



2025-17

6 May 2025

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Jean-Charles Bricongne et Mathilde Dufouleur



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Jean-Charles Bricongne & Mathilde Dufouleur¹

July 2024, WP #953

ABSTRACT

This paper examines the impact of insolvency framework reforms on non-performing loans (NPLs), extending prior research by considering both creditor and debtor factors. Using a new metric derived from the European Banking Authority's Transparency Exercises, we focus on the insolvency regime of the debtor's country in cross-border insolvencies. Furthermore, we contribute to the creditor vs. debtor-friendly insolvency regime debate by analysing reforms according to their orientation. Our findings suggest that debtor-oriented reforms are more effective in reducing NPLs, particularly benefiting non-SMEs and large banks in high NPL contexts. Moreover, such reforms have a larger effect in non-debtor and creditor-friendly insolvency regime countries. Finally, we also find that creditor-oriented reforms are associated with higher NPL ratios.

Keywords: Non-Performing Loans, Insolvency Regime, Transparency Exercise, Reform, Banking Sector

JEL classification: G15, G21, G33

¹ jean-charles.bricongne@banque-france.fr: Banque de France, Paris 1 University and LEO (Laboratory of Economics of Orleans); mathildedufouleur@hotmail.fr: University of Paris-Saclay, CEPS.

We extend our sincere appreciation to Pablo Aguilar Pérez, Lara Coulier, Elena Dumistrescu, and Grégory Verdugo for their invaluable feedback, and to Julien Salin for his valuable contribution. Additionally, we are grateful to Tatsiana Kliatskova from the World Bank for her insightful discussion during the Banque de France seminar, and to the participants at this seminar. We also thank Vicky Buffery from Banque de France for checking the writing of the article. All remaining errors remain ours and do not necessarily reflect the views of the Banque de France, Paris 1 University, LEO, University of Paris-Saclay or CEPS.

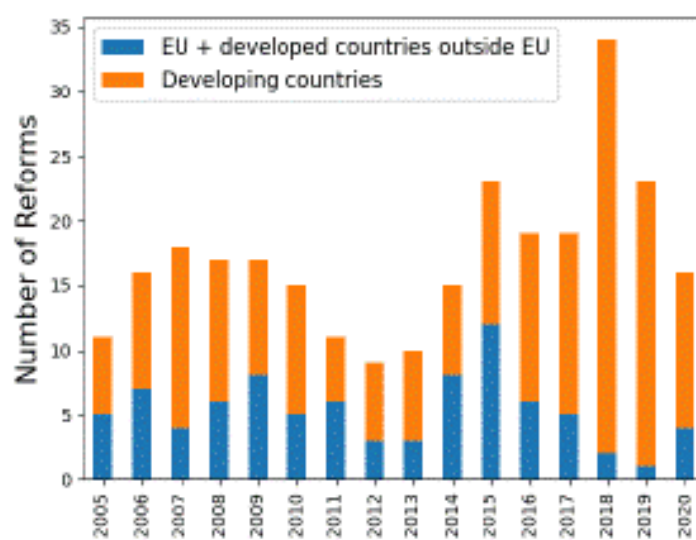
NON-TECHNICAL SUMMARY

This paper examines the impact of insolvency framework reforms on non-performing loans (NPLs), extending prior research by considering both creditor and debtor factors. Using a new metric derived from the European Banking Authority's Transparency Exercises, we focus on the insolvency regime of the debtor's country in cross-border insolvencies. For this purpose, we use detailed data on loans granted by banks in domestic and foreign countries, indicating how NPL ratios vary depending on the debtor countries, for a given creditor bank.

The impact of insolvency regimes is analysed through reforms in that field and their impacts on NPL values and dynamics. We take advantage of waves of insolvency reforms, as shown in Figure 1. Furthermore, we contribute to the creditor vs. debtor-friendly insolvency regime debate by analyzing reforms according to their orientation.

Following the NPL determinant literature, our analysis incorporates macroeconomic, institutional and bank-specific factors to consider these effects and isolate the impact of insolvency reforms. For macroeconomic variables, we consider GDP growth, the inflation rate, and the unemployment rate. Thanks to the granularity of our dependent variable data, we are also able to control for time-varying factors associated with both the bank and its origin country.

Figure 1. Number of reforms passed per year



Source: Doing Business, authors' calculations.

We show that insolvency regime reforms are efficient at speeding up the resolution of NPLs, especially during financial distress. This effect is particularly true for big firms and big banks, in a debtor country with an already high NPL level. This result is driven by debtor-oriented reforms, more precisely reforms that aim to facilitate business continuity. Our findings also reveal that such reforms are more efficient in countries with a non-debtor- and creditor-friendly insolvency regime. Conversely, we find that creditor-oriented reforms present a perverse effect, as they are associated with higher NPL levels.

Impact du régime d'insolvabilité sur les prêts non performants : Mieux vaut deux prêts en perspective qu'un en main

Ce document examine l'impact des réformes des régimes d'insolvabilité sur les prêts non performants, en étendant la littérature existante en prenant en compte à la fois les facteurs liés aux créanciers et aux débiteurs. En utilisant une nouvelle métrique dérivée des exercices de transparence de l'Autorité bancaire européenne, nous nous concentrons sur le régime d'insolvabilité du pays du débiteur dans les insolvabilités transfrontalières. De plus, nous contribuons au débat sur le régime d'insolvabilité favorable aux créanciers ou aux débiteurs en analysant les réformes selon leur orientation. Nos résultats suggèrent que les réformes orientées vers le débiteur sont plus efficaces pour réduire les prêts non performants, bénéficiant particulièrement aux non-PME et aux grandes banques dans des contextes de prêts non performants élevés. De plus, de telles réformes ont un plus grand effet dans les pays ayant un régime d'insolvabilité non favorable au débiteur et favorable au créancier. Enfin, nous trouvons également que les réformes orientées vers le créancier sont associées à des taux de prêts non performants plus élevés.

Mots-clés : prêts non performants, régime d'insolvabilité, exercices de transparence, réformes, secteur bancaire

Les Documents de travail reflètent les idées personnelles de leurs auteurs et n'expriment pas nécessairement la position de la Banque de France. Ils sont disponibles sur publications.banque-france.fr

1 Introduction

Is improving creditor protection during insolvency proceedings always conducive to a reduction in banks' non-performing loans (NPLs)? Could enhancing debtor rights mitigate bank NPLs? Recognizing the critical role played by insolvency regimes in addressing and preventing high NPL levels, regulators have increasingly prioritized insolvency reforms. Notably, with the COVID-19 crisis and the fear of elevated NPLs, the European Commission proposed a new directive on December 7, 2022 (COM/2022/702) aimed at harmonizing insolvency laws across European countries. Strengthening insolvency regimes is known to have positive effects on entrepreneurship (Lee et al. (2011); Fu et al. (2020)), to increase financial flows (Kliatskova et al. (2023)), and to facilitate the survival of viable and distressed firms while facilitating the exit of non-viable and insolvent firms (McGowan et al. (2017)). However, the literature on the link between insolvency regimes and NPLs remains scarce.

Addressing insolvency frameworks is especially important in a context of high private debt, since this may create a situation of debt overhang, deterring the private sector from undertaking new investments, and dampening consumption (see e.g., Dynan (2012)). Thus, as long as private debt remains at high levels, economic activity may be negatively affected. Moreover, high non-performing loan (NPL) ratios in banks' balance sheets are likely to act as a constraint on the supply of credit and have implications for the allocation of financial resources. In turn, there are financial stability implications that require the active involvement of the regulators.

Insolvency frameworks could help to address issues linked to high debt. They may first contribute to reducing the adverse effects of high private debt on economic activity by freeing up resources caught in unproductive activities. Moreover, they can lower costs linked to bankruptcies. They should also diminish, ex ante, potential concerns regarding credit supply and demand in the event of insolvencies. Research has also shown that bankruptcy reform can help an economy to recover more quickly during a recession (Claessens and Klapper (2002)).

But while modernizing insolvency law helps to address problems linked to high debt, it may not be sufficient on its own. Indeed, other factors play a key role (judicial infrastructure, regulatory and tax policies among others) and these may take more time to change.

From the creditors' perspective, the presence of non-performing debt in their balance sheets weighs on their ability to finance the economy. There are several channels through which NPLs can affect creditors (Aiyar et al. (2015)). First, they create higher provisioning needs. This weighs on banks' profits (with the impact depending also on the particular tax treatment of provisions), thereby reducing their ability to generate equity. Second, the willingness of banks to finance risky projects could be reduced by the perception of increased asset riskiness linked to NPLs (e.g., Diwan and Rodrik (1992)). Third, higher capital requirements linked to increased asset riskiness are a constraint for banks and crowd out new credit.

A high NPL stock also has implications for growth prospects via the allocation of capital between firms. High NPL stocks are often associated with a relatively large fraction of credit being locked up with non-viable firms. Banks may have an incentive to refinance non-viable "zombie" firms to delay losses on these loans. As this happens at the expense of the supply of credit to new, viable projects, the protracted refinancing of unviable debt implies that capital becomes increasingly misallocated, with implications in terms of overall investment and growth prospects. On this issue, see for example Caballero et al. (2008), who argue that keeping zombie firms alive prevented the entry of more efficient ones, and contributed to Japan's 'lost decade' of growth.

Moreover, what is the optimal insolvency regime orientation to implement? This question refers to the creditor- vs debtor-oriented regime debate concerning NPLs. Both orientations exhibit efficiencies and inefficiencies in reducing NPLs, and present conflicting symmetric mechanisms. On the one hand, increasing creditor protection equips creditors with enhanced tools for credit recovery; however, it may also diminish banks' risk exposure, leading to decreased borrower screening. On the other hand, improving debtor protection increases credit demand from lower-quality borrowers while giving viable firms a means of restoring their financial health. Therefore,

this paper answers the following questions: Does the improving the insolvency regime affect bank NPLs? What impact does increasing debtor or creditor protection have on bank NPLs? Do such reforms yield different outcomes based on the characteristics of firms or banks, or the orientation of the prevailing insolvency regime?

To address these questions, we introduce a novel metric for NPLs derived from data obtained through the European Banking Authority (EBA) transparency exercises. Notably, our NPL measure adopts a multidimensional approach, diverging from the unidimensional metrics commonly employed in existing studies. Leveraging transparency exercise data offers a detailed breakdown of NPLs by European bank, debtor country (on a global scale), and borrowing firm (SME or non-SME). For instance, we can measure the NPL ratios of banks like Société Générale concerning SMEs in Japan. By exploiting this new data, we analyze the impact of insolvency regime reforms in the debtor's country on European bank NPLs.

While prior studies analyze the insolvency regime of the creditor's country, in this paper we focus on the insolvency regime of the debtor's country. This constitutes the major contribution of this paper. Both the 2000 EC Insolvency Proceedings Regulation, applicable to EU Member States, and the UNCITRAL Model Law, adopted by 23 jurisdictions, apply the concept of "center of main interest" (COMI) to choose the jurisdiction to apply in the case of cross-border insolvencies. This concept sets the place where the debtor regularly conducts its business and which can be ascertained by third parties, as the competent jurisdiction in cross-border insolvencies. In addition, regarding non-EU and non-UNCITRAL countries, Franken (2014) argues that countries tend to afford foreign creditors the same treatment as domestic ones, because they prefer their own policies over those of other countries. Therefore, while specific laws exist for foreign creditors due to their importance in cross-border activities, this underscores the necessity of considering the insolvency regime of the debtor's country. This is now possible, thanks to the nature of our data.

More generally, we are able to explore the influence of both creditor and debtor factors on bank NPLs. Incorporating debtor-related variables as determinants of default probability is not only logical but also essential for a comprehensive understanding of cross-border NPLs, yet it is often overlooked in previous research due to data limitations.

Furthermore, our study contributes by distinguishing between insolvency regime reforms based on whether they are oriented towards creditors or debtors. While existing literature often focuses on the overall strength of insolvency regimes, our approach delineates four distinct types of reforms, three of which have creditor or debtor-friendly implications.

By employing a rich structure of fixed effects, our analysis reveals a significant correlation between positive insolvency regime reforms and reduced NPL growth rates, particularly during periods of bank NPL accumulation. However, these reforms exhibit no significant impact on NPL ratios themselves. This aligns with the conclusions of Consolo et al. (2018) and underscores the relevance of implementing EU insolvency regime regulations to address NPL challenges.

Furthermore, the exploration of different insolvency reform types highlights that debtor-oriented reforms are consistently linked to lower NPL ratios and growth rates across various specifications. Particularly noteworthy is the finding that these benefits are more pronounced for non-SMEs, especially within large banks and high NPL ratio contexts. This disparity may stem from the diminished bargaining power of large banks following debtor-oriented reforms, while non-SMEs benefiting from larger legal and financial resources can leverage new insolvency laws more effectively than SMEs.

Additionally, our findings indicate that debtor-oriented reforms are associated with decreased NPL growth rates irrespective of the country's insolvency regime orientation. However, the magnitude of this effect varies, with the smallest impact observed in debtor-oriented regimes, followed by creditor-oriented regimes, and the most pronounced effect observed in non-debtor-oriented regimes. Implementing debtor-friendly reforms is therefore more efficient in countries with a high level of creditor protection and in countries with a low level of debtor protection. Notably, we identify a counterproductive outcome of creditor-oriented reforms, particularly affecting large banks and countries with non-debtor-oriented insolvency regimes, underscoring

the importance of striking a balance between creditor and debtor rights. Moreover, our analysis reveals a positive correlation between domestic banks and NPL ratios, indicative of a home bias effect.

While this study sheds light on the relationship between insolvency reforms and NPLs, additional research is warranted to delve into the underlying mechanisms driving this association.

The paper is structured as follows: the second section outlines the relevant literature, followed by a description of the dataset in the third section. The fourth section discusses the empirical approach employed, while the fifth section presents the results. Finally, the sixth section provides concluding remarks.

2 Literature review

This section is divided into two parts, each dealing with a different strand of the literature. The first section concerns the impact of insolvency regimes on the level of NPLs. The second deals with the determinants of NPLs.

2.1 The importance of insolvency frameworks

Economists have extensively emphasized the significance of an effective insolvency regime, citing its role in capital and debt market development, fostering entrepreneurship, and facilitating access to finance. This line of research can be traced back to La Porta et al. (1998), whose findings demonstrate that countries with weak investor protections have smaller capital and debt markets. Djankov et al. (2008) further establish the positive impact of efficient debt enforcement on per capita income and debt market development. Likewise, Davydenko and Franks (2008) reveal that creditor rights protection plays a vital role in credit growth, as banks operating under these laws require greater collateral. Examining the efficiency of judicial enforcement systems and creditor protection, Ferrando et al. (2018) demonstrate that improvements in these variables enhance the probability of obtaining credit.

