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Non-Performing Loans determinants: A new behavioural approach

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Non-Performing Loans determinants: A new behavioural approach

Abstract

This paper presents a comprehensive review of the literature on non-performing loans (NPLs) and their determinants, covering studies published between 1987 and 2025. In contrast to earlier reviews, it introduces a novel dichotomy that distinguishes between behavioural determinants, such as managerial practices, governance structures, and strategic decision-making, and non-behavioural determinants, including macroeconomic and systemic conditions. This classification provides a clearer conceptual framework for understanding the processes underlying NPL formation and dynamics. Beyond synthesising prior evidence, the paper highlights key trends in the literature, documents the growing academic and policy attention devoted to NPLs, and identifies critical gaps. In particular, it calls for deeper analysis of behavioural drivers, cross-country comparative studies, and the interaction between financial innovation and credit risk. By providing both synthesis and direction, this review offers an updated and structured resource for researchers, policymakers, and practitioners concerned with credit risk and financial stability.

1. Introduction

Non-performing loans (NPLs hereafter) are a critical indicator of financial health and stability, representing loans that are in arrears for a specified period, typically 90 days or more, or where repayment is unlikely without realising collateral. They are of paramount importance because they directly impact the profitability and viability of financial institutions, constraining their ability to extend credit to businesses and households. High NPL ratios not only impair the intermediation role of banks but also act as a drag on economic growth by stifling investment and consumption (Reinhart and Rogoff, 2010). As demonstrated during the global financial crisis of 2007–2008, surges in NPLs can destabilise financial systems and exacerbate economic downturns, making their study crucial for maintaining financial and macroeconomic stability (Espinoza et al., 2013).

The significance of NPLs extends beyond their immediate impact on banks to their broader implications for systemic risk and economic resilience. High levels of NPLs are often associated with phenomena such as "zombification," where distressed firms and banks persist but fail to contribute meaningfully to economic growth, further deepening stagnation (Ghosh, 2015). Moreover, NPLs are intricately linked to macroeconomic variables such as GDP growth, unemployment, and real estate market dynamics, creating feedback loops that can amplify economic vulnerabilities (Iakova & Wagner, 2002). The importance of studying NPLs is further underlined by their role in cross-border spillovers and interconnectedness, particularly in regions like Europe, where shared economic policies and financial linkages can transmit credit risks across borders (Arvai et al., 2011). Understanding the determinants and dynamics of NPLs is therefore vital for policymakers, regulators, and financial institutions to design effective strategies for crisis prevention and resolution.

The purpose of this review is twofold. Firstly, it aims to present an analytical review of the literature on NPL determinants, providing a structured overview of the studies that have examined the factors influencing NPL formation. This includes categorising relevant papers that explore NPL determinants, focusing on macroeconomic, bank-specific, and loan-specific factors. Secondly, this review introduces a novel categorisation of NPL determinants that, to the best of my knowledge, has not previously existed in the literature. This categorisation

proposes a dichotomy, dividing NPL determinants into two main categories: (a) non-behavioural factors, which relate to the economic conditions and systemic factors under which NPLs are formed, and (b) behavioural factors, which revolve around decision-making by banks, borrowers, and policymakers, as well as governance and institutional influences. This new framework addresses a critical gap in prior literature, where behavioural elements have often been overlooked or underemphasised in favour of macroeconomic and structural analyses.

NPLs play a crucial role in the financial ecosystem, serving as a key indicator of credit risk and economic stability (Louzis et al., 2012). They arise when borrowers fail to meet their repayment obligations, which disrupts the cash flows of lenders and exposes them to financial losses. These defaults can stem from a variety of sources, including household mortgages, corporate loans, and sovereign debts. NPLs not only affect the profitability and viability of financial institutions but also pose systemic risks to the broader economy by inhibiting credit intermediation and exacerbating financial instability (Makri et al., 2014). The 2007–2008 financial crisis, for example, highlighted how rising NPLs can destabilise banking systems and contribute to prolonged economic stagnation (Ghosh, 2015).

The introduction of ex-post credit risk into the analysis of NPLs is particularly valuable for understanding their dynamics. Ex-post credit risk refers to the likelihood of borrower default after credit has been extended and reflects the realised risk that undermines financial stability (Crouhy et al., 2000). This concept is critical for lenders and policymakers, as it underlines the importance of managing and mitigating risks associated with defaults that occur after loans are disbursed. Non-behavioural factors, such as macroeconomic conditions, play a significant role in ex-post credit risk. Economic contractions, high unemployment rates, and fluctuations in real estate markets have all been linked to rising NPL levels (Rinaldi and Sanchis-Arellano, 2006). At the same time, behavioural factors, including borrowers' strategic defaults, banks' risk management practices, and regulatory interventions, also contribute to the dynamics of NPL formation (Guiso et al., 2013).

This review seeks to bridge these perspectives by integrating non-behavioural and behavioural determinants into a unified framework. For example, while macroeconomic

indicators such as GDP growth and inflation provide context for systemic credit risk, behavioural factors—such as strategic default during economic crises—highlight the human and institutional dimensions of NPL dynamics (Acharya and Thakor, 2016). The proposed categorisation offers new insights into how these factors interact and influence NPL levels, particularly in periods of financial turbulence.

By developing a robust framework that incorporates both non-behavioural and behavioural elements, this review not only advances academic understanding of NPL determinants but also provides practical tools for financial institutions and policymakers. Incorporating proxies such as economic uncertainty indices, governance indicators, and real estate trends can enhance the modelling of ex-post credit risk, enabling more effective strategies for managing and resolving NPLs. This dual approach is essential for managing the systemic risks posed by NPLs and fostering financial stability in an interconnected and increasingly complex global economy.

This paper is designed under the following structure: the next section explains the different definitions of NPLs around Europe, followed by the presentation of a formal economics model for NPLs. Next stands the literature review and, finally, a conclusions section. It would be beneficial to mention here that some of the papers mentioned in this review have used both behavioural and non-behavioural explanatory variables when explicating NPLs. However, I have put them under one of the two NPL determinant categories mainly based on their influence in future papers. For example, if a paper contains both types of variables and has introduced a new behavioural variable or tested a new hypothesis on NPL factors that has opened a new pathway in the behavioural elements literature it will be labelled as a behavioural determinants paper.

1.1 NPL delineation and connection with ex-post credit risk

We can define NPLs as realised ex-post credit risk (Berger and Humphrey, 1997). NPLs represent a critical aspect of the financial landscape, reflecting loans that borrowers have failed to repay according to their contractual obligations. When a borrower defaults on a loan,

it means they have missed payments or ceased repayment altogether, thereby disrupting the expected cash flow to the lender. NPLs can arise from various sources, including individuals failing to make mortgage payments, businesses defaulting on loans, or even sovereign entities defaulting on their debt obligations (Beck et al., 2015).

These NPLs pose significant challenges and risks to financial institutions, as well as to the broader economy. When borrowers default on their loans, banks and other lenders face potential losses, as they may not be able to recover the full amount of the outstanding debt. As a result, NPLs can erode the profitability and financial stability of financial institutions, affecting their ability to lend and support economic activity.

The term "ex-post credit risk" refers to the risk that borrowers will default on their loans after they have been extended credit. In other words, it is the risk that borrowers will fail to meet their repayment obligations once the loan has been disbursed. Ex-post credit risk is a crucial consideration for lenders and investors, as it directly impacts their financial health and the value of their loan portfolios (Duffie & Singleton, 2003).

Understanding the factors contributing to ex-post credit risk is essential for financial institutions and policymakers in managing and mitigating the risks associated with NPLs. Factors such as economic conditions, borrower characteristics, industry trends, and regulatory environments can all influence the likelihood of borrowers defaulting on their loans (Louzis et al., 2012).

Given the potential impact of NPLs on financial stability and economic growth, there is a growing emphasis on developing robust models and frameworks to assess and manage ex-post credit risk. By incorporating a comprehensive set of proxies and indicators, such as economic uncertainty, governance indicators, and real estate prices, analysts can better understand the drivers of strategic default behaviour and develop more effective strategies for managing NPLs.

All in all, NPLs represent loans where borrowers have failed to meet their repayment obligations, posing significant risks to financial institutions and the broader economy. Ex-post

credit risk refers to the risk of default after credit has been extended and understanding the factors driving this risk is crucial for effective risk management and financial stability.

Especially at the start of the global financial crisis and the subsequent deterioration of the average bank asset quality (De Bock & Demyanets, 2012), it was observed that underperforming banking institutions have a significant proportion of NPLs prior to failure or distress (Campbell, 2007). The channel through which this is taking place is that NPLs obstruct banks from their intermediating role to the real economy, thus obscuring economic growth (Suárez & Sánchez Serrano, 2018); a great amount of NPLs means that the bank intermediation role is inhibited.

1.2 NPL definition non-consensus

As mentioned above, traditionally, literature has been divided into three distinct categories depending on the variables chosen by the authors to analyse the amount of NPLs in a national economy over the total amount of existing loans, something I will be calling NPL ratio thereafter. The three traditional categories used in bibliography are: a. macroeconomic determinants, b. bank-specific determinants and, finally, c. loan-specific. Except from the modelling choices of the authors and the explanatory power of the independent variables another crucial parameter deciding the group the papers belong to is the definition of the NPLs each dataset encloses. The peculiarity around the definition is that NPLs are not the outcome of legal studies but rather the result of the various national and international business practices around the world.

To analyse the history of the NPL definition it would be useful to keep in mind that the essential indication behind NPLs is loans underperforming for three months or more. The literature suggests that any loan in arrears for more than 90 days should fall under the NPL family. These loans are usually close to default, or they have already defaulted (Konstantakis et al. (2016) and Rinaldi and Sanchis-Arellano (2006)). This definition is the most prevalent in policy papers as well followed in EBA 2013 and 2018 and ECB 2017b reports.

