results, while the final section outlines the conclusion and recommendations, paving the way for future research.

2. Literature Review

NPL levels in the European region remain very low, especially in Western Europe. The low level of NPLs can be attributed to banks' successful deleveraging in the years before the pandemic (EBCI, 2023). In the 12 months leading up to December 31, 2022, NPL levels at the regional level decreased by 10.0 percent to €27.4 billion. Regarding percentage drops, Bosnia and Herzegovina, Croatia, and Latvia saw the most significant decline in NPL, falling by 20.9 percent, 20.8 percent, and 19.1 percent, respectively. The most significant contributor to the drop in absolute terms was Poland, where the level of NPLs fell to €8.5 billion (14.8%). Only three nations — Lithuania (6.3 percent), Kosovo (4.4 percent), and Montenegro (0.8 percent) — saw an increase in the volume of NPLs. The most recent statistics show how stable and robust the banking industry has remained in the European Union (EU) and the larger central, eastern, and south-eastern European (CESEE) region (EBCI, 2023).

Corruption remains a significant challenge for both developed and emerging economies, with far-reaching consequences across various sectors, including the banking sector. In the context of NPLs, several studies have explored corruption as an institutional governance factor influencing the size of NPLs in the banking sector. When corruption is widespread, it can compromise lending practices; for instance, corrupt bank officials may approve loans to unqualified borrowers, thereby deteriorating the quality of loan portfolios. Park (2012) examined the

relationship between NPLs and economic corruption in the period leading up to 2007, arguing that corruption not only impairs the allocation of loanable funds but also undermines both public and private investment. Similarly, Méon and Weill (2010) found that corruption hampers growth, investment, and firm productivity in both advanced and developing countries.

In the literature, two main hypotheses regarding corruption are commonly discussed: the "sand the wheels" hypothesis and "grease the wheels" hypothesis. The "sand the wheels" hypothesis suggests corruption can adversely affect financial sector activity. Studies highlight that factors such as inadequate supervisory policies, insider trading, weak regulation, and a lack of transparency play a significant role in enabling corrupt practices. Méon and Sekkat (2005) examined the effect of corruption on economic activity and found that corruption diminishes economic growth in countries where governance quality declines, hence corroborating the "sand in the wheels" theory. In contrast, the "grease the wheels" hypothesis proposes that corruption can, in some cases, reduce bureaucratic inefficiencies, thereby positively influencing economic activity—particularly in environments burdened by rigid regulations. According to this perspective, economic entities operating in countries with stricter legislation may actually benefit from corruption's ability to bypass regulatory and bureaucratic obstacles. The underlying premise of the arguments is that corruption can be beneficial for growth and development because it can offset the adverse effects of faulty policies and bureaucratic shortcomings. Nonetheless, one can question if bribers always make more sensible decisions than public officials and if corruption either causes or exacerbates other inefficiencies. In an institutionally weak setting, bribery might be advantageous, but it might also come with additional expenses. The "sand the wheels" theory has support due to the presence of such costs (Méon & Sekkat, 2005). According to Akins, Dou, & Ng (2017), the relationship between corruption and loans makes it possible to view lending misconduct as a traditional agency problem where the agent (loan officer) takes personal gain at the expense of the principal (investors and depositors).

Using data from banks in emerging economies, Toader, Onofrei, Popescu, & Andrieș (2018) examine the impact of corruption on the stability of financial systems. Their sample includes several countries from the CEE region (such as Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia, and Ukraine). Their results show that lower levels of corruption are linked to moderate credit growth, fewer credit losses, and improved bank stability. Their results indicate that corruption has a greater impact on the stability of banks operating in nations without corporate governance codes or those

that are not EU members. Mohamad and Jenkins (2021) examined the effect of widespread corruption on banks' credit risk in 16 countries in the Middle East and North Africa (MENA) region from 2011 to 2019. Using data from 197 sources on both macroeconomic and bank-specific factors, the study reveals a positive relationship between corruption and non-performing loans (NPLs). Corruption was found to increase credit risk, even in banks that exhibit significant risk aversion. According to Mohamad and Jenkins (2021), a country's governance can have an impact on the regulation and supervision of the banking sector, which tries to influence bank behaviour.

The institutional quality can have an impact on the stability of a country's banking system. As mentioned by Awartani, Belkhir, Boubaker, & Maghyereh (2016), higher institution quality leads to slower corporate debt maturity. Furthermore, they discover that in the MENA region, the use of longer-term debt is positively associated with better institutional frameworks. More specifically, MENA enterprises employ long-term borrowing more frequently when there is a stronger rule of law, higher regulatory effectiveness, better legal protection for creditors, and more advanced financial intermediaries.

