



Drivers of non-performing loans: Evidence from the Western Balkans

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ABSTRACT

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The main aim of this study is to investigate the determinants that impact non-performing loans in the Western Balkans. The methodology used is quantitative, using secondary data obtained from World Bank Indicators for the period 2000–2022. The study employs econometric models used for panel data estimation, such as Pooled OLS, Fixed Effects, Random Effects, and the Hausman Test. The econometric results based on the Fixed Effects model, which was suggested as the appropriate model under the study context, show that an increased level of employment may be associated with a lower level of non-performing loans (NPLs), while domestic savings and higher real interest rates are associated with an increased level of NPLs under the study circumstances. The other macroeconomic variables, such as foreign direct investment, gross fixed capital formation, domestic credit to the private sector by banks, inflation, unemployment, and Gross Domestic Product, do not show statistical significance under the Fixed Effects model. However, due to the limited number of observations, the unbalanced panel, and the inclusion of only three countries in the econometric estimation, the results of this study are interpreted as sample-specific and preliminary rather than generalized, and are based on three Western Balkan countries, including Albania, Bosnia and Herzegovina, and North Macedonia (WB3). This research has implications for policymakers since it provides insightful information that suggests reducing non-performing loans (NPLs) may be achieved through targeted credit controls, improved employment levels, and macroeconomic stability.

Contribution/Originality: This study contributes to the existing literature by identifying the determinants of non-performing loans and estimating their impact on economic growth using panel data for Albania, Bosnia and Herzegovina, and North Macedonia, thereby providing empirical evidence from an underexplored Western Balkan context.

1. INTRODUCTION

After the global financial crises, non-performing loans are widely debated, especially in developing countries, as a key determinant of financial stability and economic prospects. Non-performing loans represent one of the most important problems in the banking sector, but at the same time, they have economic consequences in terms of the possibility of expanding investment lending and financial stability.

Considering the Western Balkan countries, as economies in transition and with financial infrastructure still under development, non-performing loans play a crucial role in maintaining financial stability and economic growth. In general, the global challenges of financial instability and, specifically, non-performing loans are increasingly receiving attention in the broad scientific discourse. The Western Balkan countries are characterized by high levels of non-

performing loans (NPLs), despite their regulatory frameworks and banking supervision. This is a consequence of the complex interaction between institutional quality and macroeconomic factors. On the other hand, credit risk comes as a result of high unemployment rates, poor quality of credit control, weak contracts and their implementation, as well as external factors. Despite numerous studies addressing non-performing loans for various countries, including those of the Western Balkans, the most influential factors regarding non-performing loans have not been fully elaborated. Macroeconomic factors such as gross domestic product, unemployment, and inflation are noted as factors influencing non-performing loans (Basha & Alilaj, 2025; Keco, 2024). Although the Western Balkans have made remarkable progress towards lowering NPLs—from 16.4% in 2013 to less than 5% in 2023, structural vulnerabilities still exist (Vienna Initiative, 2024). According to Basha and Alilaj (2025), political unpredictability, a high exposure to foreign exchange lending, and weak contract enforcement all contribute to the region's elevated credit risk. Comparative panel studies on NPL determinants unique to the Western Balkans are still rare, despite growing interest in the recovery of the banking sector following the crisis. By expanding on the frameworks created in recent studies (International Monetary Fund European Department, 2023; OECD, 2024) and providing a regional empirical model to evaluate important macro-financial drivers, this study seeks to close that gap.

The general practice in most of Western European nations appears to underwrite the standard that, for a credit to be nonperforming, no less than one of two (essential) components must be available: (1) principal or interest 90 days or more late, and (2) presence of fundamental distinct shortcomings of credit or borrower (Barisitz, 2013). A loan becomes non-performing when there are indications that the borrower is unlikely to repay the loan, or if more than 90 days have passed without the borrower paying the agreed instalments. This may happen when an individual loses their job and therefore cannot repay their mortgage as agreed, or when a company experiences financial difficulties (European Central Bank, 2016). From the viewpoint of the CFI Team (2020) a non-performing loan (NPL) is a loan in which the borrower is in default and has not paid the monthly principal and interest repayments for a specified period. Thus, non-performing loans occur when borrowers run out of money to make repayments or get into situations that make it difficult for them to continue making repayments towards the loan. Based on the regulatory definition, the definition of non-performing loans (NPLs) varies across jurisdictions. For example, for countries reporting Financial Soundness Indicators (FSI) to the IMF, the FSI guideline recommends that loans (and other assets) should be classified as NPLs in three cases. One of them is when (1) payments of principal and interest are past due by 90 days or more; the second is when interest payments equal to 90 days' interest or more have been capitalized (reinvested into the principal amount), refinanced, or rolled over (payment delayed by agreement). The third case is when evidence exists to reclassify them as non-performing even in the absence of a 90-day past-due payment, such as when the debtor files for bankruptcy (Ari, Chen, & Ratnovski, 2019).

The majority of Western European nations classify nonperforming loans as having at least one of the following main characteristics: underlying borrower or loan vulnerabilities, and principal or interest that is 90 days or more past due (Barisitz, 2013). Nonperforming loans are those that no longer produce principal or interest and have a detrimental effect on banks' operations (Syed & Tripathi, 2019). Loans that fail to satisfy repayment obligations are referred to as nonperforming loans (NPLs), and they are seen as a barrier to reform and growth in commercial banks (Zhang, Yu, Guan, & Yang, 2014). Bank profitability and the success of the real estate market are impacted by nonperforming loans; a lower percentage of nonperforming loans is correlated with a larger ratio of corporate to individual loans (Wu, Chang, & Selvili, 2003). Another study from Manz (2019) reveals that the interaction of loan- and asset-specific events with macroeconomic and bank-specific factors still lacks a deep understanding and deserves additional empirical research. The relevant research categorized the causes of non-performing loans (NPLs) into three groups: industry, bank-specific, and macroeconomic issues. The majority of factors associated with non-performing loans are macroeconomic in nature (Alnabulsi, Kozarević, & Hakimi, 2023). The determinants of non-performing loans are also investigated for Western Balkan countries; thus, a study by Gabrisch (2014) stated that the binding constraint on credit and investment growth in the case of the Western Balkan countries is the high and still increasing

share of non-performing loans, primarily in the private household sector, due to policy failures. Also, Çitaku, Asllani, Luboteni, and Grima (2020) stated that, in order to resolve non-performing loans, low capital adequacy, and slight credit growth, financial integration is essential in Western Balkan nations and thus will eventually lead to economic progress and EU membership. Changes in non-performing loans are a result of better macroeconomic conditions in the Western Balkans, with varying degrees of impact between regions (Kozarić & Žunić, 2017). In the Western Balkans, macroeconomic variables including GDP growth, government spending, interest rates, and the unemployment rate have a positive effect on non-performing loans (Gashi, Tafa, & Bajrami, 2022). A study by Krasniqi-Pervetica and Ahmeti (2022) finds that the government debt-to-GDP ratio and unemployment positively impact non-performing loans at commercial banks in the Western Balkans, but GDP and inflation have a negative impact.

The main aim of this study is to analyze the determinants of non-performing loans in the Western Balkans. Taking into consideration that nonperforming loans are an indicator that shows financial-sector stability and, on the other hand, impacts the general economic system, the determinants impacting NPLs are of great interest. In this regard, the study goes further with the analysis in order to interpret the factors that impact NPLs and also to measure their impact on nonperforming loans.

1.1. Objectives

1. To investigate the impact of macroeconomic determinants on nonperforming loans in the cases of Albania, Bosnia and Herzegovina, and North Macedonia.
2. To interpret the effect of economic conditions on nonperforming loans in Albania, Bosnia and Herzegovina, and North Macedonia.

1.2. Research Questions

1. Which factors determine nonperforming loans?
2. What is the specific impact of the factors on nonperforming loans in Albania, Bosnia and Herzegovina, and North Macedonia?

1.3. Research Hypothesis

H₁: Improving macroeconomic conditions, represented by foreign direct investment, gross domestic savings, gross fixed capital formation, GDP growth, and employment, are expected to reduce non-performing loans in the WB3 countries.

H₂: Worsening economic conditions and increased financial exposure, represented by higher unemployment, expanded bank credit to the private sector, higher inflation, and higher real interest rates, are expected to be positively associated with non-performing loans in the WB3 countries.

This subject is especially significant when considering the impact non-performing loans have on financial and economic stability. In light of the fact that numerous international authors have examined the factors influencing non-performing loans, this study stands out from the others in a number of ways. This study addresses macroeconomic factors and broadens the scope of the research; in addition, this study considers the time period 2000 to 2022; and it is specifically focused on the Western Balkan countries, including Albania, Bosnia and Herzegovina, and North Macedonia. In addition, this study presents a comparison of the trend of non-performing loans in the countries of the Western Balkans and evaluates, in the econometric models of the panel, the specific weight of the impact of each factor included in the analysis.

2. LITERATURE REVIEW

This section presents a review of empirical research on nonperforming loans in various countries around the world, along with several proxies for measurement. Additionally, this study goes deeper by presenting a review of

empirical literature on nonperforming loans in the context of Western Balkan nations. The examination of the literature reveals many factors that might influence non-performing loans. Non-performing loans have different perspectives on the stability of the banking industry and the advancement of the economy.

Due to the significant impact non-performing loans have on overall financial stability, several studies have examined the factors that contribute to non-performing loan behavior. Economic theory generally divides the factors influencing the performance of non-performing loans into two main categories: financial factors influencing non-performing loan performance that are associated with bank self-management, or internally referred to as such; and external factors influencing non-performing loan performance. In the context of external factors, many studies refer to them as macro factors or macroeconomic factors. In terms of macroeconomic factors as determinants of non-performing loans, a wide and varied list is considered, which was taken as a basis by different authors for different countries of the region and the world. Among the most prominent macroeconomic factors that have been analyzed in the assessment of their impact on non-performing loans are GDP, GDP per capita, government expenditures, inflation, the consumer price index, unemployment, corruption, and institutional freedom. Inekwe (2013) investigated the relationship between Nigeria's real GDP and non-performing loans from 1995 to 2009. Analysis of time series based on the Pearson product-moment correlation coefficient reveals a significant and positive relationship between real GDP and non-performing loans in Nigeria's banking sector. The study recommends that governments implement policies that create an enabling environment for the desired improvement in real GDP and, through their regulators, ensure that banks and other financial institutions strictly adhere to due process and good lending principles.

Muthami (2016) analyzes the relationship between economic growth and nonperforming loans in the case of Kenyan commercial banks for the period 1980Q1–2015Q4. The study adopts a regression econometric model with gross nonperforming loans as the dependent variable and the real economic growth rate as the independent variable. The study also uses macroeconomic variables such as the budget deficit, domestic credit, exchange rate, inflation rate, average savings rate, and average lending rates. The Ordinary Least Squares (OLS) results show that economic growth and nonperforming loans are negatively correlated; thus, a one percent increase in the economic growth rate reduces nonperforming loans by 0.2238 percent, holding other factors constant. Khalaf and Masih (2018) examine the relationship between bank nonperforming loans and GDP. The study employs nonlinear ARDL and ARDL in the case of Malaysia. According to both ARDL and nonlinear ARDL, the results generally show that NPLs and GDP are cointegrated. The relationship between nonperforming loans and GDP was also analyzed by Kuzucu and Kuzucu (2019) in a case study of emerging and developed countries using the periods before and after the global financial crisis. The study used panel data techniques and found that real GDP was the most important factor affecting NPLs in both emerging and developed countries and also seemed to be important before and after the global financial crisis. The study also concluded that NPLs are impacted by the exchange rate and foreign direct investment. (Beck, Jakubik, & Piliou, 2015) estimated the key determinants of nonperforming loans using panel data from a sample of 75 countries and found that real GDP growth significantly impacts NPLs. The study also went further with the estimations and found that the exchange rate, share prices, and lending interest rate are also of great interest.

Kjosevski and Petkovski (2017) measure the impact of macroeconomic factors on nonperforming loans in the case of the Baltic states using a panel data approach and find that GDP growth, inflation, and domestic credit to the private sector are of great importance to NPLs. On the other hand, (Christodoulou-Volos & Hadjixenophontos, 2017) find that public debt as a percentage of GDP is the most significant factor affecting non-performing loans in the Cypriot banking system. There is further evidence in the literature review for factors determining non-performing loans; thus, a study by Avetisyan (2018) finds that GDP growth, interest rates, new business, FDI, ATMs, and geographical distribution of branches significantly influence non-performing loan ratios in EU countries. Khemraj and Pasha (2016) find that in the Guyanese banking industry, non-performing loans rise in response to higher interest rates and looser lending criteria; however, NPLs are not greatly impacted by bank size. Instead, they are reduced in response to GDP growth.

Messai and Jouini (2013) examined the factors that contributed to a sample of 85 banks' non-performing loans during the years 2004–2008 in a case study of Greece, Spain, and Italy. These nations had financial difficulties following the 2008 subprime crisis. Macroeconomic and bank-specific factors are the variables that are used. In terms of particular factors chosen for the return on assets, the change in loans, and the ratio of loan loss reserves to total loans, the macroeconomic variables include the rate of growth of the GDP, the unemployment rate, and the real interest rate. Following the use of the panel data approach, the study concluded that problem loans varied favorably with the loan-to-value ratio and the unemployment rate and adversely with the GDP growth rate and bank asset profitability. Using data from 2005 to 2017, Khan, Siddique, and Sarwar (2020) examined the factors that contribute to nonperforming loans in developing nations, focusing on Pakistan as their research case. Using a sample of Pakistani commercial banks, the study used the econometric model's fixed-effect and random-effect approaches. It used these variables as a stand-in for banking characteristics like profitability, operating efficiency, capital sufficiency, and income diversification. The study comes to the conclusion that NPLs are negatively correlated with operating efficiency and profitability metrics, but positively correlated with capital sufficiency and income diversification. In the case of North Macedonia, Golitsis, Khudoykulov, and Palanov (2022) examine the factors that contribute to non-performing loans. The ARDL econometric model is used in the study, which makes use of quarterly data from the years 2005 to the second quarter of 2022. The analysis concludes that, while gross loans do not appear to have a major influence, long-term NPLs are impacted by GDP, unemployment, and interest rates. The ARDL econometric approach was also used by Foglia (2022) in order to examine how macroeconomic factors affected the amount of non-performing loans (NPLs) in the Italian banking sector between Q3 of 2008 and Q4 of 2020. The study used the Autoregressive Distributed Lag (ARDL) cointegration model to examine the impact of macroeconomic factors on NPLs in both the short and long term. The empirical results obtained from the study above demonstrate the detrimental effects of public debt and GDP on non-performing loans. However, the study also shows that impaired loans are positively impacted by domestic credit and the unemployment rate. Ćurak, Pepur, and Poposki (2013) explored the determinants of non-performing loans in the case of Southeastern European banking systems. The study used a sample of 69 banks in 10 countries during the period from 2003 to 2010. The econometric model used in the study is the Generalized Method of Moments estimator for dynamic panel models. The study concludes that lower economic growth, higher inflation, and higher interest rates are associated with higher non-performing loans, and that credit risk is also affected by bank-specific variables such as bank size, performance (ROA), and solvency.

Another study from Alnabulsi et al. (2023) investigates the determinants of non-performing loans in the Middle East and North Africa. The study sheds light on the role of bank-specific and macroeconomic factors in specific time periods such as the global financial crisis, as well as the COVID-19 pandemic. The study includes 74 banks belonging to 11 MENA countries over the period 2005–2020 and uses the econometric model, the two-stage system generalized method of moments estimator. Based on the empirical results, the study indicates that the level of non-performing loans is more sensitive to bank-specific factors than macroeconomic factors. The macroeconomic environment and institutional quality significantly affect the level of NPLs. On the other hand, the study concludes that there is no significant effect regarding the impact of the COVID-19 pandemic. Conversely, Ferreira (2022) uses data from the World Bank to examine a panel of 80 countries for the years 1999–2019 and uses the generalized method of moments model to explain the trend of the bank non-performing loans-to-total-loans ratio. The analysis comes to the conclusion that, for all panels examined, economic development is always the best method to guarantee a decline in the percentage of non-performing loans to total loans, which lowers the risk of bank losses and a possible financial catastrophe. Also, Radivojevic and Jovovic (2017) used a sample of 25 emerging nations to calculate the NPL ratio's drivers between 2000 and 2011, using both static and dynamic models in the panel data technique. The study shows that the rate of non-performing loans (NPLs) may be primarily described by important macroeconomic variables like GDP and the inflation rate, as well as bank-specific variables like ROA, CAP, and the lagged NPL rate. To assess the factors that contribute to non-performing loans (NPLs) in the Central, Eastern, and Southeastern European (CESEE)

nations, Jakubík and Reiningger (2014) construct a macroeconomic model. Panel data from Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, Russia, Slovakia, and Ukraine are analyzed in this study. Based on empirical analysis, the study verifies that the primary factor adversely connected with the development of non-performing loans (NPLs) is economic growth.

The determinants of non-performing loans are also analyzed by Morakinyo and Sibanda (2016). This study focuses the analysis on the MINT (Mexico, Indonesia, Nigeria, and Turkey) economies. In order to estimate the determinants of non-performing loans in the country cases, static panel data and dynamic panel models were analyzed. The study finds out that, in the four economies, the capital adequacy ratio, liquidity ratio, total bank credit, and return on assets are significant bank-specific determinants of non-performing loans; thus, the return on assets, liquidity ratio, and capital adequacy ratio show a negative relationship with non-performing loans, while the nominal exchange rate, money supply growth rate, total bank credit, and lending rate show positive and very significant relationships with non-performing loans. The study also finds that corruption, an institutional variable, shows a very strong positive relationship with non-performing loans. The factors that contribute to non-performing loans in the banking system of the euro area are examined by Dimitrios, Helen, and Mike (2016) during the period from the first quarter of 1990 to the second quarter of 2015. The GMM econometric model and quarterly bank data from the eurozone are used in the study. The study comes to the conclusion that nonperforming loans are significantly impacted by macroeconomic factors like growth and unemployment. In addition, bank-specific factors like risk preferences and management abilities are known to have an impact on future NPLs.

Louzis, Vouldis, and Metaxas (2012) have used dynamic panel data methods to estimate the determinants of non-performing loans (NPLs) in the Greek banking sector, separately for each loan category (consumer loans, business loans, and mortgages). The study adapted the dynamic panel data approach in order to account for the time persistence in the NPL structure using the balanced data set consisting of supervisory data for the Greek banks for the period from the first quarter of 2000 until the third quarter of 2009. The study concludes that macroeconomic variables, specifically the real GDP growth rate, the unemployment rate, the lending rates, and public debt, have a strong impact on the level of NPLs. On the other hand, Wood and Skinner (2018) investigate the bank factors and macroeconomic factors of non-performing loans of commercial banks in Barbados over the period 1991–2015. The study analyses the factors of non-performing loans in commercial banks in the case study of Barbados using the multiple regression model. The multiple regression includes several macroeconomic and bank-specific variables, such as GDP growth, inflation rate, unemployment rate, and interest rate, while the bank-specific variables used in the model were ROE, ROA, capital adequacy ratio, and loan-to-deposit ratio. Based on the empirical results, the study indicates that the bank-specific factors: return on equity, return on assets, capital adequacy ratio, and loan-to-deposit ratio are significant determinants of non-performing loans, while the macroeconomic variables exerting significant influence are GDP growth, unemployment, and interest rate.

Khemraj and Pasha (2009) investigate the determinants of non-performing loans in the Guyanese banking sector using a panel dataset and a fixed-effects econometric model, which is generally used when working with panel data. The study finds that the real effective exchange rate has a positive impact on non-performing loans. Based on the empirical results, the study concludes that GDP growth is inversely related to non-performing loans, suggesting that an improvement in the real economy translates into lower non-performing loans. Another significant finding of the study was that, in contrast to previous research, this study does not support the idea that larger banks are better at screening loan applicants than their smaller counterparts. Banks that charge comparatively higher interest rates and lend excessively are more likely to experience higher levels of non-performing loans. Similarly, Ekanayake (2018) analyzed the determinants of non-performing loans in Sri Lanka for the period 2004–2013. The study used panel data methodology to measure the effects of bank-specific and macroeconomic factors on non-performing loans. The study used the panel unit root test to test the stationarity of the variables and also the Hausman test and Wald coefficient restriction test in order to choose the model out of pooled, random, and fixed effects. The study concludes that return

on assets, as a proxy for bank efficiency, has a negative impact, while non-interest income, as a variable for income diversity, is positively correlated with non-performing loans; on the other hand, real gross domestic product and lending rates were highly significant in non-performing loans. Otherwise, a study by Ouhibi and Hammami (2015) analyzes the determinants of non-performing loans in the banking system in a sample of six countries of the Southern Mediterranean, such as Tunisia, Morocco, Egypt, Lebanon, Jordan, and Turkey, for the period 2000–2012. The study concludes that non-performing loans depend negatively on the nominal exchange rate, the consumer price index, and gross capital formation.

In order to examine the joint behavior of sovereign ratings and their macroeconomic/financial determinants (i.e., GDP growth, uncertainty, government debt-to-GDP ratio, investment-to-GDP ratio, and the fiscal balance-to-GDP ratio), Boumparis, Milas, and Panagiotidis (2019) used a multivariate Panel Vector Autoregressive (PVAR) paradigm. The study highlights another pathway of interconnection between sovereign and banking credit risk by demonstrating a reciprocal link between non-performing loans (NPLs) and sovereign ratings. Generalized impulse response functions (GIRFs) show the impact of non-performing loans (NPLs) on sovereign rating decisions in addition to the other economic and financial factors. NPLs are impacted by sovereign rating decisions at the same time as every other variable. Hajja (2022) examines the relationship between bank capital and the management of non-performing loans (NPLs) in Malaysian household debt after controlling for the macroeconomic environment. According to the study, capital (past and future) is a concave function of non-performing loans (NPLs). This means that when capital is added, NPLs will rise initially until they reach a certain point (due to the moral hazard effect). At that point, additional capital additions will successfully reduce NPLs (due to the disciplinary or regulatory effect). The study used the generalized method of moments (GMM) on a dynamic panel-data set of 19 commercial banks and stress testing of NPLs using vector autoregression (VAR) on aggregated monthly time series of the banking system. Additionally, the study concludes that while higher inflation is linked to fewer NPLs, higher levels of GDP growth and lending interest rates are related to more NPLs. Higher money supply growth, or monetary expansion, causes bank non-performing loans (NPLs) to increase, whereas bank competition and increased stock market liquidity cause NPLs to decrease.

Non-performing loans can be impacted by a wide range of factors, including macroeconomic and financial ones. Thus, the literature review indicates that some factors, especially in developing countries, could have an effect on non-performing loans. Using data from 2000 to 2016, Syed and Tripathi (2019) investigated the factors that contributed to non-performing loans in the BRICS countries. The fully modified ordinary least squares model (FMOLS) and cointegration analysis were utilized to estimate dynamic panel data. Robustness tests and both fixed- and random-effects ordinary least squares techniques were incorporated into the model. The results showed a negative correlation between non-performing loans and a country's growth and financial soundness, but a positive correlation between non-performing loans and unemployment. There were also inverse links between household savings rates and the performance of non-performing loans, and negative associations between the inflation rate and the performance of default loans. Examining the drivers of non-performing loans, a study by Radivojevic and Jovovic (2017) examined the variables influencing non-performing loans in the case of 25 developing nations. The panel data, which covered the years 2000 through 2011, was used. The study concludes that some particular bank parameters, such as ROA and CAP, as well as important macroeconomic factors like GDP and the inflation rate, might have an influence on non-performing loans (NPLs).

A study conducted by Petkovski, Kjosevski, and Jovanovski (2021) examined the elements that lead to non-performing loans (NPLs) at commercial banks located in Poland. They examined the macroeconomic and bank-specific variables that led to non-performing loans (NPLs) for a panel of eighteen Polish banks using annual data spanning from 2005 to 2018. The models with fixed effects, random effects, difference Generalized Method of Moments, and system Generalized Method of Moments are the four distinct estimation approaches that the authors utilized. The analyses emphasize the features peculiar to each bank, such as rises in gross loans and return on equity,

which have an impact on the number of non-performing loans (NPLs). The most important macroeconomic factors are GDP growth, unemployment, domestic credit to the private sector, and public

Koju, Abbas, and Wang (2018) discover that the amount of NPLs varies with the income level of the nation. The study found that inflation has a major effect on NPLs using the GMM approach. The overall estimated findings show that a number of significant macroeconomic parameters, such as the official currency rate, inflation rate, unemployment rate, gross domestic product per capita, and remittances received, have an impact on non-performing loans (NPLs) in the Asian banking system. Depending on the various wealth levels of the countries, these correlations vary.

For the years 2008–2015, the loan portfolios and non-performing loans (NPLs) of the Western Balkan nations, Albania, Bosnia and Herzegovina, Kosovo, Macedonia, Montenegro, and Serbia, are analyzed and compared by (Tmava, Avdullahi, & Sadikaj, 2018). A few other macroeconomic indicators and industry characteristics are also compared in the research. These include GDP, banking sector assets, loan portfolio, asset and credit participation in GDP, deposit-credit ratio, and the NPL report on total loans. According to the study's findings, Kosovo has the lowest non-performing loan (NPL) rate, while Serbia and Albania have the highest rates, followed by Macedonia, Montenegro, and Bosnia and Herzegovina.

Based on the existing literature, macroeconomic factors, including economic growth, inflation, unemployment, interest rates, and other explanatory variables, remain key determinants of non-performing loans (NPLs). However, the results of studies in most cases vary across countries and regions, while evidence for the Western Balkans remains limited. This study contributes to the literature by providing a panel analysis for the Western Balkan countries, including Albania, Bosnia and Herzegovina, and North Macedonia, during the period 2000–2022, and assesses the impact of a specific set of macroeconomic factors on NPLs. In this way, this study expands the empirical evidence for emerging economies and provides findings that can support policymakers and financial authorities in maintaining banking stability.

3. RESEARCH METHODOLOGY

This study examines the macroeconomic factors that influence non-performing loans using a quantitative research design based on panel data estimation. This study is based on panel data for Western Balkan countries, including Albania, Bosnia and Herzegovina, and North Macedonia, and covers the period 2000–2022, obtained from World Bank indicators. The common models during the analysis of panel data are Pooled OLS, Fixed Effects, and Random Effects, and the Hausman test helps select between the random- or fixed-effects estimation model.

Non-performing loans are an important factor in financial and economic stability; for this reason, identifying the factors that affect non-performing loans in developing countries, including those in the Western Balkans, is of great importance. The literature review on non-performing loans helped further build the econometric models and select the variables that may impact non-performing loans in this study context.

3.1. Econometric Models for Panel Data

The econometric models that have been modified, adapted, and used in this study are panel-data econometric models, specifically pooled OLS, fixed-effects, and random-effects models. In order to select the most appropriate model for interpretation, hypothesis testing, and discussion of the findings, the Hausman test was used.

The econometric models used in this study are in line with Ekanayake (2018), which employed panel data methodology to investigate the impact of macroeconomic and bank-specific factors on NPLs. To choose the best model among pooled, random, and fixed effects, the Hausman test and Wald coefficient restriction test were employed. Moreover, to address the issue of heteroscedasticity, Anita, Tasnova, and Nawar (2022) employed the OLS model, fixed-effect, and random-effect estimates, as well as robust fixed-effect estimates, to investigate the impact of particular macroeconomic determinants of non-performing loans (NPLs) for a panel of eight South Asian Association

for Regional Cooperation countries (Afghanistan, Bangladesh, Bhutan, India, Nepal, Maldives, Pakistan, and Sri Lanka). Also, Anita et al. (2022) examine the factors that lead to non-performing loans for a group of EEC nations using a panel data approach, specifically the fixed-effect and random-effect econometric models.

3.2. Research Design

The first OLS equation specifies the model as follows:

$$\gamma_{it} = \beta_0 + \beta_1 X_{it} + e_{it} \quad (1)$$

Where γ represents the dependent variable, i represents the countries that will be studied, and t represents the time period under consideration. β_0, β_1 are the parameters, and X presents the independent variables, or otherwise, the number of factors influencing the dependent variable γ .

The following equation presents the Hausman-Taylor estimation.

$$\gamma_{it} = x_{it} \beta + e_{it} \quad (2)$$

Fixed and random effects equation.

$$\gamma_{it} = x_{1i} \beta_1 + x_{2i} \beta_2 + Z_{1i} \lambda_1 + Z_{2i} \lambda_2 + c_i + \mu_{it} \quad (3)$$

The variables in the econometric model of the panel are divided into two categories: dependent variables and independent variables. In the study model, the dependent variable is defined as NPLs, while the independent variables in the model include the following variables.

1. FDI - Foreign direct investment, net inflows (% of GDP).
2. GDS- Gross domestic savings (% of GDP).
3. GFC - Gross fixed capital formation (annual % growth).
4. GDP - GDP growth (annual %).
5. EMPL-Employment-to-population ratio, 15+, male (%) (modeled ILO estimate).
6. UEMPL - Unemployment, total (% of total labor force) (modeled ILO estimate).
7. DCPS -Domestic credit to the private sector by banks (% of GDP).
8. INFL - Inflation, consumer prices (annual percentage).
9. INTR - Real interest rate (%).

The econometric models are estimated using STATA software and presented in the following results section.

4. RESULTS

This section presents the results obtained from an econometric investigation using panel data for Western Balkan countries, including Albania, Bosnia and Herzegovina, and North Macedonia. This section also presents the descriptive statistics, the countries used in the investigation, the rationale for the small number of observations, the correlation matrix, followed by the Pooled OLS, Fixed Effects, and Random Effects results. It is worth noting that, based on the Hausman test, the Fixed Effect model is suggested as the appropriate model; thus, the results and their discussion are based on fixed-effect estimates.

Table 1. Descriptive statistics of variables.

Variables	Number	Mean	Standard deviation	Minimum	Maximum
Nonperforming loans	82	7.876	8.191	-25.68	22.24
Foreign Direct Investment	100	5.416	2.724	0.0622	12.66
Gross domestic savings (% of GDP)	130	3.947	8.884	-25.47	20.50
Gross fixed capital formation (annual % growth)	117	5.374	11.70	-28.90	42.63
GDP growth (Annual %)	129	3.438	3.598	-15.31	13.04
Employment to population ratio, 15+, (%) (Modeled ILO estimate)	132	46.65	9.849	22.49	60.00
Unemployment, total (% of total labor force) (Modeled ILO estimate)	133	23.41	9.730	9.010	57

Variables	Number	Mean	Standard deviation	Minimum	Maximum
Domestic credit to private sector by banks (% of GDP)	128	41.45	14.77	4.871	86.45
Inflation, consumer prices (Annual %)	113	4.954	11.37	-2.410	95.01
Real interest rate (%)	101	4.240	6.155	-25.68	17.73

Table 1 presents the descriptive statistics of variables included in the analysis, such as: Nonperforming loans; Foreign Direct Investment; Gross domestic savings (% of GDP); Gross fixed capital formation (annual % growth); GDP growth (annual %); Employment to population ratio, 15+, (%) (modelled ILO estimate); Unemployment, total (% of total labour force) (modelled ILO estimate); Domestic credit to private sector by banks (% of GDP); Inflation, consumer prices (annual %); and Real interest rate (%). Non-performing loans are crucial determinants of financial stability; they reduce lending and hinder economic development.

Non-performing loans under the conditions of this study result in an average of 7.88% and a standard deviation of 8.19%, which indicates considerable differences in non-performing loans among the Western Balkan countries and changes in the risk of loan default within the study context. Foreign direct investment, as a macroeconomic indicator that is expected to affect non-performing loans, has an average of 5.42%, which shows that the improvement of the foreign direct investment climate, accompanied by an improvement in the labor market and an increase in income, is expected to reduce the risk of loan default, in which case non-performing loans decrease.

However, the low average of 3.95% for gross domestic savings points to a lack of internal financial buffers, which may make households and businesses more susceptible to shocks and, consequently, less able to pay debt. Although gross fixed capital formation, which measures investment activity, has a mean growth rate of 5.37%, it varies greatly (from -28.90% to 42.63%), suggesting that capital investments are unstable throughout the region. Increased loan defaults and disruptions to income flows can result from such volatility, especially when investments are unproductive or unsustainable. GDP growth averages about 3.44%, which presents the level of economic activity that may positively influence the NPLs.

The standard deviation of 3.60% and the minimum value of -15.31% further demonstrate a contraction in economic activity, which otherwise implies difficulty for economic agents in being liquid toward their obligations to the bank, specifically making it impossible to repay credit debts. Banking systems in conditions of contraction in economic activity, when unemployment rises and businesses cease operations, are likely to experience an increase in non-performing loans.

The unemployment rate has an average of 23.41% and is increasing to 57%, while the employment-to-population ratio is 46.65%. The dynamics of the labor market, specifically employment and unemployment, also play an important role in the banking sector, specifically in non-performing loans. As for domestic credit to the private sector, it constitutes about 41.45% of GDP, and this proves how long the expansion of credit contributes to the accumulation of bad loans if there is no correct assessment of risk and repayment capacity. On the other hand, inflation, with an average of 4.95% and a maximum of 95.01%, proves uncertainty and an increase in non-performing loans under the conditions of the analysis. As a result of inflation, real interest rates also change and have an average of 4.24%. This suggests that substantial fluctuations in real interest rates may constrain borrowing and undermine borrowers' ability to service their debt. According to the findings of the descriptive statistics analysis of the variables under review, it is worth noting that non-performing loans in the case of the Western Balkan countries are complex and change as a result of macroeconomic factors. The reduction in non-performing loans in the case of the Western Balkans (WB3) is associated with improved investment dynamics, improved labor market performance, and sustainable economic growth.

Table 2. Composition of the final estimation sample.

Country	Frequency	Percent	Cumulative Percent
Albania	13	36.11	36.11
Bosnia and Herzegovina	7	19.44	55.56
North Macedonia	16	44.44	100.00
Total	36	100.00	100.00

Table 2 presents the countries included in the econometric investigation, the frequency and percentage. The Western Balkan countries included in the econometric estimation and further analysis are Albania, North Macedonia, and Montenegro; thus, the panel has only three IDs. Otherwise, due to missing values of variables, Kosovo, Montenegro, and Serbia were excluded from further econometric investigation. The small number of observations and three countries in the analysis remain the main study limitations, and the results are presented with particular caution.

Table 3. Correlation.

Determinants	NPL	FDI	GDS	GFC	GDP	EMPL	DCPS	INFL	INTR
NPL	1								
FDI	0.274	1							
GDS	0.040	0.040	1						
GFC	-0.326	0.305	0.013	1					
GDP	-0.110	0.450	-0.000	0.490	1				
EMPL	0.123	0.358	0.684	-0.053	-0.045	1			
DCPS	-0.342	-0.570	-0.192	0.054	-0.387	-0.353	1		
INFL	-0.164	0.271	-0.301	0.254	0.342	-0.111	-0.082	1	
INTR	0.697	-0.064	0.000	-0.347	-0.306	-0.061	-0.147	-0.431	1

Table 3 presents the correlation matrix of the relationship between macroeconomic variables and non-performing loans in the Western Balkans, including Albania, Bosnia and Herzegovina, and North Macedonia. The purpose of the correlation matrix is to analyze the strength of the relationship between non-performing loans and selected macroeconomic variables. The findings indicate a positive correlation between NPLs and relative interest rates ($r = 0.697$), highlighting that the increased level of borrowing costs resulting from the increase in real interest rates further affects the increase in NPLs under the conditions of this study. Meanwhile, gross fixed capital formation (GFC) has a negative correlation with NPLs ($r = -0.326$), suggesting that increased investment may lower the share of non-performing loans through economic stimulation, while foreign direct investment (FDI) has a weaker positive correlation with NPLs ($r = 0.274$).

NPLs are in a positive relationship with the employment rate ($r = 0.123$), indicating that an increased employment level may be positively associated with NPLs, as supported by economic theory: the higher the employment level, the higher the income level, thus enhancing the capacity to repay loans.

The correlation analysis shows that Gross Domestic Savings (GDS) is positively, but to a lesser extent, related to non-performing loans ($r = 0.040$), while the inflation rate is negatively related to non-performing loans ($r = -0.164$), because inflation increases the relative rates of loans, which makes it impossible to repay debts on time and negatively affects NPLs.

The results obtained from the correlations between the NPL variable and macroeconomic variables are in line with the theory and empirical evidence presented in this study. Foreign direct investment plays a dual role in economic expansion and is thus seen from two perspectives: first, FDI in non-productive sectors leads to risk and makes it impossible to repay debts, increasing NPLs; on the other hand, FDI can expand economic activity if it brings innovation, technology, and new jobs, thus decreasing NPLs. Regarding the GDS, based on economic theory and empirical evidence, it is proven that the increase in savings is the basis of investment and, in turn, improves economic

activity, which seems to have an impact on the reduction of NPLs, but it is worth emphasizing that if the GDS are not used for productive investment, this may lead to an increased level of NPLs under economic conditions. Moreover, labor market indicators, specifically employment, affect NPLs due to the fact that employment increases the income base and, in turn, decreases the risk of loan default, while expanding economic activity in general and, in turn, reducing the risk of loan default or NPLs.

Regarding loan interest rates, it is worth noting that they are directly related to the ability to repay debt as a result of making borrowing more expensive. The negative correlation between GFC and NPLs is also supported by economic theory, namely that GFC in the long term strengthens the foundations of the economy by reducing credit risk and NPLs. In general, the increase in Gross Domestic Product implies an expansion of economic activity by reducing NPLs. It is also worth saying that, in the case of the Western Balkan countries, Domestic Credit to the Private Sector (DCPS) is also important because the expansion of credit, if credit risk is assessed and monitored correctly and the possibility of repayment is not jeopardized, stimulates entrepreneurship by stimulating innovation and performance and reducing NPL risk. Inflation as a macroeconomic factor has a very important impact on NPLs because it reduces purchasing power and real income, thereby worsening NPLs; on the other hand, moderate inflation stimulates investment, expands economic activity and, as a result, improves NPLs. From a theoretical perspective, it is worth noting that the selected macroeconomic variables have a theoretical basis and, on the other hand, that the correlation analysis is in line with the literature review presented above in this study. However, it is important to emphasize that NPLs play a very important role in financial stability and are influenced by macroeconomic factors, highlighting the need for the development of sound policies that will support sustainable economic growth, credit risk management and investment efficiency.

Table 4. Hausman Test results.

Variables	Fixed Effects (b)	Random Effects (B)	Difference (b-B)	S.E.
FDI	-0.440	-0.026	-0.414	0.120
GDS	0.863	0.330	0.533	0.347
GFC	0.020	-0.007	0.027	0.033
GDP	0.007	0.277	-0.269	0.193
EMPL	-1.068	-1.411	0.343	0.229
UEMPL	0.266	-0.957	1.223	0.447
DCPS	0.058	-0.143	0.201	0.125
INFL	0.390	0.516	-0.126	0.152
INTR	1.074	1.492	-0.418	0.208
Null hypothesis (H ₀)	Differences in coefficients are not systematic			
Chi-square statistic	11.89			
Degrees of freedom	2			
Prob > chi-square	0.0026			
Preferred model	Fixed Effects (FE)			

Note: $p = 0.0026 < 0.05$ null hypothesis is rejected. Fixed Effects model is suggested as preferred model over the Random Effects model. Stata also reported that $V_b - V_B$ is not positive definite, so the result should be interpreted with caution.

Hausman Test results presented in Table 4 revealed that the Fixed Effects model is suggested as the preferred model under the study circumstances. The null hypothesis indicates that the differences between the fixed-effects and random-effects coefficients are not systematic. The test results show a chi-square statistic of 11.89 and a p-value of 0.0026, below the 5% significance level; the null hypothesis is rejected, suggesting that the fixed-effects model is preferable to the random-effects model. Thus, the results and discussion are based on the fixed-effects results presented further in the following table. Even though it is worth noting that, due to the small number of observations and three countries under investigation, the results are presented with caution and are not generalized. The OLS

model and Random Effect models remain a basis of econometric panel data investigation strategy and are used as a comparison basis.

Table 5. Estimation Results from Panel Data Models: Exploring Non-Performing Loans via Fixed Effects, Random Effects, and Pooled OLS.

Variables	(1)	(2)	(3)
	Pooled OLS	Fixed Effects	Random Effects
Foreign Direct Investment	-0.026 (0.329)	-0.440 (0.268)	-0.026 (0.329)
Gross Domestic Savings	0.330** (0.127)	0.863*** (0.284)	0.330*** (0.127)
Gross fixed capital formation	-0.007 (0.074)	0.020 (0.062)	-0.007 (0.074)
Gross Domestic Product	0.277 (0.265)	0.007 (0.251)	0.277 (0.265)
Employment	-1.411*** (0.432)	-1.068*** (0.375)	-1.411*** (0.432)
Unemployment	-0.957*** (0.275)	0.266 (0.402)	-0.957*** (0.275)
Domestic credit to private sector by banks	-0.143 (0.096)	0.058 (0.121)	-0.143 (0.096)
Inflation	0.516 (0.313)	0.390 (0.267)	0.516* (0.313)
Real Interest Rate	1.492*** (0.227)	1.074*** (0.236)	1.492*** (0.227)
Constant	96.651*** (29.283)	44.637 (27.707)	96.651*** (29.283)
Observations	36	36	36
R-squared	0.752	0.817	0.752
Number of IDs		3	3
Number of groups		3	3

Note: * p < 0.10 (Significant at the 10% level).
 ** p < 0.05 (Significant at the 5% level).
 *** p < 0.01 (Significant at the 1% level).

Table 5 presents the findings from three panel regression models that were used to investigate the determinants influencing non-performing loans (NPLs), using Pooled OLS, Fixed Effects (FE), and Random Effects (RE).

The econometric models include 36 observations and include three Western Balkan countries: Albania, Bosnia and Herzegovina, and North Macedonia. It is worth noting that, due to the limited data, the software excluded Kosovo, Serbia, and Montenegro from the estimation panel techniques; thus, the econometric results are presented with caution and are further discussed on the basis of three selected Western Balkan countries.

The Fixed Effects model is the preferred model for discussion because it exhibits the highest explanatory power, with a coefficient of determination ($R^2=0.817$), compared to ($R^2=0.752$) in the Pooled OLS model. In addition, the Hausman test suggested the Fixed Effects model as the most appropriate specification. It is worth noting that the basic model for interpreting the results is the Fixed Effects model, while the Pooled OLS and Random Effects models are presented within the framework of the overall panel data estimation strategy and remain as a comparative basis.

Referring to the results of the fixed effects model, Gross Domestic Savings is statistically significant at the 1% level, with a beta coefficient of 0.86 and $p<0.01$. This result shows that an increase of one unit of domestic savings is associated, on average, with an increase of about 0.863 units of non-performing loans, keeping other variables unchanged. However, it is worth noting that, due to the limitation of this study in the small number of observations, the results should be considered only in the context of this study and referred to as a basis for expansion for future studies. In general, in economic terms, it is worth noting that under conditions of economic instability and financial instability, as well as restrictions on financial intermediation, the increase in savings is not necessarily associated with

productive investments, thus increasing non-performing loans. However, this interpretation should be considered in the context of the small sample under the conditions of this study.

The employment-to-population ratio under the conditions of this study results in a negative coefficient ($\beta = -1.068$) and is statistically significant at the 1% level ($p < 0.01$), and means that an increase in the level of employment can be associated with a decrease in non-performing loans. This result is supported by the literature presented in this study. This result is economically reasonable because it is expected that increased employment will improve the income of individuals, families, and businesses, increase their ability to meet financial obligations, and at the same time reduce the probability of delays in loan repayment.

The real interest rate presents a positive coefficient $\beta = 1.074$ and is statistically significant at the 1% level ($p < 0.01$). The results of the fixed-effects model show that an increase in real interest rates is expected to be associated with an increase in non-performing loans. In the context of the economic literature, higher interest rates are associated with increased real borrowing costs, which weaken the ability of individuals and enterprises to repay their credit debt obligations. It is worth noting that, under the limitations of this study, this result supports the argument that tighter financing conditions can contribute to the deterioration of the quality of the credit portfolio.

Foreign direct investment, gross fixed capital formation, domestic credit to the private sector by banks, inflation, unemployment, and Gross Domestic Product are statistically non-significant in the Fixed Effects model under the conditions of this study. It is worth noting that the statistically non-significant variables do not show a clear and consistent relationship with non-performing loans during the analyzed period for the countries under investigation. This means that the variables show more variation between countries than within the same country during the period under investigation. On the other hand, since the Fixed Effects model identifies coefficients mainly from within-country variations, variables with limited time variation may be statistically insignificant. At the same time, invariant heterogeneity between countries is absorbed by the fixed effects and is not estimated as a separate coefficient. The unemployment variable in the Fixed Effects model is statistically insignificant; however, it is noted that the unemployment coefficient is negative and significant in Pooled OLS and Random Effects, but the results differ in Fixed Effects as a consequence of the model specification and the unobserved country-specific effects. For this reason, the unemployment variable is not interpreted under the conditions of this study.

The econometric results of the fixed-effects model show that an increased level of employment may be associated with a lower level of non-performing loans, while domestic savings and higher real interest rates are associated with an increased level of NPLs under the study circumstances. The other variables, such as foreign direct investment, gross fixed capital formation, domestic credit to the private sector by banks, inflation, unemployment, and gross domestic product, do not show statistical significance in the preferred fixed-effects model. However, due to the limited number of observations, the unbalanced panel, and the inclusion of only three countries, the results of this study are interpreted as sample-specific and preliminary rather than generalized, and are based on three Western Balkan countries, including Albania, Bosnia and Herzegovina, and North Macedonia.

Table 6. Hypothesis Testing Based on the Fixed-Effects Results.

Hypothesis	Variables included	Expected relationship with NPLs	Fixed-effects results	Decision
H1: Improving macroeconomic conditions, represented by foreign direct investment, gross domestic savings, gross fixed capital formation, GDP growth, and employment, are expected to reduce non-performing loans in the WB3 countries.	FDI, gross domestic savings, gross fixed capital formation, GDP growth, and employment	Negative	FDI: -0.440 , not significant; GDS: 0.863^{***} ; GFC: 0.020 , not significant; GDP: 0.007 , not significant; Employment: -1.068^{***}	Partially supported

Hypothesis	Variables included	Expected relationship with NPLs	Fixed-effects results	Decision
H2: Worsening economic conditions and increased financial exposure, represented by higher unemployment, expanded bank credit to the private sector, higher inflation, and higher real interest rates, are expected to be positively associated with non-performing loans in the WB3 countries.	Unemployment, domestic credit to the private sector, inflation, and the real interest rate	Positive	Unemployment: 0.266, not significant; Domestic credit: 0.058, not significant; Inflation: 0.390, not significant; Real interest rate: 1.074***	Partially supported

Note: *** indicates statistical significance at the 1% level. The assessment is based on the fixed-effects specification selected through the Hausman test.

4.1. Hypothesis Testing and Discussion

Table 6 presents the hypothesis testing and the decision based on the Fixed Effects model estimation. Hypothesis 1 is partially supported as a result of only two of the selected variables remaining statistically significant; thus, employment and gross domestic savings impact non-performing loans in the case of Albania, Bosnia and Herzegovina, and North Macedonia; otherwise, the variables foreign direct investment, gross domestic product, and gross fixed capital formation remain statistically non-significant under the study circumstances. Thus, the first hypothesis is only partially supported. The results indicate that improved labour-market conditions, reflected in higher employment, are associated with lower non-performing loans in the selected countries. However, gross domestic savings show a positive and statistically significant association with non-performing loans, contrary to the initially expected relationship. This finding may indicate that, under conditions of economic and political instability, higher gross domestic savings do not necessarily translate into productive investment. Instead, they may reflect weak consumption and investment activity, which can adversely affect borrowers' repayment capacity and be associated with higher levels of non-performing loans. Otherwise, the increased level of employment is expected to increase the income level, which may cause non-performing loans to decrease.

Hypothesis 2 is partially supported. The results indicate that higher real interest rates are positively associated with non-performing loans, as they increase the real cost of borrowing and the debt-servicing burden, potentially weakening borrowers' repayment capacity. Additionally, macroeconomic variables such as unemployment, domestic credit to the private sector, and inflation remain statistically non-significant under the study circumstances.

The literature evidence suggests further that macroeconomic indicators may be associated with non-performing loans. Thus, Koju et al. (2018) find that NPLs are influenced by several important macroeconomic factors, among others, the inflation rate and unemployment rate. In line with our study, there is also a study by Anita et al. (2022) that suggests that GDP, money supply, and inflation influence NPLs. Otherwise, Hajja (2022) concludes that while higher inflation is linked to fewer NPLs, higher levels of GDP growth and lending interest rates are related to more NPLs. Additionally, our results concur with the research by Golitsis et al. (2022), which concludes that GDP hurts NPLs; in our case, GDP is nonsignificant, unemployment impacts NPLs (i.e., a positive one), and interest rates also have a positive impact on NPLs. Contrary to our findings, a study by Mahyoub and Mohd Said (2021) finds that real GDP and inflation have no significant impact on the NPL level of the sample banks. In addition, Foglia (2022) finds that the unemployment rate and domestic credit positively impact NPLs; in our case, domestic credit is not significant, and also, in our case, a one-percent increase in unemployment will decrease NPLs in the Western Balkans. Further research from Gashi et al. (2022) finds that in the case of the Western Balkans, the real interest rate, gross domestic savings, and the unemployment rate all have a favorable impact on NPLs.

4.2. Policy Implications and Future Research

This study, referring to the theoretical framework and supporting the empirical findings of this study, comes up with some policy implications for the Western Balkan countries Albania, Bosnia and Herzegovina, and North Macedonia. It is important to improve labor market outcomes, specifically to create mechanisms for increasing sustainable employment, to match the skills required by the labor market with the skills offered, for which proper harmonization between universities, government, and the private sector is necessary. In this way, increasing employment will enable income growth, improve the ability to repay financial obligations, and reduce nonperforming loans. Another important factor that should be considered is real interest rates. Due to the fact that an increase in real interest rates increases the cost of borrowing, the risk of nonperforming loans also increases. Furthermore, it is worth noting that banking financial institutions need to pay attention to credit analysis, assessment of solvency, as well as applying sensitivity analyses and stress tests that take into account scenarios of interest rate increases. Also, borrowers should be clearly informed about the risks associated with changes in the cost of credit. Among other things, it is worth adding that it is necessary for public policies, in addition to encouraging savings, to create mechanisms to direct savings towards productive investments and related activities that affect employment growth; in this way, disposable income would also increase and nonperforming loans would be reduced. Under the conditions of this study, the findings show that savings increase nonperforming loans, which is both contradictory to theory and sufficiently explainable because, if savings are not oriented towards productive investments, they do not represent a mechanism that enables the reduction of nonperforming loans.

Since foreign direct investment, gross fixed capital formation, economic growth, unemployment, credit to the private sector, and inflation were not statistically significant in the fixed-effects model, the policy implications regarding these variables are based on the theoretical framework of this study, and it is worth noting that the improvement of macroeconomic indicators is expected to be accompanied by a reduction in non-performing loans.

Future research is suggested to increase the number of countries under analysis, specifically to make comparisons between developed and developing European countries, increase the number of observations and the range of variables in econometric models by including in the analysis specific variables of the banking sector, such as capitalization, liquidity, profitability, quality of credit management, and the structure of the credit portfolio.

4.3. Limitations

The study's primary limitations remain the small number of observations, 36, and three countries under investigation. Even though the study tried to include the six Western Balkan countries, including Kosovo, Albania, North Macedonia, Bosnia and Herzegovina, Montenegro, and Serbia, as a result of missing values for selected variables, the econometric panel data techniques resulted in three IDs; respectively, three countries remain under further estimation: Albania, Bosnia and Herzegovina, and North Macedonia. Another research constraint is that while certain important macroeconomic elements recommended by the literature are taken into consideration in the macroeconomic modeling, not all macroeconomic components are considered. The fact that performance metrics for banks, such as return on equity (ROE) and return on assets (ROA), were not considered is another significant shortcoming of this research. A deeper understanding of the connection between economic variables and non-performing loans may be gained from these metrics.

5. CONCLUSIONS

The main objective of this study was to analyse the impact of macroeconomic determinants on non-performing loans in Western Balkan countries, including Albania, Bosnia and Herzegovina, and North Macedonia. The study is based on panel data obtained from the World Bank indicators for the period 2000–2022. Using econometric panel data models such as Pooled OLS, Random Effects, Fixed Effects, and the Hausman test, the study has a small number of observations: only 36 observations and only three countries. This also constitutes the main limitation of this study.

Referring to the results of the Hausman test, the pooled OLS and random-effects models were used as preliminary benchmarks, while the fixed-effects model constituted the primary empirical specification. However, the results have been presented with caution and under the conditions of the model because the econometric limitations of this study prevent the generalization of the findings and policy implications.

This study concludes that the increase in the employment rate decreases the level of non-performing loans in the case of Albania, Bosnia and Herzegovina, and North Macedonia. Among other things, based on economic literature, the improvement of the results of the labour market can generally improve financial stability and reduce non-performing loans. Consequently, the increase in employment is expected to be accompanied by an increase in income and improve the ability of borrowers to settle their financial obligations. On the other hand, the study concludes that the increase in the real interest rate under the conditions of this study affects the increased level of non-performing loans by raising the cost of debt and reducing the ability of borrowers to repay their financial obligations. Furthermore, the findings of this study demonstrate that the increase in domestic savings under conditions of an uncertain economic environment can affect the increase in non-performing loans. These findings, although contradictory to theoretical evidence, can again be justified in the light of the savings paradox and the fact that savings may not always lead to productive investments, increased incomes, or improved borrowers' ability to repay their financial obligations. Slow economic growth and political instability in the Western Balkans in general, and specifically in the case of Albania, Bosnia and Herzegovina, and North Macedonia, may contribute to savings contributing to the increase in non-performing loans. Foreign direct investment, gross fixed capital formation, economic growth, unemployment, bank credit to the private sector, and inflation, based on the results of the fixed effects model, which is considered the basic model for interpretation under the conditions of this study, are statistically insignificant, so their impact on non-performing loans is not interpreted. These variables lose their statistical significance in the fixed effects model, as this model identifies the coefficients mainly from the changes that occur within each country during the analysed period. When the variables present limited variation over time or vary more between countries than within them, the coefficients can be estimated with less precision and result in statistical insignificance. At the same time, the fixed effects model controls for invariant heterogeneity between countries. Further recommendations for policymakers are presented in this study's context. These include the governments' efforts to increase GDP and employment rates, and lower unemployment and inflation through fiscal policy, as well as the central banks' control over the money supply and interest rates in their respective nations to lower the amount of non-performing loans and maintain financial sector stability.

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REFERENCES

- Alnabulsi, K., Kozarević, E., & Hakimi, A. (2023). Non-performing loans as a driver of banking distress: A systematic literature review. *Commodities*, 2(2), 111-130. <https://doi.org/10.3390/commodities2020007>
- Anita, S. S., Tasnova, N., & Nawar, N. (2022). Are non-performing loans sensitive to macroeconomic determinants? An empirical evidence from banking sector of SAARC countries. *Future Business Journal*, 8(1), 7. <https://doi.org/10.1186/s43093-022-00117-9>
- Ari, A., Chen, S., & Ratnovski, L. (2019). *The dynamics of non-performing loans during banking crises: A new database*. IMF Working Paper No. 2019/272. Washington, DC: International Monetary Fund. <https://doi.org/10.5089/9781513521152.001>.

- Avetisyan, S. (2018). EU geography of non-performing loans (NPL). *Preprints*. <https://doi.org/10.20944/preprints201809.0109.v1>
- Barisitz, S. (2013). Nonperforming loans in Western Europe: A selective comparison of countries and national definitions. *Focus on European Economic Integration*, 1, 28–47.
- Basha, M., & Alilaj, A. (2025). Macroeconomic factors affecting NPLs: Evidence from Albania and the region. *SEER Journal*, 18(2), 92–106.
- Beck, R., Jakubik, P., & Piloiu, A. (2015). Key determinants of non-performing loans: New evidence from a global sample. *Open Economies Review*, 26(3), 525–550. <https://doi.org/10.1007/s11079-015-9358-8>
- Boumparis, P., Milas, C., & Panagiotidis, T. (2019). Non-performing loans and sovereign credit ratings. *International Review of Financial Analysis*, 64, 301–314. <https://doi.org/10.1016/j.irfa.2019.06.002>
- CFI Team. (2020). *Non-performing loan (NPL)*. Corporate Finance Institute. Retrieved from <https://corporatefinanceinstitute.com/resources/commercial-lending/non-performing-loan-npl/>
- Christodoulou-Volos, C., & Hadjixenophontos, A. (2017). Empirical determinants of the non-performing loans in the Cypriot banking system. *Journal of Finance and Investment Analysis*, 6(4), 1–20.
- Çitaku, S., Asllani, G., Luboteni, G., & Grima, S. (2020). Financial integration, banking supervision and sustainability of the Western Balkan countries. *International Journal of Economics and Business Administration*, 8(1), 3–14. <https://doi.org/10.35808/ijebe/404>
- Ćurak, M., Pepur, S., & Poposki, K. (2013). Determinants of non-performing loans: Evidence from Southeastern European banking systems. *Banks and Bank Systems*, 8(1), 45–53.
- Dimitrios, A., Helen, L., & Mike, T. (2016). Determinants of non-performing loans: Evidence from Euro-area countries. *Finance Research Letters*, 18, 116–119. <https://doi.org/10.1016/j.frl.2016.04.008>
- Ekanayake, N. (2018). The impact of bank-specific and macroeconomic factors on non-performing loans in Sri Lankan commercial banks. *Journal of Modern Accounting and Auditing*, 14(11), 611–627.
- European Central Bank. (2016). *What are non-performing loans (NPLs)?* Retrieved from <https://www.ecb.europa.eu/ecb-and-you/explainers/tell-me/html/npl.en.html>
- Ferreira, C. (2022). Determinants of non-performing loans: A panel data approach. *International Advances in Economic Research*, 28(3), 133–153. <https://doi.org/10.1007/s11294-022-09860-9>
- Foglia, M. (2022). Non-performing loans and macroeconomics factors: The Italian case. *Risks*, 10(1), 21. <https://doi.org/10.3390/risks10010021>
- Gabrisch, H. (2014). *The binding constraint on growth in less developed Western Balkan countries*. MPRA Paper No. 60020, Munich, Germany: Munich Personal RePEc Archive, University Library of Munich.
- Gashi, A., Tafa, S., & Bajrami, R. (2022). The impact of macroeconomic factors on non-performing loans in the Western Balkans. *Emerging Science Journal*, 6(5), 1032–1045. <https://doi.org/10.28991/ESJ-2022-06-05-08>
- Golitsis, P., Khudoykulov, K., & Palanov, S. (2022). Determinants of non-performing loans in North Macedonia. *Cogent Business & Management*, 9(1), 2140488. <https://doi.org/10.1080/23311975.2022.2140488>
- Hajja, Y. (2022). Impact of bank capital on non-performing loans: New evidence of concave capital from dynamic panel-data and time series analysis in Malaysia. *International Journal of Finance & Economics*, 27(3), 2921–2948. <https://doi.org/10.1002/ijfe.2305>
- Inekwe, M. (2013). The relationship between real GDP and non-performing loans: Evidence from Nigeria (1995–2009). *International Journal of Capacity Building in Education and Management*, 2(1), 1–7.
- International Monetary Fund European Department. (2023). *Regional economic outlook: Europe, April 2023—Europe’s balancing act: Taming inflation without a recession*. Washington, DC: International Monetary Fund.
- Jakubik, P., & Reiningger, T. (2014). *What are the key determinants of nonperforming loans in CESEE?* IES Working Paper No. 26/2014, Prague, Czech Republic: Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague.
- Keco, B. (2024). Determinants of NPLs in SEE countries. *EconSouth Journal*, 12(1), 33–47.

- Khalaf, T., & Masih, M. (2018). *Is the relationship between non-performing loans of banks and economic growth asymmetric? Malaysia's evidence based on linear and nonlinear ARDL approaches*. MPRA Paper No. 103714. Munich Personal RePEc Archive.
- Khan, M. A., Siddique, A., & Sarwar, Z. (2020). Determinants of non-performing loans in the banking sector in developing state. *Asian Journal of Accounting Research*, 5(1), 135-145. <https://doi.org/10.1108/AJAR-10-2019-0080>
- Khemraj, T., & Pasha, S. (2009). *The determinants of non-performing loans: An econometric case study of Guyana*. MPRA Paper No. 53128, Munich, Germany: Munich Personal RePEc Archive, University Library of Munich.
- Khemraj, T., & Pasha, S. (2016). Determinants of nonperforming loans in Guyana. In A. V. Gevorkyan & O. Canuto (Eds.), *Financial deepening and post-crisis development in emerging markets: Current perils and future dawnings* (pp. 169–187). New York, NY: Palgrave Macmillan.
- Kjosevski, J., & Petkovski, M. (2017). Non-performing loans in Baltic States: Determinants and macroeconomic effects. *Baltic Journal of Economics*, 17(1), 25-44. <https://doi.org/10.1080/1406099X.2016.1246234>
- Koju, L., Abbas, G., & Wang, S. (2018). Do macroeconomic determinants of non-performing loans vary with the income levels of countries? *Journal of Systems Science and Information*, 6(6), 512-531. <https://doi.org/10.21078/JSSI-2018-512-20>
- Kozarić, K., & Žunić, E. (2017). Cointegration analysis of non-performing loans and macroeconomic conditions. In S. Goić, A. Karasavoglou, and P. Polychronidou (Eds.), *Finance in Central and Southeastern Europe* (pp. 89–102). Cham, Switzerland: Springer.
- Krasniqi-Pervetica, A., & Ahmeti, S. (2022). The effect of macroeconomic indicators on non-performing loans: The case of Balkan countries. *International Journal of Applied Economics, Finance and Accounting*, 14(1), 42-49. <https://doi.org/10.33094/ijaef.v14i1.647>
- Kuzucu, N., & Kuzucu, S. (2019). What drives non-performing loans? Evidence from emerging and advanced economies during pre-and post-global financial crisis. *Emerging Markets Finance and Trade*, 55(8), 1694-1708. <https://doi.org/10.1080/1540496X.2018.1547877>
- Louzis, D. P., Vouldis, A. T., & Metaxas, V. L. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking & Finance*, 36(4), 1012-1027. <https://doi.org/10.1016/j.jbankfin.2011.10.012>
- Mahyoub, M., & Mohd Said, R. (2021). Factors influencing non-performing loans: Empirical evidence from commercial banks in Malaysia. *Research Journal of Business and Management*, 8(3), 160-166. <https://doi.org/10.17261/Pressacademia.2021.1448>
- Manz, F. (2019). Determinants of non-performing loans: What do we know? A systematic review and avenues for future research: F. Manz. *Management Review Quarterly*, 69(4), 351-389. <https://doi.org/10.1007/s11301-019-00156-7>
- Messai, A. S., & Jouini, F. (2013). Micro and macro determinants of non-performing loans. *International Journal of Economics and Financial Issues*, 3(4), 852-860.
- Morakinyo, A. E., & Sibanda, M. (2016). The determinants of non-performing loans in the MINT economies. *Journal of Economics and Behavioral Studies*, 8(5(J)), 39-55. [https://doi.org/10.22610/jeb.v8i5\(J\).1430](https://doi.org/10.22610/jeb.v8i5(J).1430)
- Muthami, A. M. (2016). Relationship between non-performing loans and economic growth: A case study of commercial banks in Kenya. Master's Thesis, University of Nairobi.
- OECD. (2024). *Western Balkans competitiveness outlook 2024: Regional profile*. Paris, France: OECD Publishing.
- Ouhibi, S., & Hammami, S. (2015). Determinants of nonperforming loans in the Southern Mediterranean countries. *International Journal of Accounting and Economics Studies*, 3(1), 50-53.
- Petkovski, M., Kjosevski, J., & Jovanovski, K. (2021). Macro and bank specific determinants of nonperforming loans in polish commercial banks. *Argumenta Oeconomica*, 47(2), 107–126. <https://doi.org/10.15611/aoe.2021.2.06>
- Radivojevic, N., & Jovovic, J. (2017). Examining of determinants of non-performing loans. *Prague Economic Papers*, 26(3), 300-316. <https://doi.org/10.18267/j.pep.615>
- Syed, A. A., & Tripathi, R. (2019). Non-performing loans in BRICS nations: Determinants and macroeconomic impact. *Indian Journal of Finance*, 13(2), 22-35. <https://doi.org/10.17010/ijf/2019/v13i2/141684>

- Tmava, Q., Avdullahi, A., & Sadikaj, B. (2018). Loan portfolio and nonperforming loans in Western Balkan Countries. *International Journal of Finance & Banking Studies*, 7(4), 10-20.
- Vienna Initiative. (2024). *NPL monitor H1 2024*. Vienna, Austria: European Bank Coordination Initiative.
- Wood, A., & Skinner, N. (2018). Determinants of non-performing loans: Evidence from commercial banks in Barbados. *The Business & Management Review*, 9(3), 44-64.
- Wu, W.-C., Chang, C.-O., & Selvili, Z. (2003). Banking system, real estate markets and nonperforming loans. *International Real Estate Review*, 6(1), 43-62.
- Zhang, Y., Yu, G., Guan, Y.-S., & Yang, D.-H. (2014). *Feature selection of nonperforming loans in Chinese commercial banks*. Paper presented at the 2014 International Conference on Management Science & Engineering 21th Annual Conference Proceedings, IEEE.

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