Regarding entrepreneurship, Lee et al. (2011) establish a significant positive correlation between entrepreneurship-friendly bankruptcy laws (e.g., shorter timelines, lower costs, and provisions for a second chance in liquidation procedures) and the rate of new firm entry. Conversely, Fu et al. (2020) explore the relationship between the effectiveness of insolvency regulations and entrepreneurship, finding that entrepreneurs in the innovation sector are more affected by onerous insolvency regulations than necessity-oriented entrepreneurs. McGowan et al. (2017), in the context of restructuring, reveal that insolvency frameworks favoring restructuring are associated with higher multi-factor productivity growth. By reducing the cost of entrepreneurial failure, insolvency regimes reinforce the gains in multi-factor productivity resulting from reduced administrative barriers to entry into product markets. Andrews (2019) argues that weak banks must be strengthened to facilitate the exit of zombie firms, but asserts that such efforts would be futile without appropriate insolvency reforms to reduce impediments to corporate restructuring. Furthermore, Kliatskova et al. (2023) examine the impact of insolvency regulation reforms on cross-border debt and equity positions, finding that investors prefer countries with more efficient insolvency regimes for investment purposes.

While economists have extensively explored the effects of insolvency frameworks on entrepreneurship, financial sector development, and access to credit, limited research has been conducted on the relationship between insolvency regimes and NPLs. Among the few studies that have addressed this relationship, Carcea et al. (2015) investigate the significance of pre-insolvency frameworks in smoothing deleveraging processes. They construct a composite indicator of pre-insolvency frameworks and incorporate it into an NPL adjustment model in response to macroeconomic shocks. Their analysis covers the 28 EU countries from 2007 to 2012, and their findings reveal a positive association between efficient pre-insolvency frameworks and deleveraging episodes. Similarly, Consolo et al. (2018) explore the importance of insolvency frameworks in relation to NPL levels and resolution. They construct an aggregate insolvency framework index for OECD countries spanning from 2003 to 2016, based on the World Bank's Doing Business database. Their results indicate that improved insolvency frameworks lead to faster reductions in NPLs and smaller increases in NPLs during periods of high unemployment.

Another interesting source is EBA (2020), which uses a very granular loans database and a survey on the characteristics of the enforcement frameworks for the EU Member States, providing cross-sectional data. The survey was conducted with selected countries (EU Member States) in a single time period and with the reference date of 31 December 2018, which was also the reference date for the loan-by-loan level data on the main variables (i.e. recovery rate, time to recovery, judicial costs to recovery, etc. . .) used in the analysis. Though based on very detailed information, the main shortcoming of this source is the lack of temporal variations, which does not make it possible to analyze the impact of insolvency reforms over time, as in our paper. Moreover, as EBA (2020) used, for the first time, individual loan level information from across the EU, there may be some remaining data quality issues, suggesting that the results should be interpreted with caution.

EBA (2020) finds that, for both corporates and SMEs, the determinants of higher recovery rates are similar, namely: the existence of legal instruments to enable the out-of-court enforcement of posted collateral, the absence of long moratoria that suspend the enforcement of collateral, the possibility for creditors to influence the proceedings through creditor committees, the absence of repayment privileges (prior rank) for specific types of creditors/debt (such as government, social security, wages, pension schemes), and the existence of ‘pre-pack’ insolvency (or restructuring) regimes for SMEs.

In summary, economists have extensively examined the significance of effective insolvency regimes in various economic dimensions. However, research specifically focusing on the relationship between insolvency frameworks and NPLs remains limited. This gap underscores the importance of further investigation in this area.

2.2 Determinants of NPLs

As this article is also part of the literature on the determinants of NPLs, this section summarizes the research conducted on this topic. In contrast with the literature on the link between insolvency

regimes and NPLs, many studies attempt to explain the level of NPLs. Three main categories of determinants emerge: macroeconomic, bank-specific and institutional factors. This section looks in turn at each of these three main drivers, as well as borrower-specific factors.

2.2.1 Macroeconomic factors

The empirical literature has largely validated the negative relationship of GDP with the level of NPLs, as well as the positive significant impact of unemployment and the interest rate on the level of NPLs. Other variables have also been studied, some with ambiguous and/or uncertain effects. The model of Rinaldi and Sanchis-Arellano (2006) shows that an economic downturn, involving a fall in GDP, an increase in unemployment or an increase in interest rates, leads to an increase in the level of NPLs. Indeed, the drop in income linked to this economic downturn leads to a drop in real income and therefore increases the probability of default by the agent. Espinoza and Prasad (2010), Klein (2013) and Beck et al. (2013) have shown the importance of the exchange rate in determining NPLs, but the direction of the relationship is ambiguous. Espinoza and Prasad (2010) and Beck et al. (2013) find a negative relationship. Countries with a relatively high share of private sector foreign currency borrowing will see their level of NPLs increase following a depreciation of their currency. Klein (2013) and Beck et al. (2013) find a positive relationship between the exchange rate and NPLs. Exchange rate depreciation, by improving the export competitiveness of local firms, leads to an increase in income and thus facilitates debt collection. The impact of inflation on the level of NPLs is also ambiguous. An increase in inflation can lower the real value of debt and thus facilitate repayment, but it also erodes real income (when prices are sticky) and thus makes repayment more difficult (Skarica (2014); Nkusu (2011); Klein (2013)). Studies have also shown that inflation is not significantly associated with the level of NPLs (Makri et al. (2014); Angela and Irina (2015)). Makri et al. (2014), Angela and Irina (2015) and Louzis et al. (2012) have also shown the importance of public debt in determining the level of NPLs. An increase in public indebtedness can lead to a decrease in social income and aggregate demand, thus causing an increase in NPLs.

Research on the macroeconomic determinants of the level of NPLs is extensive, and covers

different country samples, different time periods and different methodologies, but they all confirm the significant impact of the business cycle on the level of NPLs.

2.2.2 Bank-specific factors

Another part of the literature on the determinants of NPLs concerns bank-specific factors and focuses on micro-data. These studies take into account both systemic factors (macroeconomic factors) and idiosyncratic influences (related to bank-specific indicators). They highlight that banks' balance sheet indicators, measuring cost efficiency and bank capital, are related to the level of NPLs. The seminal paper Berger and DeYoung (1997) gives four hypotheses on the relationships between problem loans and measured cost efficiency. The "bad luck" hypothesis refers to an increase in NPL operating costs due to accumulation of problem loans caused by a deterioration in the external macroeconomic condition. There is thus a negative relationship between NPLs and cost efficiency. Under the "bad management" hypothesis, high costs, or low cost efficiency, are associated with bad management. These "bad" managers may then have difficulties in credit scoring, monitoring, and control, leading to a higher proportion of NPLs. In contrast, the "skimping" hypothesis reflects a positive relation between NPLs and cost efficiency. Low operating costs, or high cost efficiency, may also mean that funds for evaluation, monitoring and credit control are limited, leading to higher NPLs in the future. They also describe the "moral hazard" hypothesis, according to which managers of low capital banks have the incentive to adopt riskier behavior, leading to a higher level of NPLs in the future. By controlling for macroeconomic variables, the studies agree on the significant effect of bank-specific factors on the level of NPLs, but the empirical results remain mixed with regard to the selected variables. One reason for this is that studies cover different financial sectors and different time periods. Espinoza and Prasad (2010) study 80 banks in the Gulf Cooperation Council (GCC) region over 1995-2008 and uses size of capital, credit growth and the non-interest revenue to assets ratio to measure risk-taking and efficiency. They find that these measures have a significant impact on future NPLs. Louzis et al. (2012) study the Greek banking sector and find that only management quality related to inefficiency and proxied by the operating expenses to operating income ratio influences the level of NPLs. Size of capital and profitability (ROE,

ROA) were found to be insignificant. Messai and Jouini (2013) focus on 85 banks in Italy, Greece and Spain over the period 2004-2008 and find that problem loans vary negatively with the profitability of banks' assets (ROA) and positively with their loan loss reserves. Ghosh (2015) analyze the NPLs of commercial banks and savings institutions across 50 US states for 1984-2013 and find that greater capitalization, liquidity risks, poor credit quality, greater cost inefficiency and banking industry size are positively associated with NPLs, while greater profitability lowers NPLs. Conversely, Klein (2013) investigates NPLs in Central, Eastern and South Eastern Europe (CESEE) over the 1998-2011 period and finds that bank-specific factors have low explanatory power (relative to macroeconomic factors). Thus, the empirical results are mixed. However, they highlight the heterogeneity between and within banking systems, and underline the importance of considering bank-specific microeconomic indicators in explaining the level of NPLs.

2.2.3 Institutional factors

Studies have also looked at the link between NPLs and the institutional framework and analyzed the significance of a country's legal, regulatory, institutional and political environment on loan quality. It is interesting to note here that insolvency regimes are part of these institutional factors. Breuer (2006) argues that "because bank activities take place within the tangible and intangible structure of institutions, institutions may affect the quality of bank loans". Boudriga et al. (2010) study the level of NPLs in 59 countries for 2002-2006 and assess the role of regulatory supervision and the institutional environment (the political and legal environment) on credit risk. They conclude that regulatory devices do not have a significant impact on NPLs in countries with weak institutions, a corrupt environment, and little democracy, and argue that strengthening the legal system and increasing transparency and democracy are more effective policies for reducing NPLs than those focused on regulatory issues. Breuer (2006) analyzes the impact of legal, political, sociological, economic and banking institutions on problem bank loans. The results show that corruption, ethnic heterogeneity and deposit insurance raises NPL ratios. Tanaskovic' and Jandric' (2015) study the role of macroeconomic factors and quality of legal frameworks in explaining the level of NPLs, and focus on CESEE countries in the period 2006-2013. They use

strength of auditing and reporting standards, the financial market development, and soundness of the banking system for measuring the quality of institutions, and show that only financial market development is statistically significant in relation to the level of NPLs. Finally, Bayar (2019) explores the macroeconomic, institutional and bank-specific factors behind NPLs in emerging countries over the 2000-2013 period. He proxies institutional development for the first time with the economic freedom index and shows that institutional development, among other factors, has a significant impact on NPLs.

2.2.4 Borrower-specific factors related to NPLs

In the literature, most articles related to the determinants of NPLs consider macroeconomic, bank-specific and institutional determinants. Those related to borrower-specific aspects are less frequent, which is also linked to a lack of available data. Among these, Angelini and Zingales (2017), using a detailed bank-firm dataset to consider the origins of Italian NPLs, and are able to identify the contributions of macroeconomic conditions, bank lending decisions, and factors related to the non-financial corporate sector. On this latter point, Angelini and Zingales (2017) show that at least 50% of NPLs were unavoidable because the loans were to firms that were ex-ante very safe. Using data on around 30,000 Portuguese firms, Bonfim (2009) also shows that, beyond macroeconomic conditions, which play an important role, idiosyncratic firm characteristics are also key drivers. On average, Bonfim (2009) finds that firms in default are less profitable, have weaker sales and investment growth and lower liquidity ratios, and are more dependent on external funding sources.

In line with the literature on zombie lending, some research even suggests that undercapitalized banks used additional monetary capacity to lend to clients that were already distressed (see Acharya et al. (2019)). This would thus imply a mix of bank and borrower-specific factors played a role. However, the opposite outcome may also be true, with decreased lending to the most financially fragile firms, as underlined by the Financial Stability Report of Bank of Italy (2016).

3 Data

3.1 The dependent variable: NPLs

3.1.1 Definition

This paper introduces a novel measure of NPL levels, serving as the dependent variable in our econometric framework. Leveraging annual data from the European Banking Authority’s EU-wide transparency exercises, this measure aligns with the EBA’s mandate to enhance market transparency in accordance with Basel III regulations under the EU Capital Requirements Directive (CRD). The transparency exercises, akin to stress tests, offer comprehensive disclosures on banks’ financial metrics, including assets, liabilities, capital positions, risk exposure, and asset quality. In 2020, they covered 136 banks across 25 countries, with consolidated assets of over EUR 30 billion, representing some 75% of the European banking sector, in addition to Norway and the United Kingdom (see Table 1 for yearly coverage). Insurance activities are notably excluded. The scope of consolidation is consistent with the banking group definition outlined in the Capital Requirements Regulation (CRR), aimed at bolstering banks’ solvency and resilience.

Year	2015	2016	2017	2018	2019	2020
Number of selected banks	105	132	133	131	132	136

Table 1: Number of banks selected in transparency exercises per year

To construct our novel NPL measure, we leverage credit risk databases spanning from 2015 to 2020, and extract the original exposure values of defaulted and non-defaulted loans in the “Corporates” class, as defined by the CRR. We adopt the term “defaulted loans” as per the EBA database definition, which includes loans with uncertain repayment prospects. The inherent disparity in the definitions of NPLs across institutions poses a challenge to data comparability. Addressing this, the EBA’s “Guidelines on the application of the definition of default”, effective from January 1, 2021, aim to standardize default definitions, enhancing data consistency across institutions.

Unlike conventional NPL datasets, our measure extends beyond domestic borders to encompass cross-border NPLs. Focusing on European banks, we assess NPL levels within debtor countries ranking among the bank’s top ten borrowers globally. Our analysis distinguishes between SME and non-SME borrowers. While other borrower classifications exist within the EBA dataset, they are not pertinent to our analytical framework, which focuses on corporate insolvency. Consequently, we exclusively extract data from the “Corporates” class. It is worth noting that this breakdown is unavailable for Malta, Cyprus, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia, Iceland and Estonia. It is also worth noting that, according to article 19 of the CRR ¹, data consolidation does not need to include financial institutions that are subsidiaries under certain conditions. Supported by the literature, we first define the level of NPLs as follows:

$$NPL_{i,j,s,t} = \frac{DefaultedLoans_{i,j,s,t}}{TotalLoans_{i,j,s,t}} \quad (1)$$

where i refers to the bank (in an origin country), j to the debtor’s country, s is the size of the borrowing companies (SME or non-SME) and t is the year.

3.1.2 Stylized facts

This section outlines trends and stylized facts pertaining to European banks’ loans and NPLs, using data from transparency exercises. Graphical representations show that the banking market is well integrated and characterized by significant cross-border lending activities, emphasizing the influence of debtor countries’ economic environments on European banking stability. It is essential to note that our analysis focuses solely on corporate lending, and the transparency exercises data exclusively captures banks’ top ten borrowers. Consequently, the dataset does not provide a complete representation of banks’ entire cross-border loan portfolios and NPLs.

The sample comprises banks from 16 European countries, and reveals significant disparities in lending activities, as depicted in Figure 1. Notably, loans extended by the United Kingdom, France,

¹<https://www.eba.europa.eu/regulation-and-policy/single-rulebook/interactive-single-rulebook/16132>

and Germany in 2020 collectively account for 50% of the total loan volume within our sample.

Figure 2 describes the credit composition by firm type (SME and non-SME) and bank type (domestic or foreign), highlighting that banks in the selected countries allocate at least 25% of their lending to foreign entities, with exceptions noted for Greece. Notably, Finland, Austria, France, the Netherlands, and the United Kingdom predominantly engage in foreign lending, as exemplified by the Netherlands with 68% foreign loans in 2020. This indicates a strong level of integration within the European banking market. While disparities across countries are observed, the amount of lending across sectors is stable over our sample period at the following levels: EUR 45 billion to domestic non-SMEs, EUR 17 billion to domestic SMEs, EUR 9 billion to foreign non-SMEs and EUR 2 billion to foreign SMEs.

Figure 3 shows the distribution of loans by debtor country relative to total loans in 2020. Notably, the United States emerges as the primary destination financed by European banks, surpassing even European countries. Additionally, Hong Kong, China, Singapore, and Canada feature among the top 20 countries financed.

The data presented underscore the importance of the foreign sector in loans extended by European banks. Considering the environment in borrower countries is thus imperative for understanding European banking stability.

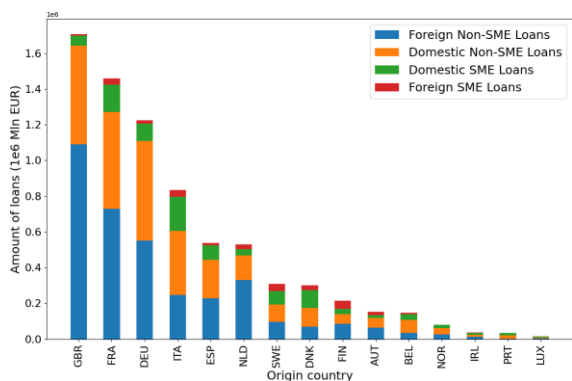


Figure 1: Amount of loans per origin country (10⁶ Mln EUR, 2020)

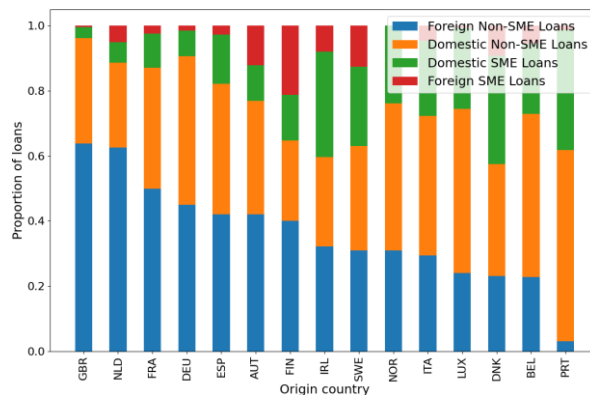


Figure 2: Breakdown of loans per origin country (% of total loans, 2020)

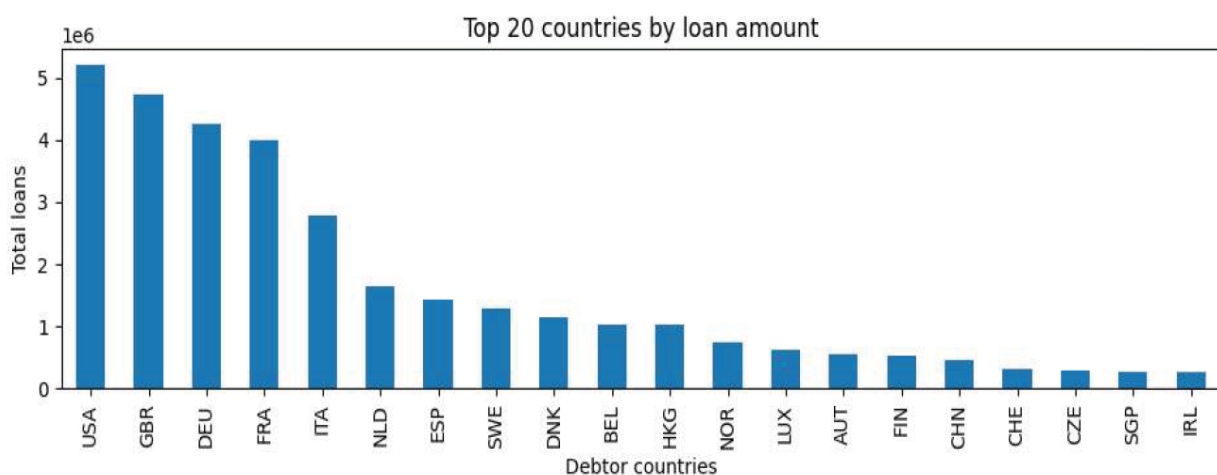


Figure 3: Distribution of loans per debtor countries (Mln EUR, 2015-2020, top 20 debtor countries)

In Figure 4, we present a dual perspective on bank NPLs. The left graph depicts the sector-wise mean NPL rates¹, calculated as the NPL level of each sector divided by its corresponding loan amount. Notably, we discern a declining trend in NPL rates from 2017 onwards. This trend is particularly pronounced in the domestic sector, especially for non-SMEs, which have exhibited lower NPL rates than SMEs since 2018. Additionally, foreign NPL rates are observed to be generally lower than domestic ones, while foreign SMEs notably display much lower rates than foreign non-SMEs.

The right graph in Figure 4 illustrates the proportion of NPLs in each sector relative to the banks' total loan portfolio. This perspective sheds light on the contribution of each sector's NPLs to the banks' overall NPLs. While foreign NPLs constitute a relatively minor portion of the total NPL rate, domestic non-SMEs exhibit a larger share of NPLs than SMEs. This finding is noteworthy given that SMEs typically face more financing constraints than larger firms. Overall, the banks' NPL rate follows a downward trajectory throughout the 2016-2020 period. The distribution of NPL rates in debtor countries can be found in the Figure 8 in the Annexes.

The literature is mixed regarding the connection between firms' size and their probability of default, as underlined by Bonfim (2009). On the one hand, Bhattacharje et al. (2002), Bunn and Redwood (2003), Eklund and Bernhardsen (2001), and Jiménez and Saurina (2004) find that

¹ NPL "rates" and NPL "ratios" are considered as equivalent wording.

smaller firms are more likely to default. On the other hand, Pain and Vesala (2004) and Bernhardsen (2001) conclude that there is limited systemic effect of firm size on default. Furthermore, there is also contrary evidence on the impact of firm size in the literature. According to Moody's (2004), larger firms default less often, but when financial statement ratios are taken into account, the impact of the size advantage declines. Hence, a small firm with healthy financial ratios should not be riskier than a large firm with comparable financial indicators. Finally, Benito et al. (2004) obtain a result similar to Bonfim (2009), observing a positive relationship between firm size and default rates (still, this conclusion is somewhat fragile since databases may be biased towards "good" companies in both cases).

If NPL ratios are higher for SMEs than for larger firms, a selection effect may help to justify why NPL ratios are also higher for domestic banks than for foreign banks. Indeed, from a macroeconomic perspective, a high level of NPLs may generate negative externalities at the system level, so that banks operating in a high NPL country may be seen in general as being weaker than banks operating in a country with lower stocks of troubled assets (Board (2019)). Angelini and Zingales (2017) confirm, in the case of Italy, that NPL ratios for subsidiaries of foreign banks are much smaller than for domestic banks, whatever the category (joint stock companies or cooperative banks). In addition, their analysis of the geographical distribution of NPLs finds that NPL ratios are much lower for foreign loans than for domestic loans, regardless of the area of Italy under consideration (North, Center or South and Islands).

Another possible justification for higher observed NPLs for domestic banks (without distinguishing between loans to SMEs or non-SMEs) is given by Us (2017) in the case of Turkey. Us (2017) notices that the impact of being a large bank depends on whether the bank is Turkish (whether private or state-owned): Turkish banks tends to have higher NPLs than foreign banks. This is consistent with the too-big-to-fail hypothesis, which encourages large domestic banks to take excessive risk and causes them to end up with higher NPLs, as they are more likely to be rescued in a crisis period than foreign ones.

A report by the Council of the European Union (2017) examines a panel of EU countries using data as of June 2016, and confirms that foreign domiciled banks tend to have lower NPL ratios (2.5 pp lower on average) than their domestic peers in the non-financial corporate (NFC) segment. On the other hand foreign banks have higher NPL ratios than their domestic peers in the household segment (on average 0.6 pp higher). This confirms that the economic, financial and legal conditions in local markets are not the only factors affecting credit quality. The report underlines that there can be many reasons for these differences, such as higher risk-taking in the household segment due to stronger competition, different business models (more consumer finance than mortgage financing) or established links with domestic healthy corporations for the NFC segment.

Regarding the differences between SME and non-SME NPL ratios, there may also be composition factors at play. As shown by Haselmann and Wachtel (2010), the legal environment can affect the composition of bank portfolios: in countries with efficient insolvency regulations, banks lend more to SMEs, while in less efficient legal environments, banks tend to lend to large enterprises. Another composition factor may have an effect as less sophisticated investors have a higher home bias in their investment decisions and are more affected by information costs and familiarity (see Christelis and Georgarakos (2013) for the case of households). Hence, combining these two composition effects, there should be a higher proportion of more sophisticated investors (typically the largest banks) abroad lending to SMEs in foreign countries with better insolvency systems. These investors may be more careful than a sizeable fraction of domestic ones, and thus register more favorable NPL rates or dynamics.

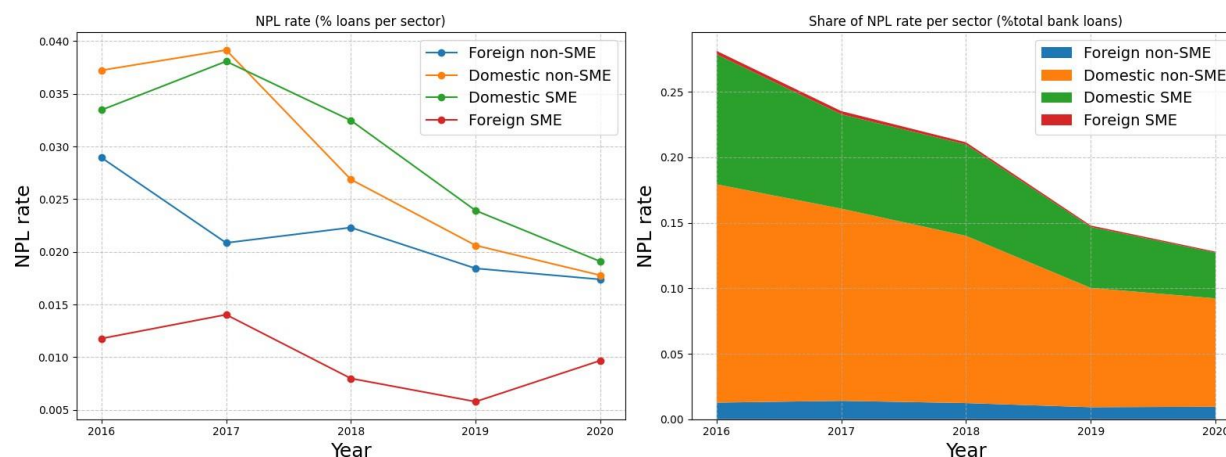


Figure 4: NPL rate per sub-category and per year

3.2 Variables of Interest: Insolvency Reforms

3.2.1 Definitions

This section presents the variables of interest: reforms to insolvency regimes. These have been derived from the World Bank's Resolving Insolvency database from Doing Business.

From this database, we use the Strength of insolvency framework index (*Strength_index*), a composite indicator of four sub-indices covering 191 countries from 2004 to 2020. This index evaluates the effectiveness of insolvency legislation in facilitating the recovery of viable firms and the liquidation of non-viable ones. It ranges from 0 to 16, with higher values indicating a more efficient insolvency regime. The index is calculated as the sum of the following indicators²:

- **Creditor participation index:** evaluates the extent of creditor involvement in court decisions, considering factors such as the requirement for creditor approval in the sale of significant debtor assets, and the ability for creditors to challenge court decisions or reject claims against the debtor. It ranges from 0 to 4. A higher index indicates greater involvement (*Creditor index*).

²For a more detailed description, see: <https://archive.doingbusiness.org/en/methodology/resolving-insolvency>

- **Commencement of proceedings:** assesses the accessibility of insolvency proceedings, encompassing both liquidation and reorganization. It ranges from 0 to 3, with a higher index indicating a greater access (*Commencement_index*).
- **Management of debtor's assets:** measures the degree to which the bankruptcy regime facilitates business continuity during the insolvency proceedings. This includes considerations such as the debtor's ability to maintain essential contracts, secure financing after the start of proceedings, and reject overly burdensome contracts. It ranges from 0 to 6, with a higher value indicating facilitated business continuity during the insolvency proceedings (*Management_index*).
- **Reorganization proceedings:** quantifies the degree of creditors' voting rights in reorganization plans. It measures, in particular, whether the plan is voted only by the creditors whose rights are modified or affected by the plan, and whether dissenting creditors receive as much under the reorganization plan as they would have received in liquidation. It ranges from 0 to 3, with a higher index indicating greater compliance with international practices, and a better treatment of creditors in reorganization plan (*Reorganization index*).

According to the World Bank's methodology, "all changes to laws and regulations that have any impact on the economy's score on the strength of insolvency framework index are classified as reforms". Thus, each variation of the indices represents a reform, and the amplitude of the variation its intensity. We then created the variable *Strength*, measuring reforms as the difference between t and $t-1$ of the World Bank index. To account for the persistent effect of reforms and the time required for their implementation, we consider the effect of three years of reforms. As a robustness test, we also consider a time span of two and four years of reform implementation. *Strength* captures reforms as well as their intensity, and is defined as follows:

$$Strength_{j,t} = Strength_index_{j,t} - Strength_index_{j,t-3} \quad (2)$$

Where j is the country and t the year. We also decompose this variable using the World Bank sub-indices. We then have four additional variables, called *Creditor*, *Commencement*, *Management* and *Reorganization*, measuring the implementation and intensity of the corresponding reforms. This

breakdown of insolvency reform enriches the analysis by making it possible to ask which specific reform helps to enhance the insolvency regime from a bank NPL reduction perspective. These variables are defined as follows:

$$Creditor_{j,t} = Creditor\ index_{j,t} - Creditor\ index_{j,t-3} \quad (3)$$

Commencement, *Management*, and *Reorganization* variables are defined following the same methodology.

3.2.2 Hypotheses

Within our framework, the *Strength* variable quantifies insolvency reforms designed to increase creditor participation during court decisions (*Creditor*), improve access to insolvency proceedings (*Commencement*), maximize the value of firms by promoting continued business activity (*Management*), and enforce creditor voting rights during reorganization plans (*Reorganization*). In this section, we describe the expected relationship and the underlying mechanisms between enhanced insolvency regimes and bank NPL rates.

With regard to the *Creditor* variable, improving creditor participation in court decisions, and enhancing overall creditor protection, directly gives creditors greater recourse to obtain repayment. This fosters higher repayment rates, consequently reducing bank NPL rates. Furthermore, strengthened creditor rights discourage risky managerial practices among debtors. Acharya et al. (2011) shows that a strong creditor protection framework is related to a decreased cash-flow risk, diversified acquisitions, and investments in assets with a high recovery potential. Consequently, these mechanisms diminish the probability of debtor default, contributing to reduced NPL rates. Moreover, improving creditor rights also discourages lower-quality borrowers, resulting in a diminished pool of defaulting debtors. These mechanisms collectively support a negative relationship between increasing creditor participation and bank NPL rates.

Nevertheless, such reforms also facilitate access to credit, owing to the moral hazard effect stemming from creditors' diminished risk exposure. Enhancing creditor protection encourages

them to reduce their risk assessment standards and extend credit to riskier borrowers (VIG (2013)), thereby raising bank NPL rates. Thus, the direction of the relationship between creditor participation and bank NPL rates remains ambiguous.

Concerning the *Commencement* variable, improving access to insolvency proceedings serves to mitigate financial fragility upstream, thereby averting insolvency or mitigating default at an early stage. We anticipate a negative relationship between the *Commencement* variable and bank NPL rates.

The *Management* variable measures reforms designed to facilitate business continuity. Such reforms are particularly beneficial for viable firms experiencing cash flow issues, as they maintain economic confidence among business partners. Moreover, the pursuit of business activities allows for reorganization proceedings, providing debtors with the opportunity to restore their financial health and facilitate debt recovery. These mechanisms support a negative relationship between the *Management* variable and bank NPLs. However, while increased creditor participation discourages risky management, a strong debtor protection framework may alleviate their financial pressures, potentially leading to riskier behavior. This dual moral hazard effect contributes to the creditor versus debtor-oriented regime debate. Consequently, the direction of the relationship between the *Management* variable and bank NPLs is ambiguous.

The *Reorganization* variable is associated with reforms aimed at enhancing creditor protection. Similar mechanisms as for the “Creditor” variable apply, resulting in an ambiguous relationship between the “Reorganization” variable and bank NPLs.

Overall, while some relationships among reform categories remain ambiguous, we hypothesize that implementing positive insolvency reforms creates a more transparent, sound, and efficient framework, ultimately leading to fewer cases of default and accelerating the resolution of default occurrences. In this sense, we expect that an increase in the “Strength” variable should reduce bank NPLs.

Variables	Mechanisms	Impact on bank NPLs	
Creditor, Reorganization	Better credit recovery tools, less risky behavior on the part of debtors and fewer lower quality borrowers	-	Ambiguous
	Moral hazard leading to a reduction in risk exposure for creditors	+	
Commencement	Default problem addressed at an early stage: reduces the size of the default	-	Negative
Management	Maximize business value by maintaining business partner trust and the ability to restore financial health	-	Ambiguous
	Moral hazard leading to riskier behavior by debtors	+	
Strength	More transparent, sound and efficient insolvency framework	-	Negative

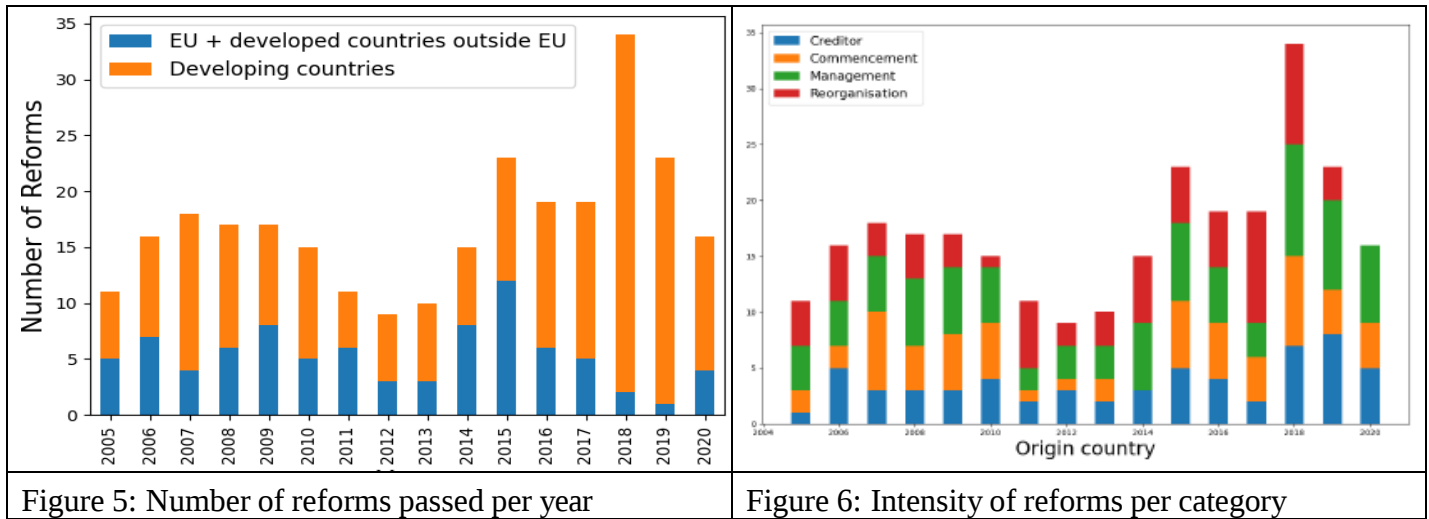
Table 2: Hypotheses - Impact of variables on bank NPLs

3.2.3 Stylized facts

This section provides insights into trends in insolvency reforms. Figure 5 presents the annual number of countries undertaking reforms, indicating a notable peak before and after 2012 among European and advanced non-EU nations. This surge can be traced back to the imperative post-debt crisis reform efforts, notably influenced by the 2011 European Parliament Resolution advocating for enhancements to insolvency procedures.

Developed countries display distinct reform patterns, characterized by two distinct waves, commencing in 2006 and 2015, respectively. The latter wave correlates with the aftermath of the global economic crisis, which prompted adjustments in insolvency regimes. The temporal gap in reform implementation between developed and developing countries may be attributed to judicial rigidity in developing regions (Balas et al. (2009)) and to a reluctance to reform insolvency practices given the prevalence of informal business activities in these countries. These reform waves effectively represent a quasi-natural experiment.

Figure 6 depicts the reform intensity categorized by reform type. Notably, each reform category persists over the years, with “Management” and “Reorganization” reforms dominating since 2015. This figure also accentuates the observed two reform waves.



3.3 Controls

Following the NPL determinant literature, our analysis incorporates macroeconomic, institutional and bank-specific factors as control variables. For macroeconomic variables, we consider GDP growth, the inflation rate, the unemployment rate, and public sector debt as a percentage of GDP. Data comes from the IMF, except for the public sector debt variable which is sourced from the World Bank databank. However, due to high collinearity with other variables, we omitted the public sector debt variable from the regression after assessing the variance inflation factors.

Thanks to the granularity of our dependent variable data, we incorporate a rich structure of fixed effects, with notably the bank*time fixed effect. This fixed effect controls for time-varying factors associated with both the bank and its origin country. Consequently, our analysis incorporates macroeconomic factors solely at the debtor country level, while abstaining from including bank-specific factors, which are captured by the bank*time fixed effect.

Concerning institutional factors, we decided not to include them. This choice is supported by the limited availability of this type of data across our country sample, compounded by the relatively stable nature of institutional quality indicators over the five-year study period. Consequently, the average institutional quality level of the debtor country is captured by the debtor country fixed effect.

Additionally, we control for the systemic asset quality of the debtor country through its NPL level as a percentage of total loans (*NPL_country*), sourced from the World Bank.

4 Econometric Framework

This study investigates the link between insolvency regimes and NPLs at European banks across a global context from 2015 to 2020. Our primary objective is to estimate the impact of implementing reforms that enhance insolvency regimes on the NPL level of banks. Moreover, we explore the efficiency of these reforms during a period of financial distress, as well as the efficiency of different types of reform. We leverage the granularity of our dataset to investigate the differential between insolvency reforms across borrower and creditor categories, while also evaluating how the orientation of a country's insolvency regime—whether creditor or debtor-oriented—affects the efficacy of these reforms.

To estimate the relationship between insolvency reform implementation and bank NPL levels, we employ the fixed effects estimator. Thanks to the granularity of our data, we account for unobserved time-invariant heterogeneity related to banks, debtor countries, firm size, and their interactions. The model with our more constrained structure of fixed effects is defined as follows:

$$NPL_{i,j,s,t} = \beta_0 + \beta_1 Strength_{j,t-1} + \beta_2 NPL_country_{j,t-1} + \beta_3 X_{j,t} + \alpha_s + \alpha_t + \alpha_{i*t} + \alpha_{i*j} + \epsilon_{i,j,s,t} \quad (4)$$

Where i represents the bank, j the debtor country, s the firm size, and t the year. The variable of interest, *Strength*, reflects the magnitude of reforms that were implemented between the year $t-4$ and $t-1$. To discern the specific types of reform influencing the results, *Strength* will be substituted with the variables $\Delta Creditor$, *Commencement*, *Management* and *Reorganization*, which are defined as *Strength* in their respective domains.

$X_{j,t}$ denotes the macroeconomic controls of the debtor country, while *NPL_country* is its lagged level of NPLs, capturing the systemic asset quality of the country. α_s and α_t are the firm size (dummy equal to 1 if borrowers are SMEs, 0 otherwise) and the time fixed effects, while α_{i*t} and α_{i*j} represent the bank*time and bank*debtor country*firm size fixed effects, respectively. Due to the non-normal distribution of our dependent variable, we apply a Box-Cox transformation, aiming

to reach the optimal transformation to approach a normal distribution curve.

Additionally, to measure the NPL growth rate, we consider the midpoint of NPL levels. The midpoint was introduced by Davis and Haltiwanger (1998) and is defined as follows:

$$Midpoint_{i,j,s,t} = \frac{NPL_{i,j,s,t} - NPL_{i,j,s,t-1}}{\frac{1}{2}(NPL_{i,j,s,t} + NPL_{i,j,s,t-1})} \quad (5)$$

Where $NPL_{i,j,s,t}$ denotes the NPL level. Because of the numerous 0-NPL observations, we would lose a large share of our dataset by computing the traditional growth rate. The midpoint metric incorporates both present and lagged values, and makes it possible to compute a more consistent growth rate, addressing the problem of an NPL level of zero. The interpretation is as follows: for continuous NPL levels, $Midpoint_{i,j,s,t}$ represents the percentage variation between the two periods. If the NPL level varies from zero to a positive number, the midpoint equals 2. Conversely, if the NPL level shifts from a positive number to zero, the midpoint equals -2.

To address the potential issue of reverse causality, we exclude reforms implemented between $t - 1$ and t from our model. This is to avoid any distortion in our findings where a high level of NPLs might lead policymakers to implement insolvency reforms. It is worth noting that a single bank's NPL level has a limited influence on triggering a reform. However, if there were still reverse causality, the sign of estimated coefficient of the reforms variable would be changed, because of the positive impact of NPLs on reforms. If the sign remains negative, it is because we have causality in the expected direction, even if the magnitude may be reduced. Furthermore, we consider insolvency reform over a period of up to three years to capture the persistent effect of reforms and the time required for their implementation.

To address issues of heteroscedasticity and autocorrelation, and to manage errors that are independent across clusters but correlated within clusters, it is advisable to employ a clustered robust variance estimator. This entails adjusting standard errors to account for clustering at the treatment level, specifically, at the debtor country level. The NPL levels across banks within a country may not be independently distributed; for instance, banks may exhibit lower NPL levels in countries with more robust insolvency regimes. Clustering

at the country destination level helps accommodate such patterns.

When the number of clusters is small (lower than 50), which is actually our case, using the wild cluster bootstrap is recommended instead of computing a clustered robust standard error (Cameron et al. (2008)). According to MacKinnon and Webb (2018), our number of treated clusters is also not sufficiently large for the wild cluster bootstrap to be efficient. To address this issue, we implement subcluster wild bootstraps as proposed by MacKinnon and Webb (2018). For our first set of regressions, p-value of the variables of interest will be presented by using different bootstraps and clusters, namely the individual level bootstrap (ordinary bootstrap), bootstrap with cluster at country level (wild cluster bootstrap), and bootstrap with cluster at country*year and country*bank level (sub-cluster bootstrap).

We also explore the potential increased efficiency of insolvency reforms in times of financial distress. Therefore, we introduce an interaction term in a subsequent step, denoted as *Strength* $\times$ *NPL_accumulation*, where *NPL_accumulation* is a dummy variable set to one if the bank encounters an increase in its NPL levels.

Furthermore, to exploit the detailed nature of our data, we investigate potential heterogeneity in the impact across various borrower and creditor categories. Our analysis distinguishes between the following criteria:

- SME versus Non-SME: Defined by the EBA.
- Small, Medium and Big Banks: Thresholds are set to the first and third quartile, 39.65 and 250.07 respectively.
- Low versus High NPLs at Country Level: The threshold corresponds to a level of 5%. Countries with NPL levels exceeding 5% are categorized as high NPL countries.
- Debtor, Non-Debtor, Creditor, and Non-Creditor-Oriented Regime: We establish four distinct classes instead of two (debtor versus creditor) to account for nuanced variations. If a country is creditor-oriented, this does not necessarily exclude it from being debtor-oriented. We observe a strong positive correlation between the Creditor index and the Management index. To classify countries, we add together the “Creditor” and

“Reorganisation” indices for the year 2015 and compute the median (3.5). Countries with a sum greater than or equal to 3.5 are deemed creditor-friendly, while those below are non-creditor friendly. For debtor and non-debtor friendly classifications, we calculate the median of the Management index in 2015 (equal to 5). Countries with a management index equal to or higher than the median are considered debtor-friendly, while those below the median are classified as non-debtor friendly.

5 Results

5.1 Baseline: Impact of Insolvency Reforms on Bank NPL Rates and Midpoint

We begin by estimating the impact of insolvency reforms, represented by the variable *Strength*, on NPL rates and NPL midpoints. The results derived from the fixed effects estimator are presented in Tables 3 and 4 corresponding to the regression outcomes for NPL level and NPL midpoint, respectively. P-values obtained from bootstrapping techniques are detailed in Table 5.

Table 3 presents the outcomes of the NPL rate regression analysis, emphasizing the impact of *Strength* under varying fixed effects specifications. Despite a significance of *Strength* at the 5% threshold, the results do not reveal a robust connection between the adoption of insolvency reforms and bank NPL rates. This observation is further supported by the p-values associated with *Strength* obtained through different bootstrapping methods (refer to Table 5), where the significance diminishes, even up to the 17% level.

However, an intriguing association emerges concerning NPL rates and SME lending. Notably, SME lending correlates with lower NPL levels, a trend possibly attributable to the generally lower NPL averages evident in the dataset. This finding challenges the conventional notion that SMEs inherently pose higher risks than larger enterprises, in the domestic and foreign market combined. Still, as seen in section 3.1.2., this notion may be challenged.

Furthermore, a noteworthy linkage emerges between NPL rates and the *HomeBank* dummy variable. Domestic loans exhibit a significant and positive relationship with higher NPL rates, suggesting a pronounced “home bias” effect. This effect implies that banks extend credit to riskier or lower-quality borrowers in the domestic market, potentially due to an overconfidence attributable to a deeper understanding of the domestic market.

Additionally, consistent with existing literature, the *Unemployment* variable demonstrates a positive association with bank NPL rates, that is significant at the 10% and even up to the 5% level.

Table 4 presents results derived from the regression analysis of NPL midpoints, exploring the relationship with *Strength* across various fixed effects specifications akin to Table 3. A notably significant and negative correlation emerges between *Strength* and the NPL midpoint, indicating that the implementation of insolvency reforms between *t-4* and *t-1* correlates with accelerated resolution of bank NPLs. This finding holds true across all model specifications, with significance levels reaching 1%. Robustness checks employing different bootstrapping methods (refer to Table 5) affirm the statistical significance of the *Strength* estimate at the 0.1% level, except for the debtor’s country-level bootstrap, where significance is observed at the 3% level.

Notably, macroeconomic variables exhibit diminished significance within this context. Coupled with earlier findings regarding NPL rates, this observation suggests that while macroeconomic factors are determinants of bank NPL rates, they exert negligible influence on NPL dynamics. Furthermore, both the *SME* and *HomeBank* dummy variables are found to lack significance in explaining NPL midpoint variations.

However, a contrasting pattern is observed with the lagged level of NPLs in the debtor country, significantly and positively associated with the NPL midpoint at the 5% level. This suggests that systemic asset quality serves as a significant driver of bank NPL dynamics.

The adjusted coefficient of determination of the fourth regression is negative because of the collinearity between the *i*t* and the *i*j* fixed effects, and because of the low (non-adjusted) coefficient in previous midpoint regressions. We find a negative coefficient for most of the midpoint regressions, including the mentioned fixed effects.

In summary, the findings underscore that bank NPL rates show no significant impact from insolvency reforms enacted in the past four years (excluding the present year). Nonetheless, the implementation of such reforms significantly correlates with faster NPL resolution.

Dep var: NPL rate	(1)	(2)	(3)	(4)
Strength	-0.042**	-0.028*	-0.023	-0.035*
L.NPLcountry	0.151*	0.142*	0.121	0.138
GDP	-0.035	-0.050	-0.046	-0.025
Unemployment	0.133*	0.153**	0.133*	0.116
Inflation	-0.060	-0.065	-0.040	-0.058
SME	-0.237***	-0.261***	-0.260***	-0.283***
HomeBank	0.265***	0.268***	0.264***	0.000
Fixed effects				
year	x	x		x
bank		x		
debtor country	x	x	x	
bank*year			x	x
bank*debtor country				x
N	3590	3590	3590	3561
r2_a	0.304	0.403	0.389	0.559

Standardized beta coefficients

Clustered robust standard error at debtor country level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Regressions of NPL rate on the *Strength* variable

Dep var: NPL midpoint	(1)	(2)	(3)	(4)
Strength	-0.086***	-0.087***	-0.088***	-0.101***
L.NPLcountry	0.092**	0.103**	0.084	0.120**
GDP	0.059	0.051	0.052	0.054
Unemployment	-0.009	0.020	0.005	0.008
Inflation	0.041	0.032	0.053	0.078
SME	0.018	0.022	0.021	0.026
HomeBank	-0.003	-0.006	-0.012	0.000
Fixed effects				
year	x	x		x
bank		x		
debtor country	x	x	x	
bank*year			x	x
bank*debtor country				x
N	3590	3590	3590	3561
r2_a	0.005	0.017	0.058	-0.014

Standardized beta coefficients

Clustered robust standard error at debtor country level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Results of the regressions of NPL midpoint on the *Strength* variable

Independent variable	<i>Strength</i>	
Dependent variable	NPL level	NPL midpoint
Estimate	-0.035	-0.101
		p-value
CRVE by debtor country	0.06	0.00
bootstrap by debtor country	0.17	0.03
bootstrap by debtor country*year	0.13	0.00
bootstrap by bank	0.11	0.01
bootstrap by bank*year	0.10	0.00
bootstrap by bank*debtor country	0.10	0.01

The regression used includes the bank*year (i*t) and the bank*debtor country (i*j) fixed effects.

Table 5: Estimates and p-value of lagged Reform variables with different bootstraps (NPL level)

5.2 Efficiency of Insolvency Reforms During Periods of Financial Distress

During the Covid-19 pandemic, firms faced sharp falls in sales and high uncertainty, increasing their risk of default. A potential subsequent surge in insolvencies has prompted a renewed focus on reforming insolvency regimes (such as facilitating new financing, improving restructuring processes, strengthening liquidation frameworks, and establishing specific procedures for SMEs; OECD, 2020) as a crucial policy response to the risk of a wave of insolvencies. The earlier

finding of the effectiveness of insolvency reforms in reducing the midpoint of NPLs leads us to believe that these reforms may help lower NPL growth during economic downturns.

In this section, we investigate whether enhanced insolvency regimes are associated with a faster resolution of NPLs during financial distress. To explore this, we introduce the interaction term between *Strength* and *NPL accumulation*, where *NPL accumulation* is a dummy variable equal to 1 if the bank faces an increase in NPLs between t and $t - 1$.

Table 6 presents the results of regressions incorporating the interaction term. Our independent variable remains significantly and negatively associated with the midpoint of NPLs at a 5% level of significance, even with the more stringent fixed effects structure. Furthermore, the interaction term between *Strength* and *NPL accumulation* is highly significant, demonstrating a negative relationship. This indicates that implementing reforms helps to reduce NPL growth during periods of NPL accumulation, demonstrating the heightened efficiency of insolvency reforms during financial distress. Moreover, the *SME* coefficient turns positive.

Dep var: NPL midpoint	(1)	(2)	(3)	(4)
Strength	-0.048*	-0.052**	-0.047*	-0.063**
Strength*NPL accumulation	-0.045**	-0.047**	-0.045**	-0.046**
NPL accumulation	0.662***	0.686***	0.668***	0.735***
L.NPL country	0.017	0.034	0.021	0.047
GDP	0.044	0.042	0.048	0.032
Unemployment	-0.050	-0.029	-0.023	-0.038
Inflation	0.024	0.019	0.028	0.014
SME	0.072***	0.082***	0.079***	0.096***
Home bank	-0.010	-0.018	-0.021	
Fixed effects				
year	x	x		x
bank		x		
debtor country	x	x	x	
bank*year			x	x
bank*debtor country				x
N	3590	3590	3590	3561
adj-R ²	0.43	0.44	0.46	0.45

Standardized beta coefficients

Clustered robust standard error at debtor country level.

NPL accumulation is a dummy equal to 1 if there is a positive change in NPL level between year t and $t-1$.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Efficiency of reforms during periods of financial distress

5.3 Which types of reform are decisive? Breakdown of the *Strength* variable

We investigate the specific insolvency reforms influencing banks' NPLs. The new dependent variables comprise four reform types: creditor participation in court decisions (*Creditor*), access to proceedings (*Commencement*), management of the debtor's assets during proceedings (*Management*), and creditor participation in reorganization plans (*Reorganization*). These variables are computed as the *Strength* variable, as the difference between their index in $t - 1$ and $t - 4$. These variables replace the *Strength* variable in our model, and results are presented in Table 7 and 8 for the NPL rate and midpoint, respectively.

In Table 7, the *Management* variable exhibits a highly significant association with the NP rate. The *Management* variable, encompassing reforms favoring the treatment of the debtor's assets (such as laws that enable the debtor firm to fulfil contracts essential to its survival, the avoidance

of transactions that give priority to some creditors, or laws that allow post-commencement finance) shows a consistent negative association with NPL rates at the 1% significance level across all specifications. This suggests that reforms promoting business continuity during insolvency proceedings are negatively linked to bank NPL rates. Concerning our hypotheses, this finding suggests that reforms fostering business continuity during insolvency proceedings negatively impact bank NPL rates, emphasizing the effect of maximizing value, which outweighs that of the moral hazard associated with the advantages given to the debtor. The significance of this effect is corroborated by the low bootstrap-derived p-values (Table 9).

Conversely, Table 7 presents a significant and positive association between *Commencement* and bank NPL rates at the 1% level in most specifications. This relationship is contrary to our initial hypothesis. This outcome may stem from the accelerated detection of insolvency, particularly through balance sheet tests, potentially leading to a surge in insolvent firms temporarily halting debt repayment and thus raising bank NPL rates. However, the significance of this estimate is refuted by the p-values derived from bootstrapping, displayed in Table 9. We conclude that the *Commencement* variable has no significant impact on bank NPL rates and midpoints.

Interestingly, the *Creditor* variable exhibits a positive relationship with NPL rates. This finding implies that greater creditor involvement in insolvency proceedings may positively correlate with bank NPL rates due to a potential moral hazard effect. In our country sample, enhancing creditor protection might encourage lending to riskier borrowers, contributing to increases in NPLs. This effect exceeds that of the discouragement of risky management and lower-quality borrowers. However, the significance level is mitigated by p-values derived from bootstrapping, with significance levels going from 8% to 14%. The same reasoning applies for the *Reorganization* variable, which exhibits a positive effect on bank NPL rates, with a significance level going from 10% to 11% by performing bootstrapping.

Additionally, lagged NPL rates and the unemployment rate in the debtor country continue to

positively impact bank NPL rates. The *SME* and *HomeBank* dummies also maintain a significant relationship with NPL levels.

Dep var: NPL rate	(1)	(2)	(3)	(4)
Creditor	0.015*	0.024**	0.023*	0.023**
Commencement	0.048***	0.040***	0.047***	0.041**
Management	-0.078***	-0.065***	-0.064***	-0.082***
Reorganization	-0.015**	-0.005	-0.001	0.030**
L.NPLcountry	0.199***	0.186***	0.171***	0.204***
GDP	-0.039	-0.054	-0.051	-0.031
Unemployment	0.154**	0.171***	0.152**	0.125**
Inflation	-0.060	-0.066*	-0.040	-0.056
SME	-0.237***	-0.260***	-0.260***	-0.283***
HomeBank	0.264***	0.268***	0.264***	0.000
Fixed effects				
Year	x	x		x
Bank		x		
debtor country	x	x	x	
bank*year			x	x
bank*debtor country				x
N	3590	3590	3590	3561
r2_a	0.304	0.403	0.389	0.559

Standardized beta coefficients.

Clustered robust standard error at debtor country level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Regressions of NPL rates on insolvency reform by categories

Turning to Table 8, many variables lose their significance, with only *Commencement* and *Management* maintaining a significant relationship with the bank NPL midpoint. Notably, the *Management* variable consistently exhibits a robust negative effect on the NPL midpoint at a 1% significance level across all specifications. This suggests that implementing reforms that promote business continuity is negatively correlated with both NPL rates and NPL midpoints.

Regarding the *Commencement* variable, bootstrapping (Table 9) displays p-values superior to 17%, refuting a significant effect of this variable on NPL midpoints.

In summary, only the *Management* variable shows a strong significant and negative relationship with both NPL rates and NPL midpoints. Therefore, reforms that facilitate business continuity are

associated with lower NPL rates and faster NPL resolution. Moreover, reforms increasing creditor rights are associated with higher NPL rates, and have no impact on NPL midpoints. Increasing access to proceedings is found to have no impact on both bank NPL rates and midpoints.

Dep var: NPL midpoint	(1)	(2)	(3)	(4)
Creditor	-0.007	-0.012	-0.016	-0.021
Commencement	-0.021	-0.035**	-0.038**	-0.040*
Management	-0.090***	-0.084***	-0.085***	-0.096***
Reorganization	0.016	0.019	0.031	0.043
L.NPLcountry	0.109**	0.112**	0.094*	0.139**
GDP	0.052	0.045	0.045	0.048
Unemployment	-0.005	0.019	0.003	0.003
Inflation	0.037	0.029	0.047	0.076
SME	0.019	0.022	0.021	0.026*
HomeBank	-0.004	-0.006	-0.012	0.000
Fixed effects				
Year	x	x		X
Bank		x		
debtor country	x	x	x	
bank*year			x	X
bank*debtor country				X
N	3590	3590	3590	3561
r2_a	0.005	0.017	0.058	-0.014

Standardized beta coefficients

Clustered robust standard error at debtor country level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Regressions of NPL midpoint on insolvency reform by categories

Independent var	Creditor	Commencement	Management	Reorganization
Dependent var	NPL rate			
Estimate	0.023	0.041	-0.082	0.030
	p-value			
bootstrap by debtor country	0.08	0.20	0.03	0.11
bootstrap by debtor country*year	0.11	0.12	0.03	0.11
bootstrap by bank	0.14	0.12	0.03	0.10
bootstrap by bank*year	0.10	0.15	0.03	0.10
bootstrap by debtor country*bank	0.12	0.12	0.04	0.11
Dependent var	NPL midpoint			
Estimate	-0.021	-0.040	-0.096	0.043
	p-value			
bootstrap by debtor country	0.52	0.17	0.01	0.67
bootstrap by debtor country*year	0.49	0.24	0.01	0.56
bootstrap by bank	0.48	0.30	0.00	0.47
bootstrap by bank*year	0.50	0.22	0.00	0.42
bootstrap by debtor country*bank	0.48	0.33	0.00	0.46

Table 9: P-values with different bootstrapping level and breakdown of *Strength*

5.4 Numerator Effect or Denominator Effect?

On the issue of the respective contributions of the numerator (variation of the value of NPLs) or the denominator (variation of the value of loans), see Gjeçi et al. (2023), using bank-level data across 42 countries spanning over 2000-2017, we find that high NPLs tend to be associated with less lending which tends to worsen NPL ratios.

Moreover, in the case of banks that have domestic and international lending, the Council of the European Union report (2017) notes that banks' deleveraging of foreign assets to meet deleveraging or restructuring plan targets will often increase their NPL ratios due to a decline in their performing loans (which affect the denominator) will decline. There is thus a denominator effect in an adverse situation (deleveraging or restructuring). Conversely, if the NPL ratios diminish after insolvency reforms, this may be due to a reduction in the value of NPLs or an increase in the value of total granted loans. In the former case, this means that NPLs are diminishing thanks to better insolvency systems. In the latter case, it means that banks are encouraged to lend more, due most likely to improved confidence in the insolvency system. This is consistent with the findings of Kliatskova et al. (2023) about cross-border investment decisions, which show that investors prefer to invest more in countries with more efficient insolvency frameworks. Concretely,

improvements in the NPLs ratios are probably caused by a mix of the two.

In this section, we carry out regressions with the NPL amount and the midpoint NPL amount as dependent variables. The objective is to find out whether our previous results are only driven by a variation in the amount of loans granted.

The results are presented in Table 10. We observe that implementing insolvency reforms is significantly and negatively associated with the midpoint NPL amount at the 1% level. Focusing on the breakdown of insolvency reforms, the results show that increasing creditor participation in court decisions is positively associated with the NPL amount, when implementing debtor-oriented reforms (*Management*) is negatively correlated with the NPL amount, with a 10% and 1% level of significance respectively. The debtor-oriented reform effect remains in regressions with the midpoint as a dependent variable. These results therefore show that the previous effects on NPL rates of implementing insolvency reforms is not only due to a variation in the amount of loans granted.

5.5 Exploring creditor and debtor heterogeneity

In this section, we carry out regressions on different samples depending on the type of debtor (SMEs vs. non-SMEs), the type of creditors (small, medium and large banks), and debtor country characteristics (high vs. low NPL countries and insolvency regime types). The analysis encompasses regressions of both NPL rates and midpoints, considering the overarching *Strength* variable along- side its disaggregated components. The tables show the outcomes directly obtained from regressions featuring our richest fixed effects structure, alongside p-values derived from bootstrapping at the bank-debtor country level.

5.5.1 Debtor type: SME versus non-SME

Table 11 presents regression outcomes from the differentiation of debtors between SMEs and non- SMEs. Notably, the *Management* variable exhibits a significant negative impact on both the NPL rate and midpoint, with a greater coefficient magnitude observed for non-SMEs. This suggests that improved asset treatment benefits both SMEs and non-SMEs, yet the effect is more

	NPL amount				NPL amount midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Strength	-0.028	-0.022	-0.018	-0.020	-0.087***	-0.088***	-0.092***	-0.096***
LNPLcountry	0.067	0.061	0.054	0.071	0.100	0.095f	0.083	0.091
GDP	-0.027	-0.036	-0.029	-0.020	0.007	0.009	0.020	0.018
Unemployment	0.099**	0.106***	0.093**	0.072	-0.032	-0.014	-0.003	-0.002
Inflation	-0.026	-0.018	-0.009	-0.019	-0.038	-0.022	-0.006	-0.009
SME	-0.350***	-0.378***	-0.379***	-0.405***	0.023	0.020	0.019	0.023
Homebank	0.449***	0.464***	0.461***		-0.017	-0.010	-0.011	
N	3590	3590	3590	3561	3590	3590	3590	3561
r2_a	0.39	0.56	0.55	0.68	0.01	0.01	0.02	-0.06

	NPL amount				NPL amount midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Creditor	0.022	0.027*	0.027*	0.023*	-0.020	-0.021	-0.018	-0.013
Commencement	0.018	0.006	0.006	0.001	0.002	0.000	0.001	-0.002
Management	-0.048**	-0.044**	-0.041**	-0.039*	-0.076**	-0.078**	-0.087**	-0.095***
Reorganization	-0.024**	-0.004	-0.002	0.015	-0.037*	-0.034	-0.019	-0.005
LNPLcountry	0.090**	0.082	0.076	0.094	0.112	0.109	0.106*	0.122
GDP	-0.030	-0.041	-0.036	-0.025	-0.003	0.000	0.010	0.010
Unemployment	0.111***	0.113***	0.102**	0.075	-0.007	0.010	0.016	0.011
Inflation	-0.025	-0.020	-0.010	-0.018	-0.046	-0.029	-0.009	-0.003
SME	-0.350***	-0.378***	-0.379***	-0.405***	0.023*	0.020	0.019	0.023
Homebank	0.449***	0.464***	0.461***		-0.017	-0.010	-0.011	
Fixed effects								
year	x	x		X	x	x		x
bank		x				x		
debtor coun- try	x	x	x		x	x	x	
bank*year			x	X			x	x
bank*debtor				X				x
country								
N	3590	3590	3590	3561	3590	3590	3590	3561
r2_a	0.39	0.56	0.55	0.68	0.01	0.01	0.02	-0.06

Standardized beta coefficients. * p<0.10, ** p<0.05, *** p<0.01
P-values from bootstrapping at the bank*debtor country level.

Table 10: Regressions with NPL amount and midpoint of NPL amount as dependent variables

pronounced for the latter.

The disparity in impact between SMEs and non-SMEs can be explained by the relatively higher procedural costs of insolvency for SMEs compared to non-SMEs. Studies such as Diez et al. (2021) highlight SMEs' constrained resources, which often leads them to bypass formal insolvency procedures and face direct liquidation. In contrast, non-SMEs possess greater financial, managerial, and legal capabilities, enabling them to navigate insolvency laws more effectively and better leverage new provisions, thereby exerting a higher influence on NPL rates and midpoints.

Moreover, our analysis reveals that the *Reorganization* variable exhibits significance solely in the regression involving non-SMEs, and displays a positive association with NPL rates. This phenomenon may stem from creditors adopting cautious and risk-averse strategies during reorganization scenarios with non-SME debtors, potentially exacerbating NPL rates and midpoints. Complex negotiations among debtors, creditors, and other stakeholders further compound this dynamic, where conflicting interests and disparate bargaining power may hinder optimal outcomes and impede NPL resolution.

Claessens and Klapper (2002) underline that desirable creditor rights, and their connections with bankruptcy use may not be straightforward. They notice that there are variations on this issue, for example between World Bank (2001) and La Porta et al. (1998). In World Bank (2001), work at the global level on developing principles and guidelines for an effective insolvency and creditor rights system suggests that there should preferably be an automatic stay on assets for at least an initial period. This differs from La Porta et al. (1998) who consider, in constructing their index, the absence of an automatic suspension as a positive creditor rights feature. Hence, the impact of the creditor rights index on NPLs may be uncertain, as found in our paper.

Moreover, creditor rights may have ambiguous effects on NPL ratios due to a denominator effect. On the one hand, reforms that increase the creditor protection should attract foreign lenders to a greater extent (La Porta et al. (1998)). On the other hand, reforms that increase debtor protection may also have a positive impact on financing by eliminating legal uncertainty and

hence reducing risk when the indebted firm is distressed (Haselmann et al. (2006)), showing that efficient insolvency procedures are associated with an increase in credit supply.

The lack of significance for SMEs can be attributable to the low bargaining power of the debtor.

In the non-SME regression, we observe a significant positive relationship between the *commencement* variable and NPL rates. This observed correlation may be attributed to the indication of financial distress signaled by both debtors and creditors initiating insolvency proceedings, prompting lenders to classify loans as non-performing assets. Additionally, the utilization of either a liquidity test or balance sheet test as criteria for commencing insolvency proceedings could suggest a higher risk of default, thereby influencing the NPL rate. Conversely, the absence of significance for SMEs in this context underscores the distinctive financial attributes and legal environments that distinguish them from non-SMEs. SMEs typically operate with constrained resources, potentially limiting their accessibility to and eligibility for insolvency proceedings. Such limitations may prevent SMEs from engaging in insolvency procedures compared to larger companies. However, it is important to note that this variable is not significant for NPL midpoints.

In summary, the *Management* variable significantly impacts NPL rates and midpoints, with a stronger effect observed for non-SMEs. This suggests better asset treatment benefits both, but more so for non-SMEs due to their greater resources. Additionally, the *Reorganization* variable only affects non-SMEs, with a positive link to NPL rates. This reflects cautious creditor strategies during non-SME reorganizations, potentially worsening NPL rates due to complex negotiations and conflicting interests. Finally, the *Commencement* variable is found to positively affect non-SMEs' NPL rates, which is explained by increased signals indicating financial distress and giving rise to reclassifications of loans as non-performing.

5.5.2 Creditor type: Small, Medium and Big Banks

Table 12 presents the regression results, categorizing banks into small, medium and large groups. Notably, insolvency reforms exhibit significance solely within large bank regressions. Specifically, the *Creditor* variable displays a positive correlation with NPL rates, while the *Management*

	Debtor type							
	NPL rate				NPL midpoint			
	SME	non-SME	SME	non-SME	SME	non-SME	SME	non-SME
Strength	-0.033*	-0.051			-0.094*	-0.113***		
Creditor			0.015	0.025			0.028	-0.058
Commencement			0.010	0.082**			0.041	-0.033
Management			-0.057*	-0.119***			-0.084*	-0.104**
Reorganization			0.007	0.032*			-0.066	0.115*
L.NPL	0.144	0.111	0.175	0.198*	-0.009	0.161**	-0.008	0.184**
GDP	-0.020	-0.014	-0.023	-0.020	0.016	0.079	0.006	0.073
Unemploy.	0.078	0.114	0.083	0.127	-0.017	-0.020	-0.007	-0.025
Inflation	-0.033	-0.078	-0.31	-0.075	-0.019	0.132	-0.003	0.127
SME								
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1454	1889	1454	1889	1454	1889	1454	1889
r2_a	0.88	0.67	0.89	0.68	-0.07	-0.08	-0.07	-0.08

Standardized beta coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Regressions with the year (t), the bank*year ($i * t$) and the bank*debtor country ($i * j$) fixed effects.

P-values from bootstrapping at the bank*debtor country level.

Table 11: Differentiating the impact according to debtor type (SME vs. non-SME)

variable displays a negative correlation with NPL rates and midpoints.

The positive relationship between the *Creditor* variable and NPL rates supports our moral hazard hypothesis leading to riskier loans. The sole significance of coefficients in large bank regressions can be attributed to the fact that these banks may handle more complex cases involving larger debtors, where creditor participation could have a more pronounced impact on NPL rates. Additionally, large banks face more stringent regulatory constraints, prompting them to pay heightened attention to debtor insolvency proceedings to prevent adverse regulatory repercussions.

Interestingly, the magnitude of the SME coefficient is lower in medium bank regressions compared to large bank regressions. This counter-intuitive finding contrasts with the higher NPL rates observed for domestic SMEs versus foreign SMEs and the greater lending by large banks to foreign SMEs (Mkhaiber and Werner (2021)). Thus, a higher coefficient for the SME dummy in large bank regressions relative to medium bank regressions would be expected. This outcome may stem from less rigorous screening of SMEs borrowing from large banks.

In summary, the impact of the insolvency reforms studied varies across bank sizes, with larger banks benefiting more from reforms pertaining to business continuity. However, they may face higher NPL rates if their possibility of participating in court proceedings is increased. Further exploration is needed to unravel the underlying mechanisms driving this heterogeneity.

5.5.3 Debtor country type: level of NPLs

Table 13 displays regression results categorized by the debtor country's NPL rates. At this stage it is important to note that none of the high NPL countries have implemented reforms related to creditors' participation in court decisions or reorganization plans. Notably, the significance of the *Management* variable is exclusive to countries with high NPL rates, demonstrating its robust association with both bank NPL rates and midpoints at a 1% significance level. This observation underscores the efficiency of insolvency reforms, particularly during periods of financial distress, in mitigating NPL rates and improving their resolution, especially in contexts characterized by high NPL rates and positive NPL growth rates.

	Creditor type - Bank size											
	NPL rate						NPL midpoint					
	Small	Medium	Big	Small	Medium	Big	Small	Medium	Big	Small	Medium	Big
Strength	0.115	-0.045	-0.036*				-0.077	-0.059	-0.124**			
Creditor				0.000	0.011	0.032**				0.000	-0.018	-0.020
Commenc.				0.000	0.054	0.038				0.000	0.038	-0.077
Manag.				0.115	-0.081	-0.091**				-0.077	-0.071	-0.101*
Reorgan.				0.000	0.023	0.038				0.000	0.015	0.065
L.NPL	0.027	0.127	0.140	0.027	0.194	0.200*	0.231	0.214*	0.062	0.231	0.256**	0.064
GDP	0.536	-0.002	-0.050	0.536	-0.000	-0.059	1.144	0.060	0.045	1.144	0.062	0.037
Unemploy.	-0.306	0.139	0.110*	-0.306	0.158	0.118**	-0.897	0.047	0.005	-0.897	0.062	0.007
Inflation	-0.138	-0.078	-0.049	-0.138	-0.069	-0.050	0.203	0.035	0.104	0.203	0.041	0.099
SME	0.226	-0.152***	-0.412***	0.226	-0.152***	-0.412***	0.108	-0.011	0.051**	0.108	0.011	0.051**
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	67	1554	1940	67	1554	1940	67	1554	1940	67	1554	1940
r2_a	0.24	0.55	0.61	0.24	0.55	0.61	-0.03	0.00	-0.03	-0.03	0.02	-0.03

Standardized beta coefficients. * p<0.10, ** p<0.05, *** p<0.01

Regressions with the year (t), the bank*year ($i * t$) and the bank*debtor country ($i * j$) fixed effects.

P-values from bootstrapping at the bank*debtor country level.

Small banks are defined as those with total assets below 39.65 (in Mln EUR), medium-sized banks as those with total assets ranging between 39.65 and 250.07, and large banks as those with total assets exceeding 250.07 (these figures correspond to the first and third quartiles, respectively).

Table 12: Differentiating the impact according to creditor type (small, medium and big banks)

	Debtor country type - NPL Country							
	NPL rate				NPL midpoint			
	Low	High	Low	High	Low	High	Low	High
Strength	-0.011	-0.326**			-0.107**	-0.624**		
Creditor			0.011	0.000			-0.035	0.000
Commenc.			-0.008	0.139			-0.032	-0.065
Management			-0.025	-0.402***			-0.093	-0.606***
Reorgan			0.047**	0.000			0.048	0.000
L.NPL	0.243**	0.628*	0.234**	0.643**	0.026	0.459	0.013	0.463
GDP	-0.005	0.102	-0.009	0.066	0.026	0.420	0.019	0.411
Unemploy.	0.038	-0.603**	0.044	-0.092	-0.019	-1.556*	-0.007	-1.426
Inflation	-0.048	-0.097	-0.054	-0.111	0.061	-0.252	0.056	-0.256
SME	-0.319***	-0.210***	-0.319***	-0.210***	0.028	0.013	0.029	0.013
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3127	390	3127	390	3127	390	3127	390
r2_a	0.47	0.463	0.467	0.46	-0.04	0.01	-0.04	0.01

Standardized beta coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Regressions with the year (t), the bank*year ($i * t$) and the bank*debtor country ($i * j$) fixed effects.

P-values from bootstrapping at the bank*debtor country level.

Low NPL countries are defined as those with non-performing loan (NPL) rates below 5%, while high NPL countries are characterized by NPL rates equal to or exceeding 5%.

Table 13: Differentiating the impact according to debtor country type (low vs. high NPL)

5.5.4 Debtor country type: insolvency regime

Tables 14 and 15 present the results of regressions on NPL rates and midpoints, respectively, categorized by the insolvency regime of the debtor's country. These regimes are delineated by the *Management*, *Creditor*, and *Reorganization* indices, resulting in four distinct categories: debtor, non-debtor, creditor, and non-creditor.

This section aims to investigate the influence of the prevailing insolvency regime on the effectiveness of reforms. Due to a dual moral hazard effect and risk mitigation, we hypothesize that debtor-oriented reforms, such as those pertaining to *Management*, may be more effective at reducing NPLs in creditor-friendly environments, while creditor-oriented reforms, such as those related to *Creditor* and *Reorganisation*, may be more effective in debtor-oriented countries.

Table 14 presents regression results with NPL rates as the dependent variable. We find that only the coefficient of the *Management* variable is significant, particularly in the creditor regression. This outcome supports our hypothesis regarding the higher efficiency of debtor-oriented reforms in creditor-oriented regimes. However, we do not observe any significant impact of this variable in non-debtor and non-creditor countries.

It is also interesting to note that the negative coefficient of the *SME* variable is significant across all regressions at the 1% level, with the most pronounced magnitude observed in the non-debtor regression, followed by the creditor, debtor, and non-creditor regressions. This suggests that banks may derive greater benefits in non-debtor- and creditor-oriented countries, possibly due to the lower risks associated with SME lending in these environments.

Table 15 presents the results for regressions with NPL midpoints as the dependent variable. Here, we find that the coefficient of the *Management* variable is significant in the debtor, non-debtor, and creditor regressions, exhibiting a negative sign. Notably, the magnitude of these coefficients is highest in the non-debtor regression, followed by the creditor regression, and then the debtor regression. These findings align with our hypothesis regarding the heterogeneous impact of insolvency reforms across different regime orientations. Additionally, the *Reorganization* variable shows a positive and significant impact on NPL midpoints in non-debtor countries, suggesting a

potential perverse effect of implementing creditor-oriented reforms in environments with low debtor protection.

In summary, our analysis reveals a nuanced relationship between the efficiency of insolvency regime reforms and NPL rates and midpoints, contingent upon the prevailing insolvency regime. Debtor-oriented reforms are found to be particularly effective in countries with low debtor protection and high creditor rights. Furthermore, our findings suggest the presence of power games between creditors and debtors, underscoring the importance of achieving a balance between their respective rights within the insolvency framework. However, additional analysis is required to investigate the underlying mechanisms further.

5.6 Robustness Checks

In this section, we conduct robustness checks to assess the consistency of our findings under different samples, specifications and adjustments to standard error clustering. Specifically:

- We exclude data from the year 2020 due to the specific treatment of NPLs during the Covid-19 pandemic.
- We omit observations concerning the top 1% of NPLs to account for the potential role of outliers.
- We redefine our insolvency variables to include reforms spanning 2 and 4 years.
- We cluster standard errors at both the bank and bank*debtor country levels.

Tables presenting the results of these robustness checks are provided in the appendices (Tables 23 to 27).

Our findings remain robust across these variations, with the exception of when we consider reforms spanning two years. Notably, the significance of the *Management* variable diminishes below the 10% level in midpoint regressions.

Dep var: NPL rate	Debtor country type - Insolvency Regime							
	Debtor	Non-Debtor	Creditor	Non-Creditor	Debtor	Non-Debtor	Creditor	Non-Creditor
Strength	-0.042	0.026	-0.031	0.017				
Creditor					0.023	0.043	0.013	0.030
Commenc.					0.021	0.018	0.042	0.000
Management					-0.086	-0.013	-0.074**	-0.015
Reorgan.					0.013	0.155	0.040	0.012
L.NPL	0.142	0.489*	-0.009	0.190**	0.229**	0.449	0.091	0.194***
GDP	-0.011	-0.462***	0.083	-0.040	-0.005	-0.482	0.045	-0.034
Unemploy.	0.133	-0.848***	0.082	0.204*	0.123	-0.782	0.104*	0.182
Inflation	-0.028	-0.316	-0.036	-0.070	-0.028	-0.448	-0.034	-0.074
SME	-0.276***	-0.341***	-0.306***	-0.263***	-0.276***	-0.340***	-0.306***	-0.263***
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3010	528	1613	1931	3010	528	1613	1931
r2_a	0.55	0.45	0.63	0.45	0.55	0.45	0.63	0.45

Standardized beta coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Regressions with the year (t), the bank*year ($i * t$) and the bank*debtor country ($i * j$) fixed effects.

P-values from bootstrapping at the bank*debtor country level.

Debtor-oriented countries are defined as those with a *Management* index of 5 or higher, while non-debtor countries have an index below 5.

Similarly, creditor-oriented countries are characterized by a combined *Creditor* and *Reorganization* index equal to or greater than 3.5, while non-creditor countries fall below this threshold.

Table 14: Differentiating the impact according to debtor country type (insolvency regime - NPL rate)

Dep var: NPL midpoint		Debtor country type - Insolvency Regime						
	Debtor	Non-Debtor	Creditor	Non-Creditor	Debtor	Non-Debtor	Creditor	Non-Creditor
Strength	-0.060*	-0.089	-0.139***	0.002				
Creditor					0.006	0.097	-0.041	-0.003
Commencement					-0.017	-0.021	-0.064	0.000
Management					-0.56*	-0.224*	-0.118*	0.000
Reorganization					-0.011	0.491**	0.076	0.011
L.NPL coun-try	0.052	0.924	0.073	0.058	0.067	0.692**	0.115	0.059
GDP	0.015	-0.188	0.126	-0.005	0.014	-0.236	0.087	-0.003
Unemployment	0.132	-0.952	0.052	0.090	0.134	-0.698**	0.047	0.076
Inflation	0.077	0.244	0.123	0.014	0.072	-0.149	0.123	0.008
SME	0.024	0.035	-0.004	0.052**	0.024	0.036	-0.004	0.052**
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3010	528	1613	1931	3010	528	1613	1931
r2_a	-0.027	-0.12	-0.016	-0.04	-0.02	-0.10	-0.01	-0.04

Standardized beta coefficients. * p<0.10, ** p<0.05, *** p<0.01

Regressions with the year (*t*), the bank*year (*i* * *t*) and the bank*debtor country (*i* * *j*) fixed effects.

P-values from bootstrapping at the bank*debtor country level.

Debtor-oriented countries are defined as those with a *Management* index of 5 or higher, while non-debtor countries have an index below 5.

Similarly, creditor-oriented countries are characterized by a combined *Creditor* and *Reorganization* index equal to or greater than 3.5, while non-creditor countries fall below this threshold.

Table 15: Differentiating the impact according to debtor country type (insolvency regime - NPL midpoint)

In summary, these robustness checks reaffirm the inverse relationship between insolvency reforms and bank NPLs, as well as their positive impact on NPL resolution. The results also highlight the effectiveness of reforms aimed at ensuring business continuity, through improved treatment of debtor assets, in both reducing bank NPLs and improving their resolution.

6 Conclusion

This paper examines the relationship between insolvency regime reforms and NPLs. More specifically, we analyze the effect of creditor- and debtor-oriented reforms on European banks' domestic and cross-border NPLs, spanning from 2016 to 2020. Unlike prior studies, we control for both creditor- and debtor-related factors, as well as company size. This contribution is due to the use of the European Banking Authority's Transparency Exercises to measure cross-border NPLs, which, to our knowledge, has never been used in NPL-related academic research. Considering four types of reform, we also explore the differences in their efficiency, shedding light on the creditor versus debtor debate. In terms of NPLs, what is the effect of enhancing creditor or debtor rights?

Using the fixed effects estimator, we show that insolvency regime reforms are efficient at speeding up the resolution of NPLs, especially during financial distress. This effect is particularly true for big firms and big banks, in a debtor country with an already high NPL level. This result is driven by debtor-oriented reforms, more precisely reforms that aim to facilitate business continuity. Our findings also reveal that such reforms are more efficient in countries with a non-debtor- and creditor-friendly insolvency regime. Conversely, we find that creditor-oriented reforms present a perverse effect, as they are associated with higher NPL levels.

Our results therefore support the case for reforms aimed at maximizing firm value by facilitating business continuity, especially if there is a fear of a future increase in NPLs. Although this paper attempts to provide greater insight into the relationship between insolvency regimes and NPLs, it does not present proof of the mechanisms behind this relationship. Moreover, it would also be interesting to delve deeper into reform efficiency heterogeneity among banks and debtors.

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7 Annexes

	Count	Mean	Std Dev	Min	25%	50%	75%	Max
total	3784	1.8093	6.8738	0.0	0.0	0.1613	1.1811	100
SMEs	1657	1.2917	6.2994	0.0	0.0	2.39	0.5629	100
non-SMEs	2127	2.2126	7.2659	0.0	0.0	0.4501	1.7728	100
domestic banks	547	2.8469	5.074	0.0	0.3957	0.11311	2.7156	44.7099
foreign banks	3207	1.6479	7.1506	0.0	0.0	0.0668	0.9372	100

Table 16: Descriptive statistics of banks' NPLs according to the type and the provenance of debtors (in %)

Feature	VIF
Creditor	1.200
Commencement	1.077
Management	1.077
Reorganization	1.290

Table 17: Variance Inflation Factor of explanatory variables

	Count	Mean	Std	Min	25%	50%	75%	Max
Creditor	62	1.44	0.64	1	1	1	2	3
Commencement	63	0.91	0.64	0.5	0.5	0.5	1	3
Management	87	2.29	1.42	0.5	1	2	3	6
Reorganization	70	1.21	0.68	0.5	0.5	1	1.5	3

Table 18: Descriptive statistics on insolvency reform indices

Year	Creditor	Commencement	Management	Reorganization	Total reforms
2005	1	2	4	4	11
2006	5	2	4	5	16
2007	3	7	5	3	18
2008	3	4	6	4	17
2009	3	5	6	3	17
2010	4	5	5	1	15
2011	2	1	2	6	11
2012	3	1	3	2	9
2013	2	2	3	3	10
2014	3	0	6	6	15
2015	5	6	7	5	23
2016	4	5	5	5	19
2017	2	4	3	10	19
2018	7	8	10	9	34
2019	8	4	8	4	24
2020	5	5	8	0	18
Total reforms	60	61	85	70	276

Table 19: Number of reforms per type

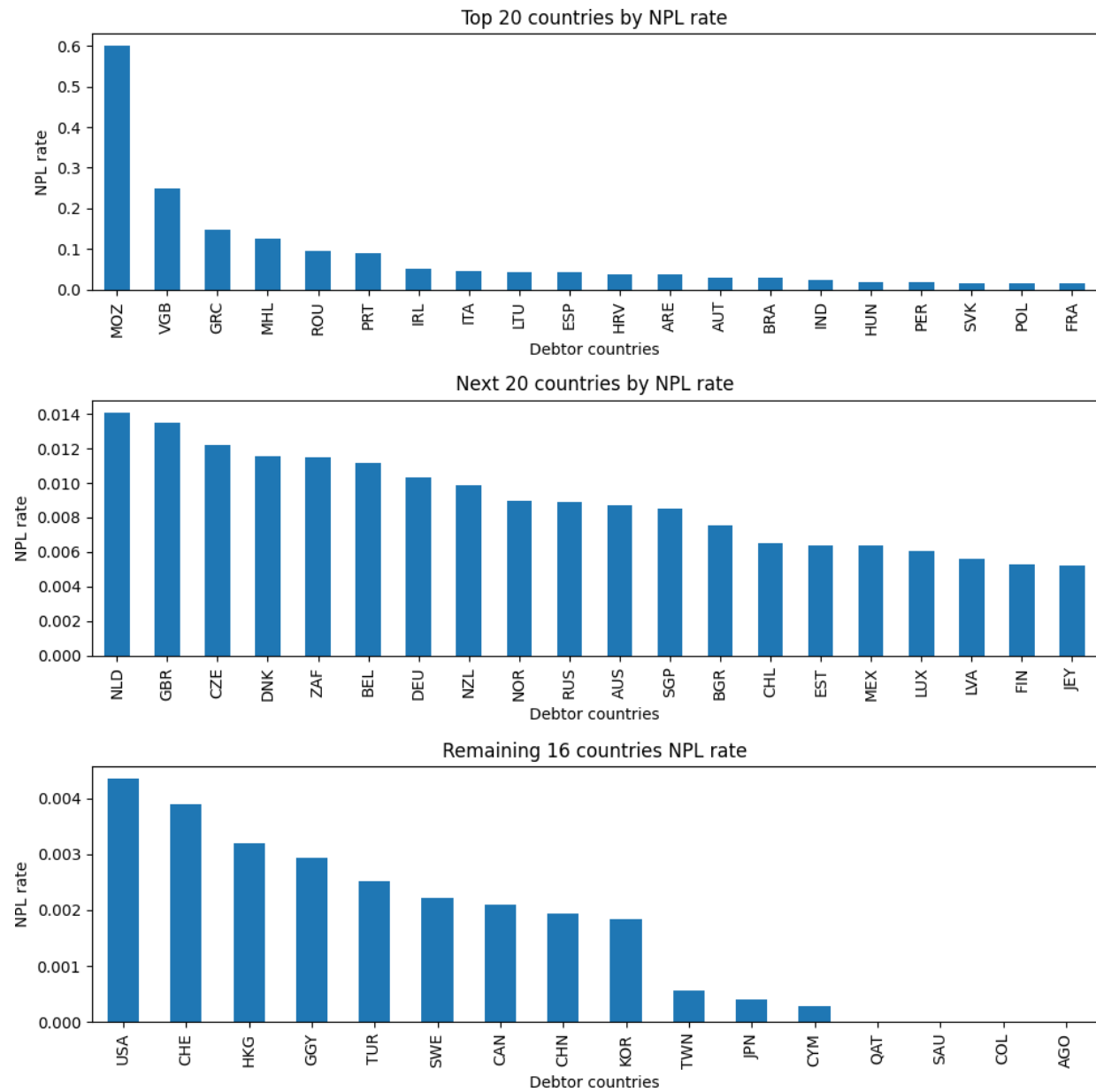


Figure 7: NPL rates from debtor countries

Variable	Description	Source
$NPL_{i,j,s,t}$	Amount of NPLs of bank i, to a debtor country j, for a borrower s (SME or non-SME), in year t	EBA, Transparency Exercise
Strength	The strength of the insolvency framework index is the sum of the scores on the commencement of proceedings index, the management of debtor's assets index, the reorganization proceedings index and the creditor participation index. The index ranges from 0 to 16, with higher values indicating insolvency legislation that is better designed for rehabilitating viable firms and liquidating non-viable ones	World Bank, Doing Business
GDP growth rate	Real GDP growth rate (annual percent change)	IMF, WEO
Inflation rate	Inflation rate, average consumer prices (annual percent change)	IMF, WEO
Unemployment rate	The number of unemployed people as a percentage of the total labor force (percent)	IMF, WEO
NPL country	Value of NPLs divided by the total value of the loan portfolio (including NPLs before the deduction of specific loan-loss provisions) (percent)	World Bank, Data Bank

Table 20: Description of Variables

Independent var	Creditor	Commencement	Management	Reorganization
Dependent var		NPL rate	p-value	
SME	0.48	0.58	0.08	0.40
Non-SME	0.28	0.04	0.01	0.09
Small banks	0.73	no reform	0.02	0.23
Big banks	0.25	0.17	0.03	0.26
Low NPL	0.52	0.56	0.41	0.04
High NPL	no reform	0.57	0.02	no reform
Debtor	0.28	0.24	0.14	0.15
Non-Debtor	0.80	0.74	0.90	0.37
Creditor	0.51	0.20	0.02	0.18
Non-Creditor	0.87	no reform	0.95	0.43

Dependent var		NPL midpoint	p-value	
SME	0.40	0.31	0.09	0.22
Non-SME	0.23	0.30	0.02	0.06
Small banks	0.49	no reform	0.03	0.65
Big banks	0.68	0.29	0.04	0.48
Low NPL	0.38	0.55	0.16	0.40
High NPL	no reform	0.62	0.04	no reform
Debtor	0.78	0.53	0.06	0.38
Non-Debtor	0.18	0.70	0.07	0.04
Creditor	0.64	0.36	0.06	0.47
Non-Creditor	0.94	no reform	0.99	0.76

Bootstrap by bank*debtor country on regressions with the year (t), the bank*year (i*t) and the bank*debtor country (i*j) fixed effects.

Table 21: P-values from bootstrapping

	NPL rate				NPL midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Strength	-0.022	-0.017	-0.014	-0.034*	-0.096**	-0.110	-0.122***	-0.139***
LNPLcountry	0.076	0.083	0.051	0.071	0.032	0.087	0.044	0.075
GDP	-0.045**	-0.045**	-0.027	-0.008	-0.007	-0.009	0.000	0.008
Unemployment	0.239**	0.226**	0.218**	0.177*	-0.051	-0.008	-0.017	-0.040
Inflation	-0.096***	-0.090**	-0.071**	-0.081**	0.013	0.010	0.007	0.035
SME	-0.241***	-0.261***	-0.260***	-0.281***	0.039**	0.042***	0.042**	0.049***
Homebank	0.257***	0.261***	0.260***		-0.013	-0.014	-0.016	0.000
N	2833	2833	2833	2810	2833	2833	2833	2810
r2_a	0.32	0.42	0.40	0.57	0.01	0.02	0.07	-0.02

	NPL rate				NPL midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Creditor	0.012*	0.018***	0.015*	0.010	-0.013	-0.021	-0.031	-0.036
Commencement	0.046***	0.040***	0.049***	0.041**	-0.020	-0.040	-0.049*	-0.056
Management	-0.056***	-0.053***	-0.054***	-0.071***	-0.091***	-0.096***	-0.101***	-0.111***
Reorganization	0.000	0.011	0.015	0.045***	0.027	0.029	0.050	0.060
LNPLcountry	0.127*	0.130*	0.107	0.131*	0.043	0.088	0.038	0.069
GDP	-0.041**	-0.042**	-0.024	-0.008	-0.012	-0.015	-0.009	-0.001
Unemployment	0.277***	0.260***	0.258***	0.202***	-0.056	-0.029	-0.043	-0.068
Inflation	-0.093**	-0.090**	-0.071**	-0.089**	0.005	0.001	-0.011	0.017
SME	-0.241***	-0.261***	-0.261***	-0.281***	0.039**	0.042***	0.042**	0.049***
Homebank	0.257***	0.261***	0.260***		0.013	-0.014	-0.016	
Fixed effects								
year	x	x		x	x	x		x
bank		x				x		
debtor's country	x	x	x		x	x	x	
bank*year			x	x			x	x
bank*debtor's country				x				x
N	2833	2833	2833	2810	2833	2833	2833	2810
r2_a	0.32	0.42	0.40	0.58	0.01	0.02	0.07	-0.01

Standardized beta coefficients. * p<0.10, ** p<0.05, *** p<0.01
P-values from bootstrapping at the bank*debtor country level.

Table 22: Robustness check: Removing 2020

NPL rate				NPL midpoint				
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Strength	-0.041**	-0.029*	-0.024	-0.032*	-0.087***	-0.087***	-0.087***	-0.099***
LNPLcountry	0.137*	0.133*	0.111	0.116	0.082*	0.090*	0.065	0.104*
GDP	-0.022	-0.042	-0.045	-0.064	0.066	0.058	0.056	0.047
Unemployment	0.142*	0.154**	0.133*	0.122	-0.000	0.025	0.008	0.020
Inflation	-0.064	-0.066	-0.040	-0.053	0.044	0.034	0.054	0.078
SME	-0.241***	-0.263***	-0.265***	-0.285***	0.020	0.024	0.023	0.028*
Homebank	0.278***	0.284***	0.280***		0.000	-0.003	-0.009	
N	3558	3558	3553	3529	3558	3558	3553	3529
r2_a	0.31	0.40	0.38	0.56	0.01	0.02	0.06	-0.01

NPL rate				NPL midpoint				
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Creditor	0.014*	0.024**	0.025**	0.025**	-0.007	-0.012	-0.015	-0.02
Commencement	0.048***	0.040***	0.049***	0.041**	-0.020	-0.036**	-0.039**	-0.040*
Management	-0.076***	-0.067***	-0.067***	-0.079***	-0.093***	-0.083***	-0.084***	-0.096***
Reorganization	-0.015**	-0.004	-0.002	0.028**	0.016	0.019	0.030	0.042
LNPLcountry	0.183***	0.177***	0.160***	0.178**	0.100**	0.098*	0.074	0.122**
GDP	-0.027	-0.047	-0.050	-0.040	0.059	0.052	0.048	0.040
Unemployment	0.163**	0.173***	0.15**	0.131*	0.004	0.024	0.006	0.016
Inflation	-0.064*	-0.066*	-0.039	-0.052	0.040	0.031	0.049	0.076
SME	-0.240***	-0.263***	-0.265***	0.285***	0.021	0.024	0.023	0.028*
Homebank	0.278***	0.284***	0.280***		-0.000	-0.003	-0.009	
Fixed effects								
year	x	x		x	x	x		x
bank		x				x		
debtor coun- try	x	x	x		x	x	x	
bank*year			x	x			x	x
bank*debtor				x				x
country								
N	3558	3558	3553	3529	3558	3558	3553	3529
r2_a	0.31	0.40	0.38	0.56	0.01	0.02	0.06	

Standardized beta coefficients. * p<0.10, ** p<0.05, *** p<0.01
P-values from bootstrapping at the bank*debtor country level.

Table 23: Robustness check: Removing the 1% highest bank NPL observations

	NPL rate				NPL midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Strength2	-0.024**	-0.018**	-0.009	-0.005	-0.040**	-0.045**	-0.046**	-0.048*
L.NPL	0.128	0.128	0.105	0.107	0.039	0.051	0.029	0.050
GDP	-0.042	-0.054	-0.052	-0.035	0.041	0.035	0.034	0.032
Unemployment	0.146*	0.161**	0.141*	0.131*	0.021	0.050	0.032	0.038
Inflation	-0.069*	-0.071*	-0.045	-0.063	0.021	0.013	0.034	0.060
SME	-0.237***	-0.260***	-0.260***	-0.283***	0.019	0.022	0.021	0.027
Homebank	0.265***	0.268***	0.264***		-0.003	-0.006	-0.012	
N	3590	3590	3590	3561	3590	3590	3590	3561
r2_a	0.30	0.40	0.39	0.56	0.00	0.02	0.06	-0.02

	NPL rate				NPL midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Creditor	-0.002	0.005	0.006	0.008	0.026	-0.026	-0.038	-0.040*
Commencement	0.019***	0.020***	0.024***	0.027***	-0.000	-0.000	-0.015	-0.016
Management	-0.029***	-0.028***	-0.021***	-0.028***	-0.027	-0.027	-0.023	-0.027
Reorganization	-0.015**	-0.012*	-0.009	0.009	-0.010	-0.010	-0.002	0.006
L.NPL	0.137	0.139	0.117	0.127	0.038	0.049	0.023	0.045
GDP	-0.046	-0.058	-0.055	-0.039	0.042	0.036	0.038	0.035
Unemployment	0.158**	0.172***	0.154**	0.137**	0.026	0.051	0.029	0.037
Inflation	-0.069*	-0.070*	-0.043	-0.060	0.019	0.011	0.029	0.053
SME	-0.237***	-0.260***	-0.260***	-0.283***	0.018	0.022	0.021	0.027*
Homebank	0.265***	0.268***	0.264***		-0.003	-0.006	-0.012	
Fixed effects								
year	x	x		x	x	x		x
bank		x				x		
debtor's country	x	x	x		x	x	x	
bank*year			x	x			x	x
bank*debtor's country				x				x
N	3590	3590	3590	3561	3590	3590	3590	3561
r2_a	0.31	0.40	0.39	0.56	0.00	0.01	0.06	-0.024

Standardized beta coefficients. * p<0.10, ** p<0.05, *** p<0.01

P-values from bootstrapping at the bank*debtor country level.

Creditor, Commencement, Management and Reorganization are built over a two-year period.

Table 24: Robustness check: reforms variable built over a period of 2 years

	NPL rate				NPL midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Strength	-0.035	-0.017	-0.012	-0.028	-0.051**	-0.047**	-0.061***	-0.067**
LNPLcountry	0.144*	0.132	0.111	0.132	0.060	0.066	0.058	0.089
GDP	-0.041	-0.055	-0.051	-0.031	0.043	0.035	0.037	0.036
Unemployment	0.146*	0.163**	0.141**	0.125*	0.023	0.054	0.032	0.036
Inflation	-0.061	-0.067*	-0.043	-0.059	0.032	0.023	0.045	0.073
SME	-0.237***	-0.260***	-0.260***	-0.283***	0.019	0.023	0.021	0.027*
Homebank	0.265***	0.268***	0.264***		-0.003	-0.006	-0.013	
N	3590	3590	3590	3561	3590	3590	3590	3561
r2_a	0.30	0.40	0.39	0.56	0.00	0.01	0.06	-0.02

	NPL rate				NPL midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Creditor	0.023**	0.026**	0.024	0.006	-0.016	-0.018	-0.016	-0.029
Commencement	0.031***	0.027***	0.042***	0.037***	-0.018	-0.025	-0.021*	-0.016
Management	-0.091***	-0.072***	-0.082***	-0.098***	-0.037*	-0.022	-0.058***	-0.060**
Reorganization	-0.008	0.005	0.006	0.034**	-0.12	-0.013	0.006	0.07
LNPLcountry	0.202***	0.185***	0.185***	0.223***	0.054	0.050	0.065	0.098
GDP	-0.043	-0.058	-0.055	-0.034	0.042	0.035	0.035	0.036
Unemployment	0.168***	0.182***	0.161**	0.138**	0.019	0.045	0.031	0.038
Inflation	-0.057	-0.064*	-0.037	-0.056	0.031	0.021	0.040	0.068
SME	-0.236***	-0.260***	-0.260***	-0.282***	0.019	0.022	0.021	0.027*
Homebank	0.265***	0.268***	0.264***		-0.003	-0.006	-0.013	
Fixed effects								
year	x	x		x	x	x		x
bank		x				x		
debtor's country	x	x	x		x	x	x	
bank*year			x	x			x	x
bank*debtor's country				x				x
N	3590	3590	3590	3561	3590	3590	3590	3561
r2_a	0.31	0.40	0.39	0.56	0.00	0.01	0.06	-0.02

Standardized beta coefficients. * p<0.10, ** p<0.05, *** p<0.01

P-values from bootstrapping at the bank*debtor country level.

Creditor, Commencement, Management and Reorganization are built over a four-year period.

Table 25: Robustness check: reforms variable built over a period of 4 years

	NPL rate				NPL midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Strength	-0.042**	-0.028	-0.023	-0.035*	-0.086***	-0.087***	-0.088***	-0.101***
LNPLcountry	0.151**	0.142**	0.121**	0.138**	0.092	0.103*	0.084	0.120*
GDP	-0.035	-0.050*	-0.046	-0.025	0.059	0.051	0.052	0.054
Unemployment	0.133**	0.153***	0.133**	0.166*	-0.009	0.020	0.005	0.008
Inflation	-0.060**	-0.065**	-0.040	-0.058***	0.041	0.032	0.053	0.078
SME	-0.237***	-0.261***	-0.260***	-0.283***	0.018	0.022	0.021	0.026
Homebank	0.265***	0.268***	0.264***		-0.003	-0.006	-0.012	
N	3590	3590	3590	3561	3590	3590	3590	3561
r2_a	0.30	0.40	0.39	0.56	0.01	0.02	0.06	-0.01

	NPL rate				NPL midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Creditor	0.015	0.024	0.023	0.023	-0.007	-0.012	-0.016	-0.021
Commencement	0.048**	0.040**	0.047**	0.041***	-0.021	-0.035	-0.38	-0.040
Management	-0.078***	-0.065***	-0.064***	-0.082***	-0.090***	-0.084***	-0.085***	-0.096***
Reorganization	-0.015	-0.005	-0.001	0.030***	0.016	0.019	0.031*	0.043**
LNPLcountry	0.199***	0.186***	0.171***	0.204***	0.109*	0.112*	0.094	0.139*
GDP	-0.039	-0.054**	-0.051	-0.031	0.052	0.045	0.045	0.048
Unemployment	0.154***	0.171***	0.152***	0.125**	-0.005	0.019	0.003	0.003
Inflation	-0.060**	-0.066***	-0.040	-0.056***	0.037	0.029	0.047	0.076
SME	-0.237***	-0.260***	-0.260***	-0.283***	0.019	0.022	0.021	0.026
Homebank	0.264***	0.268***	0.264***		-0.004	-0.006	-0.012	
Fixed effects								
year	x	x		x	x	x		x
bank		x				x		
debtor coun- try	x	x	x		x	x	x	
bank*year								
			x	x			x	x
bank*debtor				x				x
country								
N	3590	3590	3590	3561	3590	3590	3590	3561
r2_a	0.31	0.40	0.39	0.56	0.01	0.017	0.06	-0.01

Standardized beta coefficients. * p<0.10, ** p<0.05, *** p<0.01
P-values from bootstrapping at the bank*debtor country level.
Standard errors are clustered at bank level instead of debtor country level.

Table 26: Robustness check: clustered standard error at bank level

	NPL rate				NPL midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Strength	-0.042**	-0.028*	-0.023	-0.035**	-0.086***	-0.087***	-0.088***	-0.101***
LNPLcountry	0.151***	0.142***	0.121**	0.138***	0.092	0.103*	0.084	0.120*
GDP	-0.035	-0.050	-0.046	-0.025	0.059	0.051	0.052	0.054
Unemployment	0.133**	0.153***	0.133**	0.116**	-0.009	0.020	0.005	0.008
Inflation	-0.060*	-0.065**	-0.040	-0.058**	0.041	0.032	0.053	0.078
SME	-0.237***	-0.261***	-0.260***	-0.283***	0.018	0.022*	0.021	0.026*
Homebank	0.265***	0.268***	0.264***		-0.003	-0.006	-0.012	
N	3590	3590	3590	3561	3590	3590	3590	3561
r2_a	0.30	0.40	0.39	0.56	0.01	0.02	0.06	-0.01

	NPL rate				NPL midpoint			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Creditor	0.015	0.024	0.023	0.023*	-0.007	-0.012	-0.016	-0.021
Commencement	0.048*	0.040**	0.047**	0.041***	-0.021	-0.035	-0.038	-0.040
Management	-0.078***	-0.065***	-0.064***	-0.082***	-0.090***	-0.084***	-0.085***	-0.096***
Reorganization	-0.015	-0.005	-0.001	0.030***	0.016	0.019	0.031	0.043
LNPLcountry	0.199***	0.186***	0.171***	0.204***	0.109*	0.112*	0.094	0.139*
GDP	-0.039	-0.054*	-0.051	-0.031	0.052	0.045	0.045	0.048
Unemployment	0.154***	0.171***	0.152***	0.125**	-0.005	0.019	0.003	0.003
Inflation	-0.060**	-0.066**	-0.040	-0.056**	0.037	0.029	0.047	0.076
SME	-0.237***	-0.260***	-0.260***	-0.283***	0.019	0.022*	0.021	0.026*
Homebank	0.264***	0.268***	0.264***		-0.004	-0.006	-0.012	
Fixed effects								
year	x	x		x	x	x		x
bank		x				x		
debtor country	x	x	x		x	x	x	
bank*year			x	x			x	x
bank*debtor country				x				x
N	3590	3590	3590	3561	3590	3590	3590	3561
r2_a	0.31	0.40	0.39	0.56	0.01	0.02	0.06	-0.01

Standardized beta coefficients. * p<0.10, ** p<0.05, *** p<0.01

P-values from bootstrapping at the bank*debtor country level.

Standard errors are clustered at bank*debtor's country level instead of country level.

Table 27: Robustness check: clustered standard error at bank*debtor country level