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Insolvency frameworks and private debt: an empirical investigation

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Abstract

This paper presents new evidence on the importance of insolvency frameworks for private sector debt deleveraging and for the resolution of non-performing loans (NPL). We construct an aggregate insolvency framework index (IFI), which is used as explanatory variable in the empirical analysis. By means of panel estimates over 2003-2016, we shows that OECD countries with better IFI deleverage faster and adjust their NPL levels more rapidly than countries with worse IFI. We also shows that there is a strong correlation between the level of NPL and IFI, which appears to be state-dependent, i.e. in a situation of high unemployment relative to its historical average the NPL ratio is generally lower for a higher IFI. Finally, our results indicate that better insolvency frameworks lead to faster NPL reductions and to lower NPL increases during economic bad times.

Key words: private debt, non-performing loans, insolvency frameworks, panel estimates

JEL Classification: C23, E02, E05, O52

Non-technical summary

In the past five years there has been an increasing attention to the role that insolvency frameworks can play in helping to address debt overhangs and in cleaning bank balance sheets from high levels of non-performing loans (NPL). Major international institutions (EC, OECD, and IMF) have redirected their analysis and policy recommendations towards reforms that target insolvency frameworks, and more generally improve the regulatory environment. Important recent initiatives have been the IMF discussion paper on strategies for resolving NPLs (September 2015), the new Commission's draft European Directive which aims at achieving common standards on early restructuring across EU member states (November 2016), and the effort by the OECD to compile a new database on insolvency frameworks reforms (March 2017). One key common objective across these institutions has been to foster the momentum for reforms that improve the efficiency, both ex-ante and ex-post, of insolvency frameworks. This appears important in many euro area countries, as more efficient insolvency and regulatory frameworks are expected to enable a more predictable, faster and less costly resolution of debt distress as well as to reduce fire-sale externalities with positive effects on bank balance sheets and on the broader economy. This is particularly the case in the euro area countries where private debt and/or NPL levels are still very high, e.g. in Cyprus, Greece, Portugal, Italy, Spain and Ireland.

Insolvency frameworks are commonly considered "efficient" if they ensure that non-viable debt is quickly resolved while viable debt is effectively restructured in a sustainable way. Their "ex-ante" efficiency refers to the quality of legislation which sets out the conditions for initiating insolvency procedures or early restructuring, outlines creditor and debtor rights and obligations, and describes the steps to be followed once the procedure starts. Their "ex-post" efficiency refers to the actual, transparent and speedy implementation of the law. The paper shows that there is a very large heterogeneity in the efficiency of insolvency regimes in the euro area. While some countries (i.e. Finland, Ireland, Belgium, Netherlands) appear to be close to the OECD best performers others continue to perform very poorly, both in term of ex-ante and ex-post efficiency. Despite reforms having been significant in many euro area countries during the past five years, insolvency regimes continue to be biased towards liquidation rather than restructuring, which is often associated with lengthier processes and lower recovery rates. This might help explaining why the downsizing of the private non-financial sector balance sheet (active deleveraging) has so far largely taken place via loan reduction rather than restructuring and write-offs.

The empirical literature linking explicitly insolvency regimes and economic outcome is still relatively scarce, but growing. During the past 20 years this growing literature has shown that more efficient insolvency frameworks lead to deeper markets for equity and credit, easier financing conditions for companies, stronger entrepreneurship and higher productivity.

This paper adds to this literature by presenting some new evidence on the importance of insolvency frameworks for deleveraging and NPL resolution. We derive a synthetic insolvency frameworks index (IFI) by computing the simple average of four indicators collected by the World Bank: (1) the strength of legal rights in getting credits; (2) the recovery of debt in insolvency; (3) the cost of enforcing contracts and (4) the time of enforcing contracts. Our synthetic indicator includes therefore aspects of

ex-ante and ex-post efficiency of insolvency regimes as well as measures of efficiency of pre-insolvency regimes and legal rights of creditors. The idea behind using an aggregate indicator is that it allows encompassing different aspects of the insolvency frameworks which makes it relevant for corporation and households. Pulling together different indicator increases the variability of the IFI trough time, this is because while individual indicators have limited variability they do not necessary co-move. The IFI is used as explanatory variable in several econometric exercises, where the dependent variables are the change in private debt held by non-financial corporations (NFC) and households (HH), the level and the change in NPL.

The data used in the paper cover the period 2003 to 2016 for the OECD countries. While a 13-year sample might not appear very long, it however includes both the period of accumulation of debt and the subsequent deleveraging phase in an evenly manner.