Beck, Jakubik, & Piloiu (2015) analyze the macroeconomic factors that affected NPLs in 75 countries, including 26 of the 28 EU nations (except for Cyprus and Malta), over the 2000–2010 period. International claims (ICL), share, prices, the nominal effective exchange rate (NEER), the lending interest rate (Lending IR), the real gross domestic product (RGDP), and the nominal effective exchange rate (NEER) are the independent variables. They employ fixed effects and Arellano-Bond estimation as their two main econometric techniques from a methodology perspective. According to Beck et al. (2015), the three most important variables influencing NPLs are GDP growth share prices, interest rates, and the currency rate. Zheng, Ghoul, Guedhami, & Kwok (2013) examined the relationship between national culture and corruption in bank lending. They contend that, in contrast to other cultural elements, national culture—particularly collectivism—plays a significant role in shaping corrupt behaviour among bank employees. They confirmed a strong and positive correlation between the degree of collectivism and bank official corruption. Klein (2013) noted that the Global Financial Crisis left behind a significant level of NPLs in the CEE region, and as economic recovery was comparatively slow, NPLs would continue to be an issue. The results show that several variables affect the ability of borrowers to repay loans, such as economic development, unemployment rates, the devaluation of currencies, etc.

Škarica (2014) examined NPLs using aggregate data from seven CEE countries: Bulgaria, Croatia, the Czech Republic, Hungary, Latvia, Romania, and Slovakia.

The author tested the relationship between NPLs and real GDP growth, unemployment rate, nominal effective exchange rate (NEER), harmonized index of consumer prices (HICP), share price index, and the 3-month money market interest rate. The findings demonstrate that the economic downturn is the main factor contributing to the high levels of non-performing loans, as indicated by the statistically significant coefficients on GDP, unemployment, and inflation.

Another relevant study is by Tanasković and Jandrić (2015), who examined several countries in the CEE region (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Lithuania, Montenegro, FYR Macedonia, Romania, Serbia, and Slovenia) over a similar period (2006–2013). They applied a fixed estimation technique. They found that the percentage of foreign loans and the exchange rate level have a positive correlation with the rise in the NPL ratio, and this relationship is statistically significant across all models. These results support the hypothesis that countries with high levels of euroization tend to experience higher levels of NPLs, which are particularly noticeable during times of devaluation of their national currency. Beck et al. (2015) examined the relationship between macroeconomic variables (real GDP, lending interest rate, exchange rate, etc.) and NPLs for 75 countries in the EU for the period 2000–2010. They used fixed effects and Arellano-Bond estimation. They find that GDP growth, share prices, interest rates, and the exchange rate are significant NPL determinants. Anastasiou, Bragoudakis, & Malandrakis (2019a) employed the Generalized Method of Moments (GMM) estimations and Vector Autoregression (VAR) to identify the main determinants of NPLs in the Euro-area banking system for the period 1990Q1–2015Q2 and for the period 2003–2016. The independent variables are: ROA, ROE, loan to deposit, unemployment, debt, inflation, etc.

Anastasiou, Louri, & Tsionas (2019b) examined the relationship between the six Worldwide Governance Indicators (WGI) and NPL for the period from 1996 to 2016. In this study, they used Ordinary Least Squares (OLS) with robust standard errors. The index showed a negative sign and was statistically significant, meaning that higher levels of these governance indicators signify lower levels of NPLs.

Arham, Salisi, Mohammed, & Tuyon (2020) examined the relationship between the ratio of debt to GDP and NPLs for the years 2007–2017 in Emerging Asia. Additionally, they look at three out of six WGIs, which are proxies for governance quality. Specifically, they focus on three areas: government effectiveness, regulatory quality, and corruption control. The findings demonstrate the important role that national governance plays in reducing the favourable impact of the debt-to-GDP ratio on NPL levels. Similarly, Lee, Dato Haji Yahya, Habibullah, & Mohd Ashhari (2020) analyzed a sample of banks from European Union

countries between 2007 and 2016 to investigate the effect of national governance on mitigating the impact of macroeconomic cycles on non-performing loans (NPLs). Using governance indicators such as control of corruption, government effectiveness, and regulatory quality, they found that all were negatively correlated with NPLs, suggesting that stronger governance helps reduce credit risk. Bykova and Pindyuk (2019) conducted an empirical study on NPLs in CEE countries using the dataset from 2007 to 2019. The results indicate that GDP growth, inflation, and loan growth have a statistically significant impact on NPLs. Their findings show that, following the financial crisis, the asset quality of corporate loans deteriorated more markedly than that of household loans in countries such as Bosnia and Herzegovina, Croatia, Montenegro, Serbia, and Slovenia. Due to high remittance inflows and migration in the Western Balkans, the level of NPLs is often low, as these families are frequently supported during challenging times by friends or family members who live abroad. Loans to non-financial companies seem to be more sensitive to economic cycles than loans to households, showing a stronger response to variations in GDP growth and changes in unemployment.

Ofria and Mucciardi (2022) show that throughout the period of 2005–2015, NPLs in the EU countries were significantly positively influenced by both public debt to GDP and corruption. A high public debt is associated with government failure because collapsing public finances create a "ceiling" on the market's assessment of the national banks' credibility. As a result, banks are forced to reduce lending, which prevents debtors from refinancing their debts and puts them in a difficult liquidity situation. They used the CPI as a proxy for measuring corruption.

The financial performance of an organization tends to decline in the presence of corruption (Van Vu, Tran, Van Nguyen, & Lim, 2018). Ghardallou (2022) makes the case that political parties and other influential actors have the ability to restrict access to capital and financial markets. Whatever the exact measure, corruption is an issue in all economies, it is particularly severe in developing countries. The main causes of corruption in developing nations include a lack of legal independence, ineffective prudential rules, and lax internal bank oversight. Ghardallou (2022) also argues that fulfilling the interests of individual or specialized groups can result in market distortions and inefficient resource distribution. This includes lending money to an agent based on their affiliation with a particular political party, religion, level of familiarity, or friendship without conducting an adequate evaluation of their ability to repay the loan.

Asteriou, Pilbeam, & Tomuleasa (2021) used a sample of 326 banks from 19 countries in the Eurozone to examine the effects of economic freedom, bank regulation, corruption, and transparency on bank profitability and stability from 2005

to 2018. The study found that greater economic freedom leads to increased profitability, while its impact on stability depends on the type of regulation. The results indicate that corruption and transparency negatively affect both bank stability and profitability. In conclusion, the study demonstrates that the impact of the variables of interest varies depending on the specific metrics employed to assess profitability and financial stability.

High levels of corruption in the banking sector act as a barrier in accessing credit. In their research, Mohammad, Helmi, Hidthiir, Bin, & Nor (2019) note that corruption has a favourable impact on bank stability and profitability. According to the authors, the primary drivers of bribery in the banking industry are stringent risk aversion and an overabundance of bureaucracy in the credit application process. Corruption facilitates credit expansion in the near term, but as NPLs rise, it becomes negative in the long run for banks and the economy as a whole. The study shows that the stability of the banking industry is positively correlated with the control of corruption. The study also found that banks' ability to maintain adequate solvency and operational resilience is critical to financial stability and carry out their intermediation role is severely hampered by inadequate corruption control. The study concludes that corruption has a detrimental effect on banking stability, emphasizing the need for the adoption of anti-corruption laws, especially in light of current fluctuations in oil prices. Consequently, rising credit default rates have a detrimental impact on banks' stability (Younsi & Nafla, 2019). Furthermore, there is growing evidence that corruption has a detrimental impact on bank stability, profitability, and credit risk. The empirical findings demonstrate that the external governance system and its components, political stability, regulatory quality, rule of law, and corruption control, in particular, have a positive effect on the profitability of Islamic banks (Athari & Bahreini, 2021). However, these studies converge in highlighting that credit risk is a significant factor — which is created when bank employees accept bribes in exchange for high-risk loans as an indirect way that corruption affects banks' capacity to maintain their financial stability. Although this may create short-term lending opportunities, it ultimately leads to higher financing costs and long-term instability (Ben Ali, Fhima, & Nouira, 2020).

In 35 developing nations, Chen, Jeon, Wang, & Wu (2015) investigated the impact of corruption on risk-taking behaviour as measured by the bank NPL and z-score. The study was conducted between 2000 and 2012. The results show that bank stability decreases as levels of corruption rise. Furthermore, a bank is more vulnerable in areas where corruption is pervasive if it gets involved in high-risk schemes. Furthermore, in the relationship between corruption and development, banks that experience high levels of corruption take higher risks when it comes

to non-performing loans (NPLs) rather than "sanding the wheel." Corruption makes bank returns more volatile and increases the likelihood that borrowers may default.

The impact of widespread corruption on the credit risk of commercial banks with different levels of credit risk is examined by Jenkins, Alshareef, & Mohamad (2023). Using panel data from 2011 to 2018, they use the quantile regression (QR) estimation approach for 191 commercial banks from 18 Middle East, North Africa, Afghanistan, and Pakistan (MENAP) countries. The study's findings show that corruption significantly exacerbates the problem of poor bank loans. Similarly, Murdock, Ngo, & Richie (2023) explored the influence of governmental corruption on the risk and performance of U.S.-based financial institutions. Their results indicate that poor bank performance is associated with corrupt environments, although corruption does not appear to reduce overall credit risk. Interestingly, large banks often underestimate the increase in credit risk, while small and medium-sized banks in highly corrupt areas tend to reduce their liquidity in an effort to maximize profits.

Jiang and Wang (2024) found that in countries with greater rates of lending-related corruption, banks offer better loan terms for borrowers. This relationship is stronger when borrowers have trouble getting money, but it is weaker in countries where there is stricter regulation of foreign bank ownership or where religious beliefs are more prevalent. Furthermore, we discovered that banks in countries with high levels of lending corruption have lower loan quality and earnings performance, which makes them more susceptible to problems during financial crises.

Abuzayed, Ammar, Molyneux, & Al-Fayoumi (2024) examine a dataset that includes 7,235 banks from 160 nations between 2000 and 2016. They investigated the connection between bank performance, lending policies, and corruption. The results indicate that corruption increases risks related to credit, solvency, and distance to default. At the same time, it positively influences bank lending while negatively affecting bank revenues. While corruption at the national level has a relatively smaller effect on lending in developing countries, corruption at the bank level has a major impact on the performance of banks in both developed and developing countries. The study also shows that stronger regulatory frameworks, more bank competition, and market concentration lessen the negative effects of corruption on bank lending and performance.

Several studies use the CPI as a proxy for measuring corruption. Mohamad and Jenkins (2021) investigated the impact of country-wide corruption on banks'

credit risk in 16 countries in the Middle East and North Africa (MENA) over the period 2011–2019. To measure the corruption variable, they used the CPI, compiled by Transparency International. Using a fixed effects estimation technique, the results showed a significantly positive association between corruption and NPL. Similarly, Thanh, Huy, Pham Hong, & Bui Nguyen Quoc (2025) investigated the effect of corruption on credit risk of commercial banks in Southeast Asian countries using machine learning models. Their analysis also relied on the CPI as the measure of corruption.

The results showed that corruption increases the level of NPLs, weakens the lending capacity of banks, and negatively affects the financial stability of banks. Goel and Hasan (2011) used a large sample of over 100 countries with annual data of all the variables. They used the OLS method to analyze the impact of several indicators (such as CPI, Membership of European Monetary Union central bank autonomy, etc.) on NPLs. The results showed that there is an influence of corruption on increasing the level of NPL. Murta and Gama (2023) use CPI, individual banking and macroeconomic data from the World Bank to test a sample of 640 banks in 42 European countries. They used OLS covering the years 2013-2019. The result showed that corruption positively affects the NPL ratio.

While some of the above studies examined the association between corruption and NPLs, existing studies have not examined the effect of corruption on non-performing loans in CEE countries. This study is the first empirical study to use aggregate country-level data to examine the effect of corruption on NPLs in the Balkan countries (or CEE countries) which are known to have high levels of corruption.

3. Methodology

3.1. Data

We used a panel dataset consisting of 17 CEE countries. The countries include Albania, Bosnia and Herzegovina, Kosovo, Montenegro, the Republic of North Macedonia, Serbia, Bulgaria, Croatia, the Czech Republic, Hungary, Estonia, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. The sample period is from 2004 to 2021. The Hausman test identifies that the fixed effects specification is appropriate for the data, which enables adjusting for unobservable heterogenous differences among the CEE countries. Table 1 lists the variables, expected signs, and their sources. The following table presents the variables and their description.

Table 1: Variables and their definition

Variables	Definition	Expected sign	Source
Dependent variable			
Non-performing loans ratio (NPL)	Bank non-performing loans to total gross loans (%)		World Bank Database (WBD)
Independent variables			
GDP growth rate (GDPgr)	The annual percentage growth rate of GDP	–	WBD
Inflation rate (INF)	Inflation, consumer price index (annual %)	(+)/(–)	WBD
Unemployment rate (UNEM)	Total unemployment rate (% of the total labour force)	+	WBD
Loans to deposit ratio (LTD)	Total loans to deposits ratio of the banking sector	+	WBD
Credit growth (CRgr)	Rate of growth of domestic credit to the economy	+	WBD
Crisis (GFC)	Dummy variable equal to 1 for the global financial crisis period 2008 – 2009, and 0 otherwise	+	
Rule of Law (RL)	Rule of law index	+	WB, Worldwide Governance Indicators (WGI)
Voice and accountability (VA)	Voice and accountability index	-	WB
CPI	Corruption Perceptions Index	+	Transparency International

Source: Authors

3.2. Estimation method

The empirical model used in this study to investigate the effect of corruption on NPLs builds upon the approaches adopted by Bayar (2019), Ben Ali et al. (2020), Chen et al. (2015), and Çifter (2015). The baseline specification (Eq. 1) incorporates a set of macroeconomic variables—including GDP growth, inflation rate, and unemployment—alongside bank-specific indicators such as the loan-to-deposit ratio and credit growth. It also includes governance-related variables, specifically the rule of law and the voice and accountability index, as well as a dummy variable to capture the impact of the Global Financial Crisis (GFC), as detailed in Table 1.

$$NPL_{i,t} = \beta_0 + \beta_1 GDPgr_{i,t} + \beta_2 INF_{i,t} + \beta_3 UNEM_{i,t} + \beta_4 LTD_{i,t} + \beta_5 CRgr_{i,t} + \\ + \beta_6 RL_{i,t} + \beta_7 VA_{i,t} + \beta_8 GFC_{i,t} + \beta_9 CPI_{i,t} + \varepsilon_i \quad \text{(eq.1)}$$

Data analysis and parameter estimation were conducted using the STATA statistical software. Panel data regression estimations were performed using the xtreg command in *Stata* (StataCorp, 2023).

3.3. Variables justification and hypothesis

Corruption Perception Index (CPI) – The Corruption Perception Index (CPI) is a widely used measure of corruption, derived from expert evaluations and public opinion surveys. Some studies used the CPI surveys which are sent to a random or representative sample of households or businesses. The most recent CPI ranks 180 countries in 2022, which range from 100 (extremely clean) to 0 (very corrupt). CPI was used in prior studies by Mohamad and Jenkins (2021), Goel and Hasan (2011), Weill (2011), and Adit (2009). Prior NPL studies such as those by Asteriou et al. (2021), Chen et al. (2015) and Murdock et al. (2023) show evidence that corruption can exacerbate NPLs in other country contexts. Therefore, we also expect a positive relationship between corruption and NPLs in CEE countries:

H1: Corruption has a significant positive impact on the NPL ratio in CEE countries

GDP growth – GDP growth is widely used in the NPL literature as a macroeconomic indicator of economic growth and macroeconomic stability (Anastasiou et al., 2019a). According to several studies (Çifter, 2015; Semia, 2019), GDP growth is expected to have a negative relationship with NPLs. The general explanation is that a rise in real GDP, which usually indicates increased economic activity, increases the level of output and income in the economy, increases borrowers' ability to repay their debts and reduces non-performing loans (NPLs). Almost all authors studying the determinants of NPLs use GDP growth as a macroeconomic variable (Klein, 2013; Škarica, 2014; Anastasiou et al., 2019a). For CEE countries, GDP growth had a significant negative relationship with NPLs, as reported by several authors (Jakubík and Reininger, 2013; Klein, 2013; Škarica, 2014; Çifter, 2015; and Semia, 2019). According to earlier studies, we expect a negative relationship between real GDP and NPLs:

H2: GDP growth has a significant negative impact on NPLs in CEE countries.

Inflation – The percentage change in the consumer price index measures the rate of inflation. We predict that inflation should decrease the real value of debt when nominal interest rates remain constant, thereby reducing the burden on

borrowers. This implies a negative relationship between inflation and NPLs. This expectation is corroborated by Szarowska (2018), who finds that inflation can potentially reduce NPLs. On the other hand, rising inflation can increase nominal interest rates and make it more difficult for borrowers to repay their debts. This can lead to loan defaults as their real income declines in times of high inflation (Baselga-Pascual, Trujillo-Poncem, and Cardone-Riportella, 2015; Ghosh, 2015; Nkusu, 2011). This suggests a positive relationship between inflation and NPLs. This expectation is corroborated by Škarica (2014) who find a positive relationship between inflation and NPL.

H3: Inflation has a significant positive or negative impact on the NPL ratio in CEE countries.

Unemployment – Rising unemployment rates lead to loss of household income, making it difficult for borrowers to meet their debt obligations and leading to rising NPLs. Szarowska (2018) points out that there is a positive and significant relationship between unemployment and NPL, meaning that an increase in the unemployment rate would increase NPLs. Similar results have been found by other authors such as Klein (2013), Makri, Tsagkanos, & Bellas (2014), Škarica (2014), Çifter (2015), and Tatarici, Kubinschi, & Barnea (2020). Therefore, our hypothesis for the relationship between these two variables is:

H4: A positive relationship between the unemployment variable and non-performing loans in CEE countries.

Loan-to-Deposit Ratio – One of the variables that has been tested in many studies is the loan-to-deposit ratio, which is a measure of bank liquidity. It is the amount of money that banks give out as loans to borrowers from its accumulated deposits (Dimitrios, Helen, & Mike, 2016). Some studies have shown a negative (Çifter, 2015) and others a positive (Dimitrios et al., 2016; Tatarici et al., 2020) impact on NPLs.

H5: Loan to deposit has a significant positive or negative impact on NPLs in CEE countries.

Credit growth – Banks often engage in fierce competition to gain market share in credit markets. To gain market share, banks may loosen loan screening standards and lend to borrowers with lower credit quality. According to Kraft (2007) a rapid increase in credit is an important determinant of banking crises. If there are many loans, the likelihood is greater that they will lead to problem loans (Škarica, 2014). But there are cases when the relationship between credit growth and bank NPL is unclear (Dimitrios et al., 2016; Anastasiou et al., 2019a).

H6: Credit growth has a negative/positive impact on NPLs in CEE countries.

The rule of law index – The rule of law index refers to the effectiveness of the legal systems and the ability of courts to enforce laws. NPLs are expected to be lower in countries that have a strong rule of law. Studies have found a statistically significant negative relationship between the rule of law and NPL levels, indicating that stronger legal systems improve credit quality and facilitate more efficient loan recovery processes. This is because banks will be able to use the courts to compel borrowers to repay loans owed to them, thereby reducing non-performing loans in the banking system (Ozili, 2024). This suggests a negative effect of rule of law on NPLs.

H7: Strong rule of law has a negative impact on NPLs in CEE countries.

The voice and accountability – The voice and accountability refer to perception of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. It captures the ability of citizens to hold their governments and institutions to account. Countries that have a high level of voice and accountability index often have a low NPL ratio because policymakers know that they are accountable to the people, and the people will demand such accountability if a high-NPL-induced banking crisis occurs. Therefore, bank regulators will strive to increase transparency and enhance the regulation of the banking sector to avoid a high-NPL-induced banking crisis. This suggests a negative effect of voice and accountability on NPLs.

H8: Strong voice and accountability have a negative impact on NPLs in CEE countries.

Crisis dummy variable – The crisis dummy variable takes into account the effect of banking crisis on NPL. Generally, NPLs tend to be higher during a financial crisis and lower in the absence of a financial crisis. For instance, during the 2008 global financial crisis, many banks experienced a significant increase in NPLs due to widespread economic instability. This suggests a positive relationship between the crisis dummy variable and NPL. The crisis dummy variable takes the value of one for the years where there was a financial crisis and zero otherwise.

H9: Financial crisis has a positive impact on NPLs in CEE countries.

4. Empirical Results and Discussion

The panel fixed-effects regression results across all five specifications (Table 2) reveal robust insights into the determinants of NPLs. A different model specification, with variations in the variables included, is presented in each column in Table 2. For example, while later models add governance variables (e.g., voice and accountability) and banking-specific variables (e.g., loan-to-deposit ratio), Model 1 focuses on macroeconomic factors (e.g., GDP and inflation). The empirical analysis also presents the results of different variables that interact to affect NPLs. Though they complicate the analysis, interaction terms like CPI-DUMMYCRISES and CPI-LTD offer important insights into how inflation influences the connection between financial crises and lending practices on non-performing loans. Higher inflation, for instance, may lessen the beneficial effect of a high loan-to-deposit ratio on NPLs by lowering the real value of debt, according to the negative coefficient for CPI*LTD. The analysis can provide more complex conclusions regarding the variables that contribute to NPLs and their consequences for the stability of banks by thoroughly examining these findings.

Table 2: Estimation results for the effect of corruption on NPLs in CEE region

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
GDP	0.0900	0.0834	0.0811	0.0895	0.0925
	(0.0916)	(0.0924)	(0.0900)	(0.0915)	(0.0914)
INF	-0.0830	-0.0841	-0.134	-0.0687	-0.0562
	(0.150)	(0.151)	(0.149)	(0.151)	(0.151)
UNEMP	0.919***	0.919***	0.974***	0.936***	0.930***
	(0.105)	(0.105)	(0.105)	(0.106)	(0.105)
VA	-0.0921***	-0.0901***	-0.0903***	-0.0659	-0.0821**
	(0.0322)	(0.0325)	(0.0317)	(0.0402)	(0.0330)
CPI_index	0.0221***	0.0223***	0.141***	0.0263***	0.0244***
	(0.00370)	(0.00372)	(0.0388)	(0.00533)	(0.00407)
Loan to deposit	0.0736***	0.0731***	0.127***	0.0703***	0.0661***
	(0.0198)	(0.0198)	(0.0261)	(0.0200)	(0.0205)
Rule of Law	0.0126	0.0111	0.00431	0.00574	0.0210
	(0.0306)	(0.0308)	(0.0302)	(0.0312)	(0.0312)
Credit Growth	-0.0168**	-0.0166**	-0.0174**	-0.0161*	-0.0157*
	(0.00833)	(0.00835)	(0.00819)	(0.00836)	(0.00836)
Dummy_Crise	-0.00596	0.0331	-0.00877	-0.00557	-0.00509
	(0.0123)	(0.0690)	(0.0121)	(0.0123)	(0.0123)

CPI*DUMMYCRISES		-0.0275			
		(0.0478)			
CPI*LTD			-0.0265***		
			(0.00863)		
CPI*VA				-0.00676	
				(0.00618)	
CPI*RL					-0.00666
					(0.00487)
Constant	-0.312***	-0.312***	-0.555***	-0.317***	-0.293***
	(0.0798)	(0.0799)	(0.111)	(0.0799)	(0.0809)
Observations	262	262	262	262	262
R-squared	0.359	0.360	0.384	0.363	0.364
Number of index	16	16	16	16	16
F-Stat	14.77	13.29	14.70	13.42	
Prob > F	0.0000	0.0000	0.0000	0.0000	
Degree of Freedom	237				
Country Fixed effect	YES	YES	YES	YES	YES

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Authors

Unemployment (UNEMP) emerges as the strongest driver, with a highly significant positive coefficient, suggesting that rising joblessness consistently exacerbates NPLs in CEE countries. Conversely, the CPI exerts a significant positive influence on NPLs, underscoring the role of weak governance in exacerbating credit risk in banks. Strikingly, the loan-to-deposit ratio (LTD) shows a positive and significant effect, aligning with theories that aggressive lending heightens financial vulnerability. Notably, the interaction term CPI*LTD is negative and highly significant, indicating that high corruption and liquidity are jointly associated with fewer NPLs. Credit growth, however, exhibits a counterintuitive negative relationship, hinting at potential prudent credit risk management which results in fewer NPLs. The model fit remains stable ($R^2 \approx 0.36$), with F-statistics confirming joint significance ($p < 0.001$).

As evidenced by our results, GDP growth and inflation are found to be insignificant. In contrast, the third macroeconomic variable, unemployment, has a significant positive effect on NPLs across all econometric models. This finding aligns with the conclusion of other researchers, including Klein (2013), Makri et al. (2014), Škarica (2014), Çifter (2015), Tatarici et al. (2020), and Shala, Toçi, &

Mustafa (2022). These results suggest that an increase in unemployment leads to a rise in non-performing loans in Central and Eastern European (CEE) countries.

As supported by the literature, CPI is significant and positively associated with non-performing loans. Similar findings have been reported by Toader et al. (2018), Park (2012), and Bougatef (2016), who demonstrated that higher levels of corruption and weak control mechanisms contribute to an increase in non-performing loans in other contexts.

Voice and accountability are indicators that measure the extent to which a country's citizens can participate in choosing their government, as well as freedom of expression, freedom of association, and free media. The variable is significant and negative, meaning that if this variable increases, NPL also decreases, indicating that a higher level of citizen participation and government accountability is associated with lower levels of NPLs. Conversely, weak governance and a lack of accountability can lead to financial instability in the financial sector. Similar results were also found by other authors (such as Boudriga, Taktak, & Jellouli, 2010; Breuer, 2006).

The loan-to-deposit ratio is used as a proxy for liquidity. The results show a positive and significant variable. An increasing loan-to-deposit ratio reveals a risk preference and is expected to lead to higher NPLs. The coefficient of credit growth appears positive and statistically significant. In line with Klein (2013), and Kjosevski and Petkovski (2017), our results suggest that faster credit growth leads to a higher NPL ratio. During periods of more rapid credit growth, banks may ease lending standards, thus leading to deterioration in the quality of the loan portfolio.

The legal and institutional environments play a key role in reducing NPLs. This can be achieved by ensuring better enforcement of regulations, a sound regulatory environment, and accountability (Lee et al., 2020). Boudriga et al. (2010) argue that good regulatory quality plays a significant role in reducing NPL. Our variable rule of law is positive but not significant. The same results show the variable of a dummy crisis.

In Table 2, we have also presented the interaction with CPI with other variables, to determine if CPI has a joint impact on the NPL of the CEE banking industry. The results show that all the interaction terms are statistically insignificant. The interaction term CPI*LTD with a coefficient of -0.0265 indicates a statistically significant and negative moderating effect between the CPI and the LTD. This suggests that the impact of CPI on the dependent variable weakens as LTD in-

creases, and vice versa. For example, in banks with higher liquidity risk (elevated LTD), stronger corruption controls (higher CPI) have a diminished effect on NPLs, while within institutional frameworks with stronger corruption controls, the negative effects of aggressive lending (higher LTD) are less pronounced. This interaction highlights the nuanced relationship between corruption levels and liquidity risk, emphasizing that their combined influence on the outcome is more complex than their individual effects.

5. Conclusions and recommendations

The main objective of the article is to examine the impact of corruption (CPI) on NPLs while controlling for other macroeconomic, governance and banking factors affecting NPLs. Our study confirms the literature's findings on the detrimental impact of corruption on bank stability.

The empirical analysis provides evidence on the primary determinants of NPLs, offering critical insights for financial institutions and policymakers. Unemployment emerges as the most significant factor, consistently exacerbating NPLs across all specifications. The CPI also exacerbate NPLs. This signifies that policymakers should strive to reduce the level of perceived corruption in CEE countries as this is pivotal in decreasing the level of NPLs. The loan-to-deposit ratio (LDR) underscores the dangers of aggressive lending practices. The interaction between CPI and LDR (-0.0265) highlights the moderating effect of stronger corruption controls on liquidity risk, emphasizing the importance of sound governance in maintaining financial stability.

Surprisingly, credit growth exhibits a negative association with NPLs, suggesting that rapid expansion may lead to more cautious lending practices. These findings, underpinned by a robust model fit ($R^2 \approx 0.36$), offer valuable contributions to the analysis and statistical significance ($p < 0.001$), and they align with existing literature while introducing nuanced interactions that warrant further exploration. This study is significant for banks, regulators, and other financial institutions in CEE countries. The results show that to sustain low levels of NPLs, national supervisors should increase their macroprudential oversight of banks in their respective countries.

The findings of this study also demonstrate that to control the level of NPLs indirectly, supervisors should consider some of the most crucial factors, such as the CPI. Commercial banks in CEE countries should improve their risk management systems by adopting advanced machine learning models to predict credit

risk and identify loans that may cause problems. The implementation of strict anti-corruption policies within financial institutions is also very important. Transparency and compliance with regulations significantly reduce corruption in lending. Also, continuous anti-corruption training for bank employees will bring a positive effect. Moving forward, policymakers should prioritize reducing unemployment, strengthening institutional frameworks, and monitoring liquidity risks to enhance financial stability.

Looking ahead, future research could investigate additional interaction effects and contextual factors to deepen our understanding of these dynamics. Overall, by providing empirical evidence and actionable recommendations for mitigating systemic risks, this study contributes meaningfully to the ongoing discourse on NPLs. At the same time, it is also essential that the CEE countries participate in numerous international projects to advance the cross-border regulatory framework and NPL resolution procedures. From a policy perspective, this study will aid governments, legislators, and monetary authorities in both developed and emerging nations in understanding the importance of various NPL drivers. Finally, further research should include other variables and banks from other regions, such as technological changes and regulatory changes, and the like.

Acknowledgements

Maria Iannario, Albulena Shala, and Claudia Tarantola gratefully acknowledge the support of the Marie Sklodowska-Curie Actions under the European Union's Horizon Europe research and innovation program for the Industrial Doctoral Network on Digital Finance (acronym: DIGITAL, project no. 101119635). Maria Iannario also acknowledges the PRIN 2022 - CUP: E53C24002270006. Albulena Shala also acknowledges the "DataSphere: A Comprehensive Database of Economic, Structural, and Social Indicators in Kosovo"

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