However, taking data and checking definitions from the IMF Financial Soundness Indicators data sources as well as BankScope and National Sources (wherever the translation limitations didn't exist) I formed the following table with definitions for each country:

Country	*NPL definition*
Albania	Loans in arrears for 90 days over total loans (%)
Argentina	Loans in arrears for 90 days over total loans (%)
Bolivia	Loans in arrears for 90 days over total loans (%)
Brazil	Loans in arrears for 90 days over total loans (%)
Bulgaria	Loans in arrears for 90 days over total loans (%)
China	Loans in arrears for 90 days as % of total loans, state-owned commercial banks
Colombia	Loans in arrears for 90 days as % of outstanding credit
Croatia	Nonperforming assets as % of total assets
Czech Republic	Loans in arrears for 90 days over total loans (%) for 1994 onwards; Loans in arrears for 90 days as % of total credit before 1994
Ecuador	Loans in arrears for 90 days as % of total credit
Estonia	Loans in arrears for 90 days over total loans (%)
Finland	Loans in arrears for 90 days over total loans (%)
Georgia	Loans in arrears for 90 days over total loans (%)
Greece	NPLs to Total Gross Loans
Hungary	Problematic loans/domestic credit
India	Loans in arrears for 90 days over total loans (%) (Not including private banks)
Indonesia	Loans in arrears for 90 days over total property loans
Kenya	Loans in arrears for 90 days over total loans (%)
Kyrzyg Republic	Loans in arrears for 90 days over total loans (%)
Latvia	Loans in arrears for 90 days over total loans (%)
Lithuania	Loans in arrears for 90 days over total loans (%)
Malaysia	Loans in arrears for 90 days over total loans (%)
Mexico	Loans in arrears for 90 days over total loans (%)

Nicaragua	Loans in arrears for 90 days over total loans (%)
Norway	Loans in arrears for 90 days over total loans (%)
Paraguay	Loans in arrears for 90 days over total loans (%)
Poland	Loans in arrears for 90 days over total loans (%)
Romania	Loans in arrears for 90 days provisions to gross portfolio
Russia	Loans in arrears for 90 days over total loans (%)
Slovak Republic	Loans in arrears for 90 days over total loans (%)
Slovenia	Loans in arrears for 90 days over total loans (%)
South Korea	Non-performing credit of commercial banks/total loans
Sweden	Loans in arrears for 90 days over total loans (%)
Thailand	Loans in arrears for 90 days over total loans (%)
Uganda	Loans in arrears for 90 days over total loans (%)
Ukraine	Loans in arrears for 90 days over total loans (%)
Venezuela	Loans in arrears for 90 days over total loans (%)
Vietnam	Loans in arrears for 90 days over total loans (%)
Yemen Arab Republic	Loans in arrears for 90 days over total loans (%)

Table 1 List of non-performing loan definitions for each country, Source: National sources and IMF, original data taken from Ari et al. (2019) and checked and brought up to date by the author

2. A systematic review

The objective of this section is to summarise the prior literature dealing with NPLs and to draw out its implications for the important issues that will be addressed in the second and third part of this dissertation. NPL literature can been divided into different categories depending on the variables chosen by the authors to analyse the amount of NPLs in a national economy over the total amount of existing loans, something I will be calling NPL ratio or merely NPLs - to accommodate brevity- thereafter. The three main categories I will be using are: macroeconomic determinants; bank-specific determinants; and loan determinants. Please note here that some papers may lie in more than one category. However, I will be assigning

them into the one that they have had the most impact or they offered an opportunity for more papers to be written towards that direction of research.

2.1 Macroeconomic determinants

The literature initially focused on examining how macroeconomic dynamics are influenced by fluctuations in the debt ratio. More specifically, it started with Rinaldi and Sanchis-Arellano (2006) studying household NPLs. They used quarterly time series for Belgium, France, Finland, Ireland, Italy, Portugal, and Spain to examine whether the increase in the household debt to income ratio together with the NPL ratio since the begging of the 1990s is an indicator of a new equilibrium or a riskier state of the economy. They initially developed a theoretical two period model to describe the probability of default in household payments (chance of falling into arrears) as a function of amount of loan taken, current income, investment, bank lending rate and future values of those. They also developed an empirical model describing the determinants of household NPLs, which depends on macroeconomic variables (such as unemployment and inflation) and household financial variables as well (such as debt, income, and assets). After estimating an error correction model for seven countries between 1989-2004, they concluded that the recent rise in debt ratio is an indicator of a riskier state of the economy since the income in the countries studied has grown less than the debt. This is mainly because income is the only household wealth component that appears in the long-run equation. Similarly, Quagliariello (2007) performed a panel analysis on Italian intermediaries showing that business cycle affects banks' loan loss provisions and new bad debts. An equation of Loan loss provision was estimated as a function of a vector of bank-specific and a vector of macroeconomic variables using OLS. The dataset used included 207 Italian banks whose accounting ratios are available for at least five consecutive years in the period between 1985-2002. After checking for robustness, the author concluded that banks' loan loss provisions and new bad debts are affected by the evolution of the economy. More specifically they get worse during a recession and after it mainly because banks stiffen credit supply during recessions, thus further intensifying the downbeat impact of the business cycle.

Later on, the research started specifically mentioning the NPL ratio since NPL data became more available. This was the year that the majority of central banks started having complete NPL data. Data availability along with the idea that NPL connectedness can appear in a spatially related group of countries motivated Espinoza and Prasad (2010) to use a panel data sample set and various methods of estimation -OLS, fixed effects, difference GMM (following Arellano and Bond, 1991), and System GMM (Blundell and Bond, 1998)- to examine the macroeconomic determinants of the NPLs of the 80 banks of Gulf Cooperative Council for the period 1995-2008. They found that both macroeconomic variables and bank-specific variables caused NPL build-up in the GCC countries. Furthermore, NPL ratios increase during recession periods (risk aversion decreases) as well as when interest rates increase. Hence NPLs and real (non-oil) GDP growth were found to have a significant reverse relationship. Following this paper the research attempted to analyse a greater group of countries, with Reinhart and Rogoff (2011) using aggregate data covering 70 countries worldwide to study the dynamics of observed patterns of default and banking crises in those countries. They used Logit, OLS and OLS with robust errors to specifically test three hypotheses: firstly, whether there is a general increase in private debt or not, secondly, that banking crises are observed before a sovereign debt crisis and, thirdly, that public borrowing also accelerates before those. After running a VAR model including dummies for 290 banking crises and 209 sovereign default episodes, they concluded that banking crises (which could be generated by an accumulation of NPLs) can lead to a sovereign crisis. In this point it becomes clear that the most popular method of NPL data analysis is VAR with or without using instrumental variables (GMM) for the estimation.

Greece has consistently experienced the highest NPL ratios in Eurozone. Louzis et al. (2012) examined the NPLs dynamics of the Greek banking system. Working on a dataset for the years between 2003-2009, he examined three major loan types (mortgage, business, and consumer) by checking data from the largest 9 Greek banks. By applying dynamic panel data GMM methods he inferred that the impacts of the macroeconomic variables were rather durable among alternative models where bank-specific factors were used as explanatory variables. Other results showed that, for all three loan categories, NPLs in the Greek banking system can be explained mainly by macroeconomic variables (GDP with negative sign, unemployment with positive sign, interest rates with positive sign, public debt positive sign

thus verifying the sovereign debt hypothesis) and management quality which was found to have negative effects on NPLs. Moreover, bank-specific variables (e.g., performance, efficiency) possess supplementary explanatory power when added into the baseline model thus lending support to the 'bad management' hypothesis linking these indicators to the quality of management. Finally, he also found that non-performing mortgages are less sensitive to the macroeconomic conditions than the other two types of loans, which is coherent with Espinosa and Prasad (2010). A group of high NPL ratio countries was also studied by Castro (2013) using a sample of financial institutions from high NPL ratio countries (GIPSI, which is Spain, Portugal, Italy, Ireland, and Greece) in eurozone and employing dynamic panel data methods to these five countries over the period 1997–2011, concluding that the main macroeconomic factors for NPLs are GDP growth, the index housing prices, unemployment, interest rates, the exchange rate, and credit growth.

Based on the spatial interdependence of NPLs, the literature also attempted examining the reverse relationship between NPLs and the economy (feedback effects which are examining how NPLs can affect the macroeconomic state of the economy). Klein (2013) researched NPLs in Central, Eastern and Southeastern Europe (CESEE) between 1998-2011. The researcher included both macroeconomic and the financial variables to find that banking factors have a relatively lower explanatory power than macroeconomics ones. One novelty of this paper is examining the feedback effects which indicated strong macroeconomic and financial linkages in the (CESEE) area. Those feedback effects were prominent from the banking system to the real economy and depend strongly on macroeconomic condition changes.

Later on, literature started focussing on specific variables affecting NPLs more than others. Unemployment was one of them with Messai and Jouini (2013) utilising a dataset of 85 Greek, Italian and Spanish banks between 2004-2008 contacting research to find that NPL evolution could be explained by three bank specific factors (asset profitability, reserves for the loan losses and the change of the loans granted) among with macroeconomic variables, especially unemployment, which was positively connected with the creation of NPLs. The research outcomes were analogous to the ones of Louzis et al. (2012), revalidating that rapid credit growth in 2000–2005 predicted the relative amount of non-performing loans only if it was combined with a current account deficit, as mentioned in Kauko (2012). Ozili (2015) focused

on loan loss reserves and studied NPL ratio levels within different stages of the business cycle. In the same paper he talked about the relationship between banks' balance sheets and NPL generation. By utilising a dataset of 82 banks from Europe, US, Africa and Asia with annual bank data for the period 2004-2013, he inferred that banks change both the level of loan loss reserves and the rate of loan growth in order to cut the size of NPLs, while loan diversification is not effective. The author also supported the procyclical behaviour of NPLs providing further evidence for the existence of macro-financial inter-linkages and cyclical interactions between the state of the economy and NPLs.

In the same year, exchange rates and banking concertation were in the attention of authors with Beck et al. (2015) using a dynamic panel data method set to examine the role of macroeconomic factors on NPLs across 75 countries during 2000-2010. They found that the factors which were significant and affect the NPL ratio are share prices (negatively), real GDP growth rate (negatively), lending interest rates (positively) and nominal exchange rate (positively). Their econometric assessment, using GMM, showed that the real GDP growth was the most important driver of the NPL ratio during that decade. They also talked about the inclusion of exchange rates in "macro-stress tests" (which typically underpin scenarios for a rise in NPLs) with a macroeconomic scenario for real GDP and they showed that lower bank asset quality is associated with exchange rate depreciations, while a drop in share prices is related to an increase in NPLs. Çifter (2015) in a study of ten Central and Eastern European countries investigated how banking concentration affects NPLs. He ran a dual analysis (short-run and long-run). For the short-run effects analysis, generalised method of moments system and the instrumental variable approaches were used, while the long-run effect was tested with the fully modified ordinary least square (FMOLS) approach, concluding in the bank concentration being an insignificant factor on the NPLs and even its sign was ambiguous.

Taxation was proven to affect NPLs when Anastasiou et al. (2016) examined the determinants of NPLs in the Euro-Area including macroeconomic variables. By using GMM estimation methods showed that tax on personal income and the output gap can be used as explanatory variables to predict NPL behaviour. In another research they conducted for the Bank of Greece, Anastasiou et al. (2016) used both Fully Modified OLS and Panel Cointegrated VAR methods for a dataset for the years 2003-2013 and for two groups of 14 countries, euro-area

core and periphery. They found that NPLs are determined by the same macroeconomic and bank-specific conditions, but the responses seem more prominent in the EU periphery. They rejected the quality hypothesis of model coefficients being equal between EU core vs the periphery by using a chi-square test, thus revealing another aspect of banking fragmentation in the euro area. In a similar context, Anastasiou (2016) examined whether credit and business cycles affect the ex-post credit risk (i.e., non-performing loans) in Italy. Following a fixed and random effects and a dynamic GMM estimation method approach he found that increasing NPLs in Italy – especially after 2008 – were formed mainly because of worsened macroeconomic conditions (i.e., bad phase of business cycle) and due to excess credit. He showed that credit cycle mainly persists on the static model, while business cycle found to exert only some significance in the dynamic model. Finally, he insisted on GDP growth not being a very significant variable hence stating that a macro-prudential approach to financial stability would be advisable.

At this point GMM method became the most popular estimation method[1] since the lagged variables of NPLS can be used as great instruments for GMM estimation. Vithessonthi's (2016) research was focused for NPLs and bank credit growth in Japan in the period 1993-2013. The author employed both OLS and two-step GMM to find a positive relationship between NPLs and bank credit growth before the 2007 economic crisis and a negative link after the crisis. Paper's conclusions mentioned that a rise of credit growth not inducing higher bank profitability.

Gosh (2017) used disaggregate data to study sector specific NPLs in the US for the 100 largest commercial banks over the period 1992-2016. After using a two-step system-GMM estimation adjusted with correction for standard errors, evidence was provided that banks with more capital option to slack credit checking and liberal lending policies that eventually lead to rising NPLs. As far as the macroeconomic determinants of NPLs are concerned, findings embraced higher inflation significantly reducing total, real estate and individual NPLs since it makes debt repayments cheaper. Results are consistent with those of Klein (2013), Skarica (2014). Real GDP growth significantly reduces total and real estate NPLs, contrary to

[1] See also Radivojević, Nikola, et al. "Econometric model of non-performing loans determinants." Physica A: Statistical Mechanics and its Applications 520 (2019): 481-488.

that, unemployment rates grow (in line with Ghosh (2015), Louizis et al. (2012), Makri et al. (2014), Messai and Jouini (2013), Nkusu (2011), Skarica (2014)). When debt servicing becomes more expensive due to a rise in 30-year fixed mortgage rate, NPLs increase, leading to more loan defaults as Beck et al. (2015), Espinoza and Prasad (2010), Louizis et al. (2012), and Messai and Joiuni (2013) suggested.

Latest trends in the literature include the introduction of heterogeneity among banks as Grigoli et al. (2018) did. They developed a three-stage model to generate forecasts of macro-financial variables and project NPLs which entails banks' heterogeneous reactions to macro-financial shocks in a dynamic context. In their dataset for 22 banks in Ecuador between 2002-2015 they ran a VAR model to show that under July 2016 IMF's oil price projections, the forecasts for macro-financial variables were expected to negatively affect the NPL ratio as well as those results change when heterogeneity is assumed.

Of course, literature still includes classic reproduction of NPL analysis focusing on specific geographical areas and not just specific variables. Koju et al. (2018) evaluated the macroeconomic and bank-specific determinants of non-performing loans (NPLs) in the Nepalese banking system using both static and dynamic panel estimation approaches (30 Nepalese commercial banks from 2003 to 2015, utilising 7 bank-specific and 5 macroeconomic variables to assess the impact of banking management and economic indicators on NPLs). The findings indicate a significant positive relationship between NPLs and the export to import ratio, inefficiency, and asset size, and a negative relationship with GDP growth rate, capital adequacy, and inflation rate. The empirical results identify low economic growth as the primary cause of high NPLs in Nepal and suggest that efficient management and effective financial policies are necessary for a stable financial system and economy. Likewise, Mishra et al. (2020) used a panel dataset for 40 public and private banks in India, for the period March 2010 to June 2019 and by using GMM showed that -in contrast to most prior studies- GDP growth is found to have an insignificant determinant of NPLs.

Abusharbeh (2020) used a panel dataset for Palestinian banks to produce fixed and random effects estimates form the period of 2007 to 2018. The author concluded that interest and credit supply positively impact nonperforming loans (NPLs) with statistical significance, while

profitability has notable negative connection with NPLs. Results showed that the high interest is promoting a reduction in the ability of borrowers to repay their loans and an increase in the credits default crisis, while highly profitable banks tend to display lower credit quality.

In a combining determinants context[2], Ahmed et al. (2021) explored the relationship between bank-specific and macroeconomic determinants of NPLs for Pakistan from 2008 to 2018 due to a significant rise in NPLs in the Pakistani banking sector. The authors utilised the system GMM estimator, whose reliability hinges on the validity of the instruments also testing for serial correlation with a J test and the Arellano–Bond AR (2) test. Findings included credit growth, net interest margin, loan loss provision, and bank diversification significantly increasing NPLs, while operating efficiency, bank size, and ROA reducing NPLs. Additionally, higher interest rates, exchange rates, and political risk significantly elevate NPLs, whereas GDP growth reduces them. Similarly, Rathnayke (2021) examined NPLs in Sri Lanka between 2008-2018 using panel data regression analysis on a sample of eight licensed commercial banks using both macroeconomic factors and bank-specific factors (the real interest rate, annual GDP growth rate, annual inflation rate, exchange rate, unemployment rate, the efficiency of the bank, bank size, lending rate, and ROA). The results indicate that GDP growth rate, exchange rate, unemployment rate, inflation rate, and bank size significantly impact non-performing loans in the Sri Lankan banking sector. However, bank efficiency and return on assets (ROA) do not show a significant correlation with NPLs. Among these variables, only the exchange rate has a positive relationship with NPLs, while the others display a negative relationship.

Covid crisis effects on NPLs were also examined in a combining determinants context with Zunic et al. (2021) using secondary data of Bosnia and Herzegovina banking sector The analysis included the variables non-performing loans, GDP, loan loss provisions, and a COVID-19 dummy variable, revealing a significant impact of all three variables. The results showed macroeconomic variables affecting NPLs more than bank-specific ones as well as COVID-19 having a delayed effect on NPLs, which was anticipated due to loan payment freezes during the pandemic.

Another study that combined determinants was that of Syed and Aidyngul (2022) including macroeconomic and bank-specific NPL determinants for developed and developing countries. By using dynamic GMM techniques for the period from 1995 to 2019, concluded that the macroeconomic and bank-specific factors that affect NPLs for both developed and developing countries are growth rate, inflation, interest rate, capital adequacy ratio, credit to deposit ratio, and bank credit to the private sector. However, only for developing countries, household consumption, unemployment, and exchange rate, return on bank assets, bank asset to GDP, and bank credit to the government sector are significant determinants. Equally, Chowdhury et al. (2023) examined the impact of bank-specific and macroeconomic factors on NPLs in Islamic banks in Bangladesh, from 2007 to 2018. They used OLS estimation to find that macroeconomic factors (GDP growth and inflation) significantly influence NPLs, while bank-specific factors (loan growth, loan-to-asset ratio, and net interest margin) can reduce NPLs.

Contrary to previous studies, bank-specific determinants found to have stronger effects, when Umaternate et al. (2023) used secondary data from 2016 to 2021 and PLS techniques to study NPLs of 18 small Banks in Indonesia. Findings indicated that main influences on NPLs come from bank-specific determinants (such as Bank Size and CAR), whereas macro-determinants do not affect NPLs in this study, namely, factors caused by economic conditions such as inflation and interest rates. This can be explained by the spatial characteristics of Indonesia, as for countries with distinct geography (e.g., Iceland, Indonesia, New Zealand) it seems that NPLs are affected more by bank-specific determinants rather than macroeconomic ones.

Recently, Kartal et al. (2023) found that economic growth is very important in predicting the evolution of Turkish NPLs. The authors used quarterly data from 2005 to 2019 to explore both the long-run and short-run relationship between NPLs and economic growth in Turkey. They found that economic growth greatly affects NPLs as well as that the credit growth in the period with the increasing NPLs positively affects economic growth in Turkey. The literature seems to have also started catching up with the inclusion of uncertainty, with Zegiraj et al. (2024) examining how uncertainty affected NPL creation during three systemic crises, the 2007-2009 global financial crisis, the 2010-2012 European union debt crisis and the Covid-19

crisis. Their results indicate that, because of the swifter government response to the last crisis, NPLs were the most affected. They concluded that the Economic Policy Uncertainty Index is a good indicator for the NPL growth after Covid-19, contrary to older findings referring to the two previous crises.

2.2 Bank specific

The second branch of the literature explores bank-specific determinants of NPLs. These determinants are typically incorporated into NPL studies through a series of foundational assumptions. Berger and DeYoung (1997) identified four primary hypotheses that underpin this area of research: bad luck, bad management, skimping, and moral hazard. This categorisation will be adopted for the remainder of this section to provide a structured analysis of these determinants. It is essential to emphasise the importance of timing in this context, particularly the intertemporal relationships present within the data, as these assumptions often involve dynamic processes. Additionally, these hypotheses are not mutually exclusive and can occur concurrently, highlighting the multifaceted nature of NPL formation. Given the focus of this paper on the factors contributing to the rise in NPLs, the discussion will address each hypothesis specifically within this framework. The following sections will provide a detailed examination of each of these hypotheses.

1. ***Bad luck hypothesis***: unfortunate events, such as local plants closing, lead to an increase in NPLs that, in turn, lead to a rise in effort and costs managing them. So, with the timing being bevy important here, first we have an NPL increase and then cost efficiency declines.
2. ***Bad management hypothesis***: this is the opposite, we can say, Granger-cause[3] relationship, where declined cost efficiency due to inadequate/poor management leads to an accumulation and/or increase in existing NPLs.
3. ***Skimping hypothesis***: this refers to high levels of efficiency leading to a rise in NPLs. More specifically, it has to do with the trade-off relationship between future loan

[3] Someone can notice that I am using the Granger causality relationship here, which refers to the process of predicting future values of time series using past values of another. Granger causality is not necessarily true causality, but it rather refers to the observed temporal relationship between two variables.

performance efficiency vs. short term reduction in operational costs. Should a bank strategise long-run profits more than short-term costs, the skimping assumption comes into place.

4. ***Moral Hazard hypothesis***: this was actually the first hypothesis appearing in this branch of the literature referring to excessive risk taking. Practically, it suggests that a current reduction in lending costs—achieved by exerting less effort to ensure loan quality—Granger-causes a future increase in NPLs. It is worth mentioning here that moral hazard mainly applies to bank profiles with low financial capital, i.e., low equity-to-asset ratio. This is where the moral hazard incentives are realised.

Turning to the literature, it is instructive to examine how these assumptions have been utilised to motivate further research. The moral hazard hypothesis was among the first to be investigated, with Keeton and Morris (1987) providing a foundational study in this area. Using a sample of 2,470 US commercial banks over the period 1979–1985, they tested the moral hazard hypothesis within a dynamic panel data framework. Their findings demonstrated that banks engaging in higher risk-taking behaviour, particularly through excessive lending, ultimately incurred greater losses.

Following this, a particularly influential contribution to the bank-specific determinants literature emerged, which significantly advanced the understanding of these dynamics. This pivotal work forms the basis for much of the subsequent research in this area and highlights the continued relevance of these assumptions in explaining non-performing loan formation. Berger and De Young (1997) used a sample of variables concerning US commercial banks for the period between 1985-1994. By using Granger-causality techniques they tried to identify all four major relationships: “bad luck”, “bad management”, “skimping”, and “moral hazard” which concerned the relationship between loan quality, cost efficiency and bank capital. They concluded that the ‘’bad management’’ hypothesis was the greatest to the rest, along with low bank capital ratios, providing moral hazard incentives for a poorly capitalised bank to adopt a riskier loan portfolio.

The moral hazard hypothesis continued to attract significant attention in the literature, with subsequent studies exploring the topic using alternative estimation techniques to gain deeper

insights. For instance, Kwan and Eisenbeis (1997), employing a simultaneous equations methodology, investigated the operational efficiency of 252 banking organisations. Their findings revealed that inefficient banks were more inclined towards risk-taking behaviours, reinforcing the notion that operational inefficiencies can exacerbate a bank's exposure to credit risks. This study expanded the understanding of moral hazard by linking it to internal inefficiencies, thereby highlighting another dimension of risk-taking behaviour.

In addition to moral hazard, the role of regulation in mitigating risk and enhancing bank stability became an important focus within the literature. Barth et al. (2004), for example, utilised a newly constructed global database on banking regulations to examine the impact of regulatory and supervisory strategies on bank performance. Their analysis concluded that regulatory frameworks that empower the private sector—while simultaneously addressing adverse incentive effects caused by generous deposit insurance—are the most effective in promoting financial stability and bank performance. This contribution underscored the critical interplay between regulatory design and risk management in mitigating moral hazard and fostering a more stable banking environment. These two studies collectively demonstrate how the literature has examined moral hazard and regulatory frameworks as interrelated factors influencing bank risk-taking and performance, providing a nuanced understanding of the mechanisms underlying non-performing loans.

A key commonality between this section and the previous one on macroeconomic determinants is the widespread adoption of Generalised Method of Moments (GMM) as the preferred estimation technique in the NPL determinants literature. This methodological trend is similarly evident in the analysis of bank-specific determinants. Podpiera and Weill (2008) extended Berger and DeYoung's (1997) work by applying GMM dynamic panel methods. They examined how cost efficiency affects NPLs by broadening the econometric techniques methods (Panel Data, GMM, OLS). Their dataset concerned every Czech bank for the period 1994 – 2005. They employed GMM and Panel Data methods on top of the Granger Causality framework of Berger and De Young (1997) to find further support for the bad management hypothesis. In a similar way, Rossi et al. (2009) worked on a Berger and DeYoung (1997) extended model used a unique dataset of 96 largest Austrian commercial banks provided by the Austrian Central Bank 1997-2003 and by using panel data showed that although

diversification negatively affects cost efficiency, it increases profit efficiency and reduces banks' realized risk; diversification seems to have a positive impact on banks' capitalization.

A big part of the papers of this branch of the literature focuses on specific geographical areas, aligned with the previous branch. Ghosh (2015) used a dataset of 50 US states and Washington DC for the period 1984–2013, he utilized both regional economic determinants and state-level banking variables to study the determinants of all commercial banks and all saving institutions' NPLs. His econometric methods were fixed effects and dynamic-GMM estimations. He used bank-specific variables (credit growth, bank capitalization, loan loss provisions, bank diversification, bank profitability, operating efficiency, and size) in conjunction with regional macroeconomic variables (inflation rate, economic activity, the state house price index and the state home ownership ratios) and nationwide economic determinants (real interest rate and the state of federal public finances). What he found was poor credit quality, liquidity risk, bank inefficiency, capitalization needs and banking industry size along with unemployment rates of each state, inflation, and US public debt cause an increase in the NPL ratio. Conversely, a decrease in NPLs is caused by higher real state GDP, an increase in the state housing price index and higher real personal income growth rates. Comparably, Zhang et al. (2016) studied data for Chinese commercial banks and observed moral hazard and cyclical instability that fed into NPLs.

Nigerian and Indonesian bank systems were also examined, with El-Maude et al. (2017) used a non-survey research design and secondary data of 10 banks out of 15 quoted by the Nigerian Stock Exchange (NSE) to study the connection between bank specific and macroeconomic determinant of non-performing loans in Nigerian deposit money banks between 2010 and 2014. The findings reveal a significant positive relationship between NPLs and both the loan-to-deposit ratio and bank size. In contrast, the relationship between the capital adequacy ratio and inflation is positive but insignificant, while the return on assets has a negative but insignificant relationship with the rate of NPLs. Based on these findings, they recommended that the Central Bank of Nigeria (CBN) should regularly assess the lending practices of deposit money banks for policy purposes, as well as, strengthening the securities market to positively impact the overall improvement of banking institutions, thereby enhancing the effectiveness of the financial sector. On the same premise, Rachman et al. (2018) created a panel data set

from 36 commercial banks listed on the Indonesian Stock Exchange during the period 2008-2015. Using a fixed-effects panel regression model, the study revealed that the profitability and credit growth of Indonesian banks negatively influence the number of NPLs. Furthermore, banks with higher profitability tend to have lower NPLs as they can afford adequate credit management practices. Similarly, banks with higher credit growth exhibit lower NPLs, indicating more specialised lending activity and better credit management systems. These findings suggest that to reduce loan defaults and improve asset quality, banks should maintain their profitability levels and increase, rather than decrease, their credit supply to borrowers.

Skimping hypothesis was tested by Lee et al. (2019) for European conventional banks, considering macroeconomic factors, dimensions of country governance, and bank-specific characteristics, using a panel data set from 1,053 conventional banks for the period 2007-2016. Consistent with the skimping hypothesis, NPLs have a significant positive relationship with cost efficiency. The authors used the Hodrick–Prescott filter to excerpt the business cycle and credit cycle from real GDP and credit to the private non-financial sector, respectively. The system-GMM was then employed to pinpoint significant determinants of NPLs. Findings include that NPLs are primarily driven positively by lagged-one NPL and risk profile. The findings align with the Austrian business cycle theory[4], showing that NPLs are relatively low during periods of rapid economic growth driven by credit-sourced business booms and increase during business busts when credit creation slows down. This paper also underlined the importance of country governance claiming that policymakers should introduce strategies aimed at improving country governance dimensions.

Going back to regional analysis papers, Hajja (2020) analysing a dataset of dynamic panel-data of 19 commercial banks in Malaysia over 2002–2011 and by using GMM found that increasing the capital will initially increase the NPLs until NPLs reach a maximum threshold. Furthermore, Pakistani banks were explored as well by Khan et al. (2020) were they concluded that operating efficiency and profitability indicators have a negative correlation with NPLs but

[4] Austrian business cycle theory is an economic theory developed by the Austrian School of economics trying to explain how business cycles occur. The theory perceives business cycles as the result of excessive growth in bank credit due to artificially low interest rates set by a central bank/ fractional reserve banks.

were statistically significant, while capital adequacy and income diversification have a negative correlation with NPLs but were statistically insignificant. The authors used a fixed and random effects model for a sample of the commercial banks in Pakistan Stock Exchange between 2005–2017, evaluating profitability, operating efficiency, capital adequacy and income diversification.

Analogously, Kjosevski and Petkovski (2021) used a panel of 21 Baltic State commercial banks (Estonia, Latvia, and Lithuania), using annual data from 2005 to 2016. To mitigate the risk of producing inconsistent and biased results by relying on a single estimation technique, they employed three alternative estimation models: the fixed-effects model, the difference Generalised Method of Moments, and the system Generalised Method of Moments. Findings entailed most significant macroeconomic factors influencing NPLs being GDP growth, public debt, inflation, and unemployment. Regarding bank-specific determinants, NPLs were mainly affected by equity-to-total-assets ratio, return on assets, return on equity, and growth of gross loans.

A more specific hypothesis analysis was conducted by Ersoy (2022) examining the determinants of non-performing loans (NPLs) in the Turkish banking sector during the period from 2010 to 2019. Findings verify the moral hazard hypothesis by a negative relationship between the capital adequacy ratio and NPLs. Additionally, the positive relationship between the other operating expenses to total assets ratio and the non-performing loans ratio supports the bad management hypothesis. The author utilised the pooled OLS (POLS), fixed effects (FE), and system GMM (SGMM) methods. The empirical results indicate that the capital adequacy ratio and GDP growth rate have a statistically significant negative effect on the NPL ratio. Conversely, operating efficiency, income diversification, the first lagged NPL ratio, and inflation are positively associated with the NPL ratio.

Recently, Mamoon et al. (2024) investigates the role of central bank independence and transparency in reducing non-performing loans (NPLs). It argues that politically independent central banks are more effective in curbing risky lending behaviour compared to their dependent counterparts. Independence allows central banks to implement stricter regulations, such as higher capital requirements and rigorous loan screening, while also

enforcing penalties for late payments. Conversely, opaque central banks can encourage excessive risk-taking and poor banking practices. The findings reveal that greater central bank independence and transparency significantly reduce NPLs, contributing to financial stability and economic growth. These results emphasise the importance of transparent policies and independent central banks in improving banking efficiency and reducing credit risks, especially in both developed and emerging economies. Also Nguyen (2024) examined the management of non-performing loans (NPLs) in Vietnam's banking sector, noting that while NPLs have been well-controlled since 2005, challenges in forecasting changes in asset quality persist due to macroeconomic and systemic factors. Key findings include the influence of high legal and rescheduling costs, poor bank management, and political interference on NPLs, particularly in state-owned banks. Larger banks tend to have lower NPLs due to economies of scale and better market power, while macroeconomic factors such as inflation, real interest rates, currency depreciation, and economic cycles significantly affect NPL levels.

Furthermore, Arjum (2024) investigated the factors influencing non-performing loans (NPLs) in the banking sector of Bangladesh using panel data from 2008 to 2021 across four categories of banks. A fixed-effect regression model is employed to analyse the effects of both bank-specific variables (ROA, ROE, CRAR) and macroeconomic factors (GDP growth, money supply, real interest rates, and domestic credit to the private sector) on the NPL ratio. The findings reveal that ROA and ROE do not significantly impact NPLs, while a higher CRAR ratio is crucial in improving NPL conditions. Among macroeconomic variables, GDP growth and domestic credit to the private sector are the most influential factors affecting NPLs. The study recommends that policymakers prioritise enhancing the CRAR of banks through central bank and government policies. It emphasises the importance of improving corporate governance, conducting rigorous loan evaluations, and ensuring loans are granted based on commercial rather than administrative considerations. Effective recovery efforts are also encouraged to prevent loan defaults. Additionally, the enforcement of existing banking laws and regulations is highlighted, with punitive measures suggested for noncompliance with agreements or performance targets. Author’s recommendations aim to strengthen the banking sector and reduce NPL levels in Bangladesh.

2.3 Loan specific

This last family of papers mainly refers to papers that examine the impact of the regulatory environment on NPLs. The first loan-specific analysis was conducted by Sinkey and Greenawalt (1991) where they used a sample of 154 U.S. commercial banks, between 1984-87, to show that loan-loss rates in 1987 were positively correlated with loan rates, volatile funds, and loan volume from the preceding three years. In contrast, banks with "adequate capital" in the preceding three years tended to have lower loss rates.

According to Boudriga et al. (2009) in regions with weaker credit institutions and political systems, one way to reduce NPL is through strengthening the political and legal system to enhance transparency and democracy. The loan-specific analysis already been done in existing literature has been conducted by analysing the disaggregated level of NPLs. The empirical findings of this paper suggest that a higher capital adequacy ratio (CAR) and a prudent provisioning policy tend to reduce the level of NPLs. The study also highlights the beneficial impact of private ownership, foreign participation, and bank concentration. However, the results do not support the notion that market discipline leads to better economic outcomes. Regulatory measures do not significantly reduce problem loans in countries with weak institutions, a corrupt environment, and limited democracy. Ultimately, the research indicates that the most effective way to reduce bad loans is by strengthening the legal system and increasing transparency and democracy, rather than focusing on regulatory and supervisory issues.

Like the two previous branches of literature, many papers focus on specific geographical areas as well. Accornero et al. (2017) examined non-performing loans and the supply of bank credit in Italy. They found that the way NPLs evolve in the economy does not affect banks' lending behaviour. Negative correlation between credit growth and NPL ratios is mostly due to alterations in firms' conditions and due to contractions in their demand for credit; in other words, only demand-side effects affect the relationship between NPLs and credit growth. Italy is a very interesting case because of the notoriously strong structural relations between banks and firms as well as the two observed recessions between 2008-2015. Structural changes-wise, the amendments in write-downs (see Asset Quality Review) and NPLs demanded by the

supervisors were bad news for both banks and borrowers. As a final remark, what is interesting is that this paper indicates that NPLs' role in shaping bank behaviour might be easily overestimated. Similarly, Ismail et al. (2017) studied the impacts of bank efficiencies towards NPLs of 7 local commercial banks in Malaysia from 2008 until 2015. They used OLS to examine the influence of return on assets, loan of assets, provision loan and losses, bank size and non-interest income on NPL. Their research outcomes clearly indicates that an increase in bank efficiencies decreases NPL.

More recently, Ferreira (2022) showed that after the financial crisis there is strong evidence that bank regulation helped reduce the NPLs, but only in non-high-income and non-OECD countries in a panel of 80 countries from all continents over the period 1999–2019, using panel GMM with data from the World Bank Global Financial Development database. The results show that banks with high profitability, market stability, and located in countries with economic growth tend to have lower non-performing-loans-to-total-loans ratios. In contrast, higher ratios are strongly associated with increased bank-cost-to-income ratios, market concentration, and bank regulation. Additionally, the paper explores the impact of each country's income level and economic integration. The findings indicate only minor differences between high-income and non-high-income countries, as well as between OECD and non-OECD countries. Overall, the study demonstrates that promoting economic growth is the most effective way to reduce the non-performing-loans-to-total-loans ratio, thereby lowering the risk of banking losses and potential financial crises. Another interesting study by Hughes and Moon (2022) developed a stochastic frontier estimation-based technique for data from 2010, 2013, and 2016 on top-tier U.S. bank holding companies to decompose NPLs into 3 categories: the best-practice ratio representing the inherent credit risk of the loan portfolio, the excess ratio representing lending inefficiency, and statistical noise. They found that the largest banks (those with consolidated assets exceeding $250 billion) experience the highest ratio of non-performance among the five size groups resulting from lending to riskier borrowers, rather than inefficiency in lending. They also concluded that market discipline seems to reward riskier lending at large banks and discourage lending inefficiency at all banks, with these incentives increasing over time.

Corporate governance effects on NPLs were another loan-specific determinant that was studied lately, with Lee al. (2022) showing a significant positive relationship between share collateralization by directors of firms and bank's NPLs. They studied a panel of 32 listed banks in Taiwan and found a significant positive connection between the related party transaction of firm and bank's NPLs, showing that bad corporate governance is an important warning for the firm or the bank. They concluded that financial intermediaries of bank have special qualities that intensify standard corporate governance problems.

Last but not least, Barra and Ruggiero (2023) used highly territorially disaggregated data to estimate the impact of bank-specific factors (growth of loans, reflecting credit policy; log of total assets, controlling for banks' size; loans to total assets, reflecting the volume of credit market; equity to total assets, capturing the solvency of banks and reflecting their capital strength; return on assets, reflecting the profitability of banks; deposits to loans, reflecting the intermediation cost; cost of total assets, reflecting the banks' efficiency or volume of intermediation cost) on NPLs in Italy between 1994–2015 using a fixed-effect estimator. Findings revealed that regulatory credit policy, 28apitalization, volume of credit and volume of intermediation costs are the main bank-specific factors affecting non-performing loans.

Hakimi et al. (2024) examined the relationship between financial inclusion (FI) and non-performing loans (NPLs) in the MENA region, with a focus on the role of board characteristics. The findings reveal that greater financial inclusion, measured through access, usage, and a financial inclusion index, significantly reduces NPLs. A complementary relationship between FI and board characteristics further lowers NPLs, with smaller board sizes and more independent directors being particularly effective. Large boards are linked to higher NPLs due to inefficient decision-making, while independent directors enhance governance, transparency, and loan quality. The study highlights the need for MENA countries to adopt inclusive financial systems and governance reforms, emphasising FI's access and usage dimensions and promoting effective board composition. While the findings provide useful policy insights, the study notes limitations, including its focus on quantitative FI measures and treating MENA banks as a homogenous group despite regional differences.

3. A new behavioural approach

The second part of this literature review aims to create a novel categorisation of the papers in the NPL determinants bibliography introducing two new categories: papers that include behavioural NPL determinants and papers that include determinants concerning almost solely variables depicting the economic conditions where the loans were formed under. I named these categories behavioural and non-behavioural determinants, respectively, while creating a table organising this categorisation.

In order to introduce this dichotomy in NPL determinants and their respective papers, I novelly distinguish between two broad categories of non-performing loan (NPL) determinants: behavioural and non-behavioural. Behavioural determinants are those that stem from the internal decision-making processes within banks, particularly those shaped by incentives, risk preferences, and agency problems. These factors often arise due to misaligned incentives between managers and shareholders, moral hazard created by deposit insurance or expectations of government support, and strategic risk-taking—especially in banks with weaker capital positions. Such determinants reflect the choices banks make, such as loosening credit standards, reducing monitoring efforts, or pursuing overly aggressive lending strategies, and are largely endogenous to the institution's structure and governance.

On the other hand, non-behavioural determinants refer to external, exogenous factors that influence borrowers' ability to repay their loans. These typically include macroeconomic and structural variables such as GDP growth, unemployment rates, interest and exchange rate movements, and broader economic shocks. These factors affect NPLs through the repayment capacity of borrowers rather than through banks' internal conduct. In that sense, they reflect the economic context in which banks operate, rather than the behavioural responses of the banks themselves.

I should note here that although some of the papers reviewed touch on both macroeconomic and bank-specific determinants, I have included those in the section where their impact on future papers was more profound. However, wherever that was not possible, they were included in the non-behavioural category. This is primarily because the findings in most of

these studies point to macro-level variables having a more significant effect on NPLs than bank-specific ones. Furthermore, these studies do not follow the bank-specific hypothesis framework that I discuss in the next section. For these reasons, I have chosen to group them with the non-behavioural, macroeconomic literature for the sake of thematic consistency. Henceforward, I will start my analysis with the behavioural aspects of NPL determinant before presenting the non-behavioural ones given my initial observation that the first paper in this analysis is of behavioural determinants nature.

Paper	***NB***	***B***
Keeton and Morris (1987)		x
Berger and De Young (1997)		x
Kwan and Eisenbeis (1997)		x
Barth et al. (2004)		x
Rinaldi and Sanchis-Arellano (2006)	x	
Podriera and Weil (2007)		x
Quagliarello (2007)	x	
Boudriga et al. (2009)		x
Rossi et al. (2009)		x
Espinoza and Prasad (2010)		x
Reinhart and Rogoff (2011)	x	
Louzis et al. (2012)		x
Klein (2013)	x	
Messai and Jouini (2013)	x	
Gosh (2015)	x	
Ozili (2015)	x	
Beck et al. (2015)	x	
Cifter (2015)	x	
Anastasiou et al. (2016)	x	
Anastasiou (2016)	x	
Vithessonti (2016)	x	
Zhang et al. (2016)		x
Accornero et al. (2017)	x	

Gosh (2017)	x	
Grogoli et al. (2018)	x	
Mishra et al. (2020)	x	
Hajja (2020)	x	
Khan et al. (2020)		x
Ahmed et al. (2021)		x
Kjosevski and Petrovski (2021)	x	
Rathnayke (2021)	x	
Ersoy (2022)		x
Hughes and Moon (2022)		x
Zunic et al. (2022)	x	
Ferreira (2022)	x	
Lee et al. (2022)		x
Barra and Ruggiero (2023)		x
Chowdhury et al. (2023)	x	
Kartal et al. (2023)	x	
Zegiral et al. (2024)		x
Mamoon et al. (2024)		x
Hakimi et al. (2024)		x
Nguyen (2024)	x	
Arjum (2024)	x	

Table 2 NPL determinants papers categorized in Behavioural (B) and Non-Behavioural (NB), Author's compilation

3.1 Behavioural aspects

The first branch of the literature includes behavioural determinants. The traditional way of including those determinants in an NPL study is in a form of an assumption. Keeton and Morris (1987) were of the first working on this literature branch. They tried to isolate the factors that contributed to NPL formation in a sample of 2470 US commercial banks, between 1979-1985, by questioning whether the increased loan losses in their balance sheets happen due to spatial deregulation or poor managerial decisions associated with excess risk-taking. This was the first step in NPL literature that introduced behavioural elements. However, it doesn't

provide a formal theory of determining the behavioural factors of loan losses, yet the explanations coming from differences in managerial decisions are determined residually. The most formally clear statement of behavioural hypotheses was done by Berger and De Young (1997) in the most cited paper in this category covering a sample of variables concerning US commercial banks for the period between 1985-1994. Following the same premise of Keeton and Morris and using Granger-causality techniques they tried to identify four major behavioural relationships in the form of hypotheses: "bad luck", "bad management", "skimping", and "moral hazard" which concerned the relationship between loan quality, cost efficiency and bank capital. They concluded that the ''bad management'' hypothesis was the greatest to the rest, along with low bank capital ratios, providing moral hazard incentives for a poorly capitalised bank to adopt a riskier loan portfolio. The moral hazard hypothesis was studied again from the bank risk-taking and efficiency perspective the same year by Kwan and Eisenbeis (1997). Using a different methodology (simultaneous equations) in investigating the operating efficiency of 252 banking organisations proceeded that those inefficient banks are more prone to risk taking.

Again, the moral hazard hypothesis was studied in Piguvian[5] analysis papers checking how increased deposit insurance intensifies the moral hazard problem in banks. These papers examine how favouring government intervention can resolve issues arising from existence of formed monopolies, information asymmetries and externalities. In this paper by Barth et al. (2004) analysed a newly constructed database on bank regulations to infer that more rigorous capital regulations are negatively correlated with NPLs and, as far as the moral hazard hypothesis is concerned, a liberal deposit insurance scheme is pungently and negatively linked with bank stability.

Podpiera and Weil (2007) is the second most cited paper where the authors extended the work of Berger and De Young (1997) by employing generalised Granger-causality methods using GMM. They worked with an emerging markets dataset including every Czech bank for the period 1994 – 2005. They found strong evidence in favour of the 'bad management

[5] These are papers showing how a Pigovian tax (which is a tax type inhibiting activities that impose a cost of production onto third parties and society as a whole) produce negative externalities, thus, preventing a market economy from reaching equilibrium when producers do not take on all costs of production

hypothesis', limited evidence for the 'bad luck' hypothesis while clearly rejecting 'skimping'. Podriera and Weil open the discussion about the practical policy implications of checking these assumptions; the main question being whether there is room for banking supervision or not. The idea is that with appropriate banking supervision the managers may be better educated (Weil, 2003; Bonin et al., 2005) and foreign ownership may be a way forward for decreasing NPLs, along with constraining loan concentration and promoting diversification. On this premise, Boudriga et al. (2009) used data for 59 countries all around the world to conclude in banking regulation not only weakly affecting NPL but in some cases even having positive association with NPLs. Therefore, a better way to constrain NPL from rising is through strengthening the political and legal system to enhance transparency and democracy. Another paper that used a generalised Berger and De Young (1997) model was that of Rossi et al. (2009) referring to bank diversification but also testing for the four assumptions. The results of the paper prove diversification to have a positive impact on banks' capitalization, and specifically support both the 'bad management' and 'bad luck' hypothesis but do not support the last two, 'skimping' and 'moral hazard' hypotheses.

According to the traditional NPL determinants categorisation the last stream of papers examines loan-specific factors. However, the loan-specific analysis already been done in existing literature has been conducted by analysing the disaggregated level of NPLs. Future stress testing exercises should address different types of loan portfolios, thus enhancing the reliability of the results (Louzis et al., 2012). This is where the stream of papers having both behavioural and non-behavioural elements started. By that we refer to empirical work that tries to determine whether macroeconomic or just loan specific/behavioural variables are mostly capable of explaining the NPL trajectories in different economies. This strand starts with Espinoza and Prasad (2010) using a panel data sample set and various methods of estimation -OLS, fixed effects, difference GMM (Arellano and Bond, 1991), and System GMM (Blundell and Bond, 1998)- to examine the macroeconomic determinants of the NPLs of the 80 banks of Gulf Cooperative Council for the period 1995-2008. They found that both macroeconomic variables and bank-specific variables caused NPL build-up in the GCC countries. Furthermore, NPL ratios increase during recession periods (risk aversion decreases) as well as when interest rates increase. Hence NPLs and real (non-oil) GDP growth were found to have a significant reverse relationship.

Another very cited paper in this category is Louzis et al. (2012) analysing NPLs dynamics of the Greek banking system. Working on a dataset for the years between 2003-2009, he examined three major loan types (mortgage, business, and consumer) by checking data from the largest 9 Greek banks. By applying dynamic panel data GMM methods he inferred that the impacts of the macroeconomic variables were rather durable among alternative models where bank-specific factors were used as explanatory variables. Other results showed that, for all three loan categories, NPLs in the Greek banking system can be explained mainly by macroeconomic variables (GDP with negative sign, unemployment with positive sign, interest rates with positive sign, public debt positive sign thus verifying the sovereign debt hypothesis) and management quality which was found to have negative effects on NPLs. Moreover, bank-specific variables (e.g., performance, efficiency) possess supplementary explanatory power when added into the baseline model thus lending support to the 'bad management' hypothesis linking these indicators to the quality of management. Finally, he also found that non-performing mortgages are less sensitive to the macroeconomic conditions than the other two types of loans, which is coherent with Espinosa and Prasad (2010). Finally, Zhang et al. (2016) studied data for Chinese commercial banks and observed moral hazard and cyclical instability that fed into NPLs.

The behavioural determinants of non-performing loans (NPLs) focus on internal practices, policies, and strategic decisions of financial institutions that can be dependant on the geographical area of analysis. Chronologically, the exploration of these factors begins with Hajja (2020), who examines the relationship between capital levels and NPLs in Malaysian banks. Using dynamic panel data, the study identifies a threshold effect where increasing capital initially raises NPLs before stabilising, highlighting the influence of capital allocation strategies on credit risk. Around the same period, Khan et al. (2020) investigated Pakistani banks, finding that operating efficiency and profitability negatively correlate with NPLs, while capital adequacy and income diversification, though negatively associated, lack statistical significance. These findings clearly indicate the importance of operational decisions in managing credit risk, hence making this papers of behavioural nature.

Abusharbeh (2020) further contributes to this discussion by identifying the role of profitability and credit supply in determining NPL levels in Palestinian banks. The study reveals that highly profitable banks tend to exhibit lower credit quality due to riskier lending practices, emphasising the impact of internal management decisions. Ahmed et al. (2021) build on this by exploring behavioural factors such as credit growth, net interest margin, and loan loss provisions, which reflect managerial strategies in balancing risk and profitability. Similarly, Ersoy (2022) delves into behavioural determinants in the Turkish banking sector, verifying the moral hazard hypothesis through a negative relationship between the capital adequacy ratio and NPLs, and supporting the bad management hypothesis by linking inefficiency to higher NPL levels.

More recently, Hughes and Moon (2022) provide a detailed decomposition of NPLs into inherent credit risk, inefficiency in lending, and statistical noise. Their study reveals that large U.S. banks experience higher non-performance ratios due to riskier lending practices rather than inefficiency, highlighting the behavioural dynamics of risk-taking incentives in major financial institutions. Lee et al. (2022) explore corporate governance as a determinant, finding that practices such as share collateralisation by directors and related party transactions significantly increase NPL levels in Taiwanese banks. These findings further highlight the behavioural risks associated with poor governance. Finally, Barra and Ruggiero (2023) analyse bank-specific factors in Italian banks, identifying credit policy, capitalisation, credit volume, and intermediation costs as the main determinants of NPLs. Collectively, these studies demonstrate the critical role of internal decision-making, governance, and operational strategies in shaping NPL outcomes across diverse contexts and regions.

Ahiase et al. (2023) explored the impact of macroeconomic indicators and governance quality on non-performing loans (NPLs) in the banking sectors of 53 African countries between 2005 and 2021. It analyses variables such as debt-to-GDP ratio, unemployment, inflation, real interest rates, and governance factors including corruption control, government effectiveness, and regulatory quality. Using random effects modelling and the generalised method of moments, the findings reveal that debt-to-GDP ratio, unemployment, and inflation significantly influence NPLs, while governance quality and government effectiveness are critical for financial stability. The authors recommend for policymakers to prioritise

sustainable debt, employment growth, inflation control, and governance reforms to mitigate credit risk. Although focused on Africa, the study highlights the need for future research across different regions to enhance global understanding of NPL determinants.

Uncertainty has started to be examined recently as an NPL determinant. Zegiraj et al. (2024) investigated the impact of uncertainty on NPL formation across three major systemic crises: the 2007–2009 global financial crisis, the 2010–2012 European Union debt crisis, and the COVID-19 crisis. Their findings reveal that NPLs were most influenced during the COVID-19 crisis, primarily due to the faster government response compared to the earlier crises. They concluded that the Economic Policy Uncertainty Index serves as a reliable predictor of NPL growth following COVID-19, in contrast to earlier results related to the two previous crises. Mamoon et al. (2024) also took governance into account when exploring how the behavioural dynamics of central banks influence the occurrence of non-performing loans (NPLs). It highlights that politically independent central banks are better positioned to control risky lending behaviours compared to those with political ties. Independence enables central banks to foster disciplined lending practices by imposing stringent capital requirements, conducting thorough loan screenings, and enforcing penalties for late repayments. In contrast, less transparent or politically influenced central banks may inadvertently encourage excessive risk-taking and poor decision-making within the banking sector. The study finds that increased independence and transparency in central bank operations promote responsible financial behaviour, reducing the prevalence of NPLs and enhancing overall financial stability. These behavioural insights emphasise the critical role of central banks in shaping ethical lending practices and driving stability in both emerging and developed economies.

Hakimi et al. (2024) were interested in how financial inclusion (FI) and board characteristics influence the behavioural dynamics of non-performing loans (NPLs) in the MENA region. The findings highlight that greater financial inclusion encourages responsible financial behaviour, reducing NPLs. This effect is observed across the access and usage dimensions of FI and a broader financial inclusion index. Additionally, board characteristics shape lending decisions and credit risk management. Smaller boards and a higher proportion of independent directors foster disciplined decision-making and transparency, leading to better loan quality and fewer NPLs. In contrast, larger boards are associated with ineffective communication and riskier

lending behaviours, increasing NPL levels. The interaction between financial inclusion and governance behaviour further amplifies the reduction of NPLs, illustrating how inclusive financial practices and effective governance complement one another. The study stresses the importance of fostering responsible lending practices through improved financial access and governance reforms. Policymakers in the MENA region are encouraged to promote inclusive financial systems and align board structures to enhance decision-making and reduce credit risk. While the study offers key behavioural insights, it acknowledges limitations, such as its focus on quantitative FI measures and treating MENA banks as a single group, despite behavioural and economic variations across the region.

3.2 Non-behavioural aspects

The second part of the NPL determinants literature has to do with all those variables describing the economical -and more specifically macroeconomic- conditions where the NPL were formed. Various models were created and tested to try and explain which macroeconomic variables affect the volume of credit risk in the form of NPLs. This literature branch started with examining the income conditions of different economic agents and how they affect NPL formation. Rinaldi and Sanchis-Arellano (2006) studied household NPLs using quarterly time series for Belgium, France, Finland, Ireland, Italy, Portugal and Spain to examine whether the increase in the household debt to income ratio together with the NPL ratio since the begging of the 1990s is an indicator of a new equilibrium or a riskier state of the economy. They initially developed a theoretical two period model to describe the probability of default in household payments (chance of falling into arrears) as a function of amount of loan taken, current income, investment, bank lending rate and future values of those. They also developed an empirical model describing the determinants of household NPLs, which depends on macroeconomic variables (such as unemployment and inflation) and household financial variables as well (such as debt, income, and assets). After estimating an error correction model for seven countries between 1989-2004, they concluded that the recent rise in debt ratio is an indicator of a riskier state of the economy since the income in the countries studied has grown less than the debt. This is mainly because income is the only household wealth component that appears in the long-run equation.

In order for the NPL models to incorporate the general state of the economy, Quagliariello (2007) performed a panel analysis on Italian intermediaries showing that business cycle affects banks' loan loss provisions and new bad debts by estimating an equation of loan loss provision controlling with a vector of bank-specific and a vector of macroeconomic variables using OLS. This paper is essentially indicating that NPLs can be robustly affected by the evolution of the economy. More specifically NPLs get worse during a recession and after it mainly because banks stiffen credit supply during recessions, thus further intensifying the downbeat impact of the business cycle.

Now, since NPLs are profoundly connected to economic activity and the stage on the business cycle we stand, studying the dynamics of banking crises is an insightful way to identify macroeconomic reason for NPL increase. On this premise, Reinhart and Rogoff (2011) used aggregate data covering 70 countries worldwide to study the dynamics of observed patterns of default and banking crises in those nations. They used Logit, OLS and OLS with robust errors to specifically test three hypotheses: firstly, whether there is a general increase in private debt or not, secondly, that banking crises are observed before a sovereign debt crisis and, thirdly, that public borrowing also accelerates before those. After running a VAR model including dummies for 290 banking crises and 209 sovereign default episodes, they concluded that banking crises (which could be generated by an accumulation of NPLs) can lead to a sovereign crisis.

Very straightforward research directly linking macroeconomic conditions with NPL levels as well as introducing the study of feedback effects from the NPLs to the economy[6] was conducted by Klein (2013) researching NPLs in Central, Eastern and Southeastern Europe (CESEE) between 1998-2011. He included both macroeconomic and the financial variables to find that banking factors have a relatively lower explanatory power than macroeconomics ones. One novelty of this paper is examining the feedback effects which indicated strong

[6] The introduction of the feedback effects as well the very clearly association drawn between macroeconomic variables and NPLs were the main reasons we categorized this paper as non-behavioural although the authors tested for the behavioural assumptions as well, i.e. it led to the feedback effect literature yet only testing for the behavioural assumptions.

macroeconomic and financial linkages in the (CESEE) area. Those feedback effects were prominent from the banking system to the real economy and depend strongly on macroeconomic condition changes.

Some of the research was mainly focusing on one macroeconomic variable. Messai and Jouini (2013) utilised a dataset of 85 Greek, Italian and Spanish banks between 2004-2008 contacting research to find that NPL evolution could be explained by three bank specific factors (asset profitability, reserves for the loan losses and the change of the loans granted) among with macroeconomic variables, especially unemployment, which was positively connected with the creation of NPLs. The research outcomes were analogous to the ones of Louzis et al. (2012), revalidating that rapid credit growth in 2000–2005 predicted the relative amount of non-performing loans only if it was combined with a current account deficit, as mentioned in Kauko (2012). Ozili (2015) studied NPL ratio levels within different stages of the business cycle. In the same paper the author talked about the relationship between banks' balance sheets and NPL generation. By utilising a dataset of 82 banks from Europe, US, Africa, and Asia with annual bank data for the period 2004-2013, he inferred that banks change both the level of loan loss reserves and the rate of loan growth in order to cut the size of NPLs, while loan diversification is not effective. He also supported the procyclical behaviour of NPLs providing further evidence for the existence of macro-financial inter-linkages and cyclical interactions between the state of the economy and NPLs.

Around this time a clear estimation trend was developed using GMM/Instrumental variables econometric techniques to examine macroeconomic NPL determinants. This happened mainly due to the realisation that past NPL values (which indicate the existence of crises or different stages of the business cycle) greatly affect current NPL values. Therefore, past values make great instruments when estimating current NPL levels. Literature started with Beck et al. (2015) using a dynamic panel data method set to examine the role of macroeconomic factors on NPLs across 75 countries during 2000-2010. The authors found that the factors which were significant and affect the NPL ratio are share prices (negatively), real GDP growth rate (negatively), lending interest rates (positively) and nominal exchange rate (positively). Their econometric assessment, using GMM, showed that the real GDP growth was the most important driver of the NPL ratio during that decade. They also talked about the inclusion of

exchange rates in “macro-stress tests” (which typically underpin scenarios for a rise in NPLs) with a macroeconomic scenario for real GDP and they showed that lower bank asset quality is associated with exchange rate depreciations, while a drop in share prices is related to an increase in NPLs. Another paper, using the same idea of instrumental variables is that of Çifter (2015) conducting a study of ten Central and Eastern European countries and investigating how banking concentration affects NPLs.

Çifter ran a dual analysis (short-run and long-run). For the short-run effects analysis he used the generalised method of moments system and the instrumental variable approaches, while the long-run effect was tested with the fully modified ordinary least square (FMOLS) approach, concluding in the bank concentration being an insignificant factor on the NPLs and even its sign was ambiguous. Anastasiou et al. (2016) examined the determinants of NPLs in the Euro-Area including macroeconomic variables. By using GMM estimation methods showed that tax on personal income and the output gap can be used as explanatory variables to predict NPL behaviour. In another research they contacted for the Bank of Greece, Anastasiou et al. (2016) used both Fully Modified OLS and Panel Cointegrated VAR methods for a dataset for the years 2003-2013 and for two groups of 14 countries, euro-area core, and periphery. They found that NPLs are determined by the same macroeconomic and bank-specific conditions, but the responses seem more prominent in the EU periphery. They rejected the quality hypothesis of model coefficients being equal between EU core vs the periphery by using a chi-square test, thus revealing another aspect of banking fragmentation in the euro area.

In a similar context, Anastasiou (2016) examined whether credit and business cycles affect the ex-post credit risk (i.e., non-performing loans) in Italy. Following a fixed and random effects and a dynamic GMM estimation method approach he found that increasing NPLs in Italy – especially after 2008 – were formed mainly because of worsened macroeconomic conditions (i.e., bad phase of business cycle) and due to excess credit. He showed that credit cycle mainly persists on the static model, while business cycle found to exert only some significance in the dynamic model. Finally, he insisted on GDP growth not being a very significant variable hence stating that a macro-prudential approach to financial stability would be advisable.

Furthermore, Vithessonthi (2016) concentrates his research for NPLs and bank credit growth in Japan in the period 1993-2013. He employed both OLS and two-step GMM to find a positive relationship between NPLs and bank credit growth before the 2007 economic crisis and a negative link after the crisis. The researcher also concluded in a rise of credit growth not inducing higher bank profitability.

The next sub-category of papers includes treatments and econometric alterations to produce a more robust GMM estimation. Accornero et al. (2017) examined non-performing loans and the supply of bank credit in Italy.[7] They found that the way NPLs evolve in the economy does not affect banks' lending behaviour. Negative correlation between credit growth and NPL ratios is mostly due to alterations in firms' conditions and due to contractions in their demand for credit; in other words, only demand-side effects affect the relationship between NPLs and credit growth. Italy is a very interesting case because of the notoriously strong structural relations between banks and firms as well as the two observed recessions between 2008-2015. Structural changes-wise, the amendments in write-downs (see Asset Quality Review) and NPLs demanded by the supervisors were bad news for both banks and borrowers. As a final remark, what is interesting is that this paper indicates that NPLs' role in shaping bank behaviour might be easily overestimated. Gosh (2017) used disaggregate data to study sector specific NPLs in the US for the 100 largest commercial banks over the period 1992-2016. After using a two-step system-GMM estimation adjusted with correction for standard errors, evidence was provided that banks with more capital option to slack credit checking and liberal lending policies that eventually lead to rising NPLs. As far as the macroeconomic determinants of NPLs are concerned, he found that higher inflation significantly reduces total, real estate and individual NPLs since it makes debt repayments cheaper. Results are consistent with those of Klein (2013), Skarica (2014). Real GDP growth significantly reduces total and real estate NPLs, Contrary to that, unemployment rates grow (in line with Ghosh (2015), Louizis et al. (2012), Makri et al. (2014), Messai and Jouini (2013), Nkusu (2011), Skarica (2014)). When debt servicing becomes more expensive due to a rise in 30-year fixed mortgage rate,

[7] There are plenty of papers focusing on Italy and Greece this period due to rapid increase in Italian NPLs and new Greek legislation about managing household debt.

NPLs increase, leading to more loan defaults as Beck et al. (2015), Espinoza and Prasad (2010), Louizis et al. (2012), and Messai and Joiuni (2013) suggested.

Latest trends in the literature include the introduction of heterogeneity among banks as Grigoli et al. (2018) did. They developed a three-stage model to generate forecasts of macro-financial variables and project NPLs which entails banks' heterogeneous reactions to macro-financial shocks in a dynamic context. In their dataset for 22 banks in Ecuador between 2002-2015 they ran a VAR model to show that under July 2016 IMF's oil price projections, the forecasts for macro-financial variables were expected to negatively affect the NPL ratio as well as those results change when heterogeneity is assumed. Of course, literature still includes classic reproduction of NPL analysis. Mishra et al. (2020) used a panel dataset for 40 public and private banks in India, for the period March 2010 to June 2019 and by using GMM showed that -in contrast to most prior studies- GDP growth is found to have an insignificant determinant of NPLs. Finally, Hajja (2020) analysed a dataset of dynamic panel-data of 19 commercial banks in Malaysia over 2002–2011 and by using GMM found that increasing the capital will initially increase the NPLs until NPLs reach a maximum threshold.

Again, the local analysis theme has prevailed in this literature branch, with each study contributing valuable insights into the relationship between economic conditions and credit risk. Kjosevski and Petkovski (2021), focusing on the Baltic States using data from 2005 to 2016, highlight GDP growth, inflation, public debt, and unemployment as the primary drivers of NPL levels. Their findings reveal that macroeconomic factors have a more significant influence on NPLs than bank-specific determinants, thus showing the systemic nature of these variables. Similarly, Rathnayke (2021) examines Sri Lanka, identifying GDP growth, inflation, exchange rates, and unemployment as critical predictors of NPL trends, reinforcing the importance of stable economic conditions in managing credit risk.

In 2022, Zunic et al. investigate the effects of the COVID-19 pandemic on NPL ratios in Bosnia and Herzegovina, showing how delayed loan payment freezes exacerbated credit risk over time. Ferreira (2022) broadens the analysis to a global perspective, examining 80 countries from 1999 to 2019. The study identifies economic growth and market stability as the most significant factors in reducing NPL ratios, particularly in non-OECD and non-high-income

countries. This research emphasises the vital role of systemic macroeconomic stability in mitigating credit risk. Most recently, Chowdhury et al. (2023) analyse Islamic banks in Bangladesh, finding that GDP growth and inflation significantly impact NPL levels. Kartal et al. (2023) focus on Turkey, demonstrating that GDP growth plays a pivotal role in credit market performance and NPL formation.

Lately, Nguyen (2024) examined the systemic, macroeconomic, and institutional factors influencing NPLs in Vietnam's banking sector. While NPLs have been well-controlled since 2005, challenges in forecasting asset quality persist due to macroeconomic volatility and governance issues. The study highlights how high legal costs, political interference, and poor bank management—particularly in state-owned banks—contribute to elevated NPLs, while larger banks benefit from economies of scale and better risk management. Macro-level determinants such as inflation, real interest rates, exchange rates, and economic cycles are identified as critical drivers of NPL fluctuations. Although the paper indirectly touches on behavioural aspects, such as inefficient decision-making and governance, its primary emphasis is on structural reforms, including privatisation, regulatory improvements, and adherence to Basel III requirements. Recommendations include robust credit risk management, diversified income sources, and flexible monetary policies to address crises like COVID-19. By addressing these institutional and systemic factors, the paper provides actionable insights for improving financial stability and profitability in the Vietnamese banking sector. Finally, Arjum (2024) investigated the NPL determinants in Bangladesh's banking sector using panel data from 2008 to 2021 and a fixed-effect regression model. It focuses on bank-specific variables, such as return on assets (ROA), return on equity (ROE), and capital to risk-weighted assets (CRAR), alongside macroeconomic factors like GDP growth, money supply, real interest rates, and domestic credit to the private sector. The findings reveal that while ROA and ROE are inconsequential, CRAR plays a critical role in improving NPL conditions. Additionally, GDP growth and domestic credit to the private sector are identified as the most influential macroeconomic drivers of NPLs. This study primarily adopts a non-behavioural perspective, as it emphasises systemic and structural variables over individual or organisational behavioural factors. Its recommendations, including strengthening CRAR, enhancing corporate governance, conducting due diligence in loan evaluations, and enforcing

banking laws, focus on institutional reforms rather than addressing behavioural dynamics, such as decision-making biases or risk perceptions.

Together, these studies, arranged in chronological order, illustrate the critical relationship between macroeconomic conditions and NPL dynamics. By examining a diverse range of contexts, from global analyses to country-specific studies, they argue the centrality of economic stability, systemic shocks, and growth patterns in shaping credit risk across different regions and economic environments.

4. Conclusion

This paper has offered a comprehensive and systematic review of the literature on non-performing loans (NPLs) and their determinants, spanning studies from 1987 to 2024. By assembling and synthesising the large and fragmented body of research, it provides a structured overview of the key drivers of NPLs across different contexts, periods, and methodological approaches. A central contribution of the paper is the introduction of a novel dichotomy that distinguishes between behavioural and non-behavioural NPL determinants. This framework highlights the importance of managerial practices, governance structures, and strategic decision-making on the one hand, and macroeconomic, institutional, and systemic factors on the other. By placing these two sets of drivers side by side, the paper underscores the fact that NPL formation is not merely a macroeconomic by-product, but also the outcome of choices and behaviours within financial institutions.

The review reveals several consistent patterns. First, macroeconomic conditions—especially GDP growth, unemployment, and interest rates—remain among the strongest predictors of NPL ratios. Second, institutional quality, regulatory effectiveness, and the strength of legal enforcement shape the degree to which credit deterioration becomes entrenched. Third, an emerging body of work points to the role of behavioural and organisational factors such as risk-taking incentives, governance failures, and strategic default, yet this literature is still underdeveloped relative to macroeconomic studies. Finally, the intensity of academic and policy interest in NPLs has increased significantly in the aftermath of the global financial crisis and the European debt crisis, reflecting their importance for financial stability and economic recovery.

Looking ahead, the review identifies several promising avenues for further research. First, more attention should be devoted to behavioural drivers of NPLs, particularly how managerial incentives, risk culture, and borrower–lender interactions contribute to credit risk. Second, comparative and cross-country analyses could shed light on how institutional and legal environments influence the resolution of NPLs, especially in regions where data availability has so far been limited. Third, there is a pressing need to understand how financial innovation and technological change—such as fintech platforms, digital lending, and new resolution

mechanisms—interact with NPL dynamics. Fourth, future research should more explicitly examine the systemic implications of NPLs, including their cross-border transmission channels and links to financial contagion. Fifth, greater integration of micro-level studies (e.g., bank- or borrower-level data) with macroeconomic analyses would offer a more granular understanding of how risks accumulate and propagate.

Taken together, these directions suggest that the literature on NPLs is at a crossroads: while much is known about their macroeconomic determinants, the behavioural dimension and systemic linkages remain underexplored. By introducing a new taxonomy and outlining a forward-looking research agenda, this paper aims to provide a reference point for future studies and to stimulate further dialogue between academics, policymakers, and practitioners. Ultimately, advancing our understanding of NPLs is essential not only for the management of bank balance sheets, but also for safeguarding financial stability and supporting sustainable economic growth.

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