By means of panel estimates, the paper shows that countries with better insolvency frameworks deleverage faster and are able to adjust their NPL more rapidly than countries with weaker regimes. This is shown both for the EU countries and for a larger sample including other OECD countries. This result is obtained by isolating, as dependent variable, all deleveraging episodes, i.e. situations of debt decreases and it is further confirmed when dividing the sample period into pre and post-2009. The post-2009 period is essentially characterised by debt decreases and in this sub-sample one can observe a significant relationship between better insolvency frameworks and faster deleveraging.

The empirical exercises also show that there is a strong correlation between the level of NPLs and insolvency frameworks, which appears to be state-dependent. In particular, after controlling for macro and balance-sheet developments, the estimates suggest that in a situation of high unemployment relative to its historical average, the NPL ratio is generally lower when more efficient insolvency frameworks are in place. These results support the call for reforms addressing inefficiencies in insolvency regimes. Finally, we show that better insolvency frameworks appear able to affect both NPL declines and increases. While in the first case there is a significant direct link between better insolvency frameworks and NPL reductions, in the second case, the link is indirect, i.e. the accumulation of NPL is reduced in the presence of better insolvency frameworks during bad economic times (i.e. when unemployment is higher than its historical average).

Several robustness checks have been carried out by looking at the explanatory power of the individual components of the IFI, by adding variables which include a more encompassing definition of institutional quality and by changing lags of the control variables. A robust link is generally found between more efficient institutions and the ability to deleverage and reduce NPL. Interestingly, when replacing the IFI by its individual components one can notice a drop in the significance in some of them. However, the drop in significance is not linear, i.e. some variables are directly significant and other are indirectly significant (i.e. via the interaction term with debt), making it stronger the case for the use of the aggregate IFI. Finally, the IFI remains significant even when controlling for more encompassing measures of institutional quality.

1. Literature overview

Private sector debt levels increased significantly in many European countries in the decade preceding the 2009 financial crisis. In this period the strong expansion of credit to the private sector was largely used to finance consumption and unproductive investment (Barnes, 2010). After the financial crisis the private sector debt levels started to levelling-off and have been gradually on a reducing path. This notwithstanding, meeting debt service obligations became more challenging and this resulted in a sharp increase in the amount of non-performing loans (NPL), which reached their peak, at the euro area aggregate level, in 2013. Since then, NPL have been on a slowly declining trend in the euro area countries. Despite their downward trend the EUR 1 trillion of NPL (9.7% of GDP) as of 2017 in the euro area is high and it remains one key source of vulnerabilities in Europe.[1]

Several studies have shown that too high levels of private debt are harmful for economic growth (Cecchetti et al., 2015, Chen et al. 2015), via negative impact on consumption and investment decisions as well as on bank lending, to the extent that high debt is translated in rising NPL (Sutherlands and Holler, 2012; Liu and Rosemberg, 2013). Moreover, the slow recognition of bad loans tends to generate macroeconomic uncertainty, impair the intermediation function of banks and could lead to protracted periods of tight credit for the whole economy, including its viable part (Bricogne et al., 2016). The European Commission (EC) has recently reported that the EU countries with high NPL have experienced below average economic growth, have suffered the strongest contraction in bank lending, and witnessed investment ratios below the EU average (EC Quarterly Review, March 2017). Based on this evidence there seems to be good arguments to address forcefully the issue of debt overhang and NPL in the euro area.

This paper tests the hypothesis that one key channel to achieve a rapid reduction of NPL and faster deleveraging in the private sector could work via more efficient insolvency frameworks. Insolvency frameworks work very differently across countries, both in term of effectiveness of the resolution toolkit and enforcement mechanisms (Aiyar et al. 2015). The empirical evidence linking private debt and NLP to insolvency frameworks is still scarce, mostly because of data and measurement issues. The available empirical literature which established a link between insolvency frameworks and economic outcomes has been mainly developed during the past twenty years and has mostly focused on the impact of different legal frameworks on financial market efficiency and financing conditions for firms and entrepreneurship. In this context, the existing literature looks at four important elements which characterise an “efficient” insolvency framework, i.e. one that maximises the efficient working of financial markets and the financing choices of firms:

(1) The prevention of fire-sale liquidations. Acharya et al. (2008) develop a theoretical model linking firm’s capital-structure choice to the bankruptcy code under which a firm operates. The model indicates that a key factor influencing capital-structure choice is the firm’s anticipated liquidation value. More precisely, it predicts that firms with low liquidation values will employ greater leverage under a bankruptcy code that favours equity-holders than under one that favours debt holders. The authors

[1] See, for instance, the opinion piece by the Vice-President of the ECB on 5th July 2017.

find that the difference in optimal debt levels under the two regimes is a decreasing function of the degree of liquidation values.

(2) The safeguarding of creditors' rights. La Porta et al. (1997) shows that the presence of a legal environment which protects creditors favours the development of capital markets.

(3) The presence of mechanisms which ensure that debtors have the right incentives to preserve the value of the distressed company. Von Thadden et al. (2010) model the differences between the presence of single and multiple creditors. They show that in the presence of multiple creditors, bankruptcy laws, which feature an automatic stay, limits the individual rights to liquidate assets. In this setting, giving the right to trigger bankruptcy to creditors is not always optimal because creditors would want to foreclose individually if this offers them higher value than in bankruptcy. In such a case, the debtor should have the power to trigger bankruptcy to defend against an excessive foreclosure.

(4) The safeguarding of firms' business. Djnakov et. al. (2008) show that legal rules that require the company to suspend operations, or that allow suppliers and customers to rescind contracts while the company is in bankruptcy, reduce efficiency of debt enforcement.

Empirical analysis in the past two decades has shown that efficient insolvency frameworks improve the size and deepness of capital markets, access to finance and enhance entrepreneurship and company formation. Some recent examples are the works of Davydenko and Franks (2008) who found that unfriendly bankruptcy codes lead to higher collateral requirements, while Ferrando et al. (2015) found that sound and efficient investor protection rules increase the likelihood of companies gaining access to credit. The work by AFME (2016) shows that improving the insolvency recovery rate reduces significantly corporate bond spreads. Likewise, adequate insolvency regimes encourage entrepreneurship (Caracea et al., 2015) and the rate of new firm entry (Leea et al. 2011). Adalet McGowan et al. (2017a, b) show that reforms to insolvency regimes can boost labour and total factor productivity by: i) making it more likely that weak firms exit the market or are successfully restructured; ii) reducing the share of capital sunk in zombie firms; and iii) spurring productivity-enhancing capital reallocation. Andrew and Petroulakis (2017) analyse firm level data for a set of euro area countries and show that around one-third of the impact of zombie congestion on capital misallocation could be directly attributed to bank health. They show that the improvement in bank health is more likely to be associated with a reduction of zombie firms in countries with more efficient insolvency regimes, which are defined as those regimes that do not unduly inhibit corporate restructuring.

In the past two years an increasing attention has also been given to the importance of sound and efficient insolvency frameworks in affecting the dynamics of debt, and in particular of non-performing debt. However, the empirical literature remains very limited to our knowledge.

The work by Aiyar et al. (2015) distinguishes between sound insolvency regimes, which provide viable companies in distress to have a second chance and to restructure quickly, and inadequate frameworks which instead could either precipitate liquidation or limit companies' to smoothly reduce their excessive levels of debt. A costly and lengthy insolvency framework can thus lead to higher economic losses from being unable to recover the value of the assets or a significant increase in banks' NPL as agents' incentives to renegotiate may lead to delays. This distinction is particularly relevant in the current context of high NPL in some euro area countries.

Finally, Caracea et al. (2015) has reported evidence for the EU that good insolvency frameworks are associated with speedier adjustment of NPL. Our paper does not test for the direct impact of insolvency frameworks on NPL and deleveraging, but it uses the information available on the efficiency of insolvency frameworks to group countries and to compare the NPL performance inside different groups. This paper is complementary to the work by the Caracea et al. (2015) as it reports a set of empirical exercises analysing the link between insolvency frameworks, deleveraging and NPL, after controlling for macroeconomic and financial variables.

Compared to the existing and still scarce literature the econometric analysis carried out in this paper offers some new results:

First, we test the presence of a direct link between the quality of insolvency frameworks and debt accumulation / deleveraging in the EU and OECD countries, after controlling for macroeconomic variables and show that this link is significant.

Second we differentiate between households and non-financial corporations (NFC) and show that better insolvency frameworks are important to foster deleveraging in both sectors. However, in the presence of high debt, more efficient insolvency frameworks are particularly important for increasing the speed of deleveraging in the NFC sector rather than in the household sector.

Third we show that better insolvency frameworks are generally associated with lower NPL ratios.

Fourth, we show that the reduction of NPL is facilitated by more efficient insolvency frameworks when unemployment is very high. In other words, better insolvency frameworks allow a country to be better equipped in the presence of adverse macroeconomic shocks.

Finally we show that in bad economic times, i.e. when the unemployment rate is above its historical average, the increase in NPL is less pronounces in the presence of more efficient insolvency frameworks.

The remaining part of the paper is organised as follows. Section 2 describes the differences across countries in terms of insolvency frameworks and types of deleveraging and the data used for the analysis. Section 3 describes the statistical properties of the insolvency framework index (IFI) used as key explanatory variable in the empirical models. Section 4 presents the empirical models, and discusses the results, as well as a number of variants of the benchmark models and associated robustness checks. Section 5 concludes.

2. Stylised facts on insolvency frameworks in the euro area and data analysis

This section describes the available indicators used to assess the efficiency of insolvency frameworks, the differences of insolvency frameworks across countries and the treatment of the data used for the econometric exercise.

Data able to track the efficiency of insolvency frameworks are scarce and most likely they are not adequately capturing the progress occurred most recently. In fact, in the past five years many euro

area countries have been undertaking reforms to improve insolvency frameworks, speed-up debt restructuring and better support the early rescue of viable firms. While facilitating rehabilitation has been at the centre of the reform effort in several countries, currently in the euro area insolvency regimes are still based towards liquidation rather than restructuring (Table 1).[2]

A key parameter to assess the efficiency of insolvency frameworks relies on the effectiveness of restructuring tools. There is evidence that early financial restructuring of borrowers in debt distress ahead of a formal insolvency proceeding and liquidation results in higher value recovery for lenders (Garrido, 2012). Several euro area countries, however, lack an effective framework for early private debt restructuring (whether entirely out of court or with light court supervision). Against this background, the Commission in November 2016 released a proposal for a *Directive on Preventive Restructuring Frameworks and Debt Discharge*. The proposal sets an important milestone for fostering early restructuring frameworks, reducing the stigma of debt and the lengthy discharge periods during which lenders might pursue entrepreneurs. The implementation of the directive might be lengthy and not straightforward, as reforms to facilitate early debt restructuring and increase the efficiency of insolvency, restructuring and discharge procedures are complex. However, a proper implementation of the directive could lead to more efficient pre-insolvency tools to deal with debt restructuring in an out-of-court procedure and for specific creditors (it is not targeted to companies which are clearly insolvent and it is unlikely to deal with liabilities related to wages and pensions). As pre-insolvency procedures are naturally affected by subsequent legal steps, their effectiveness across EU countries will crucially depend on the judicial capacity and any related reform of the judicial system.

Table 1 – Most likely outcome for debtors in financial difficulties

Restructuring	Liquidation
BE	DE
IE	EE
ES	GR
SI	FR
FI	IT
	CY
	LV
	LT
	LU
	MT
	NL
	AT
	PT
	SK

Source: EC (DG Justice and Consumers)

The large prevalence of liquidation rather than restructuring outcomes is consistent with the finding that write-off have been relatively limited in the countries which saw a reduction of their debt during the past five years. This point is illustrated in Chart 1, which reports the euro area countries that either saw a fall in their debt-to-GDP ratio (black dotted line) or a fall in nominal debt between 2009 and 2017 (blue circle). The change in nominal private sector debt (blue circle) is decomposed in new loans and net debt issuances (including revaluations from debt transactions) and write-offs. With the exceptions of two countries (Spain and Estonia) where the share of write-off has been relatively large, the chart shows that active deleveraging (i.e. the fall in nominal debt) mainly came from a reduction of loans and net debt issuance.

The example of liquidation versus restructuring tools shows that the efficiency of insolvency frameworks needs to be assessed against two dimensions: ex-ante and ex-post. The ex-ante perspective looks at the quality of legislation which sets out the conditions for initiating insolvency

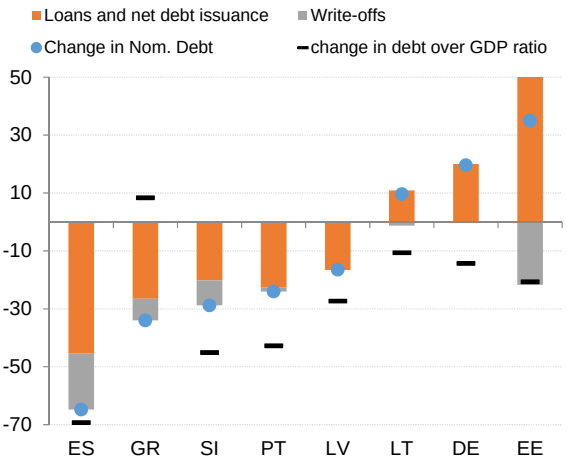
[2] Rehabilitation measures include modification of requirements to encourage debtors to file in the early stage of their financial difficulties (EE, LV, LT), affording flexibility in the use of restructuring tools such as debt to equity swaps (EE, DE, LV), simplifying procedures to facilitate creditor action on the restructuring plan (EE, DE, IT, LV, PT, ES), and according priority repayment status to creditors that provide new financing (LV).

procedures or early restructuring, outlines' creditor and debtor's rights and obligations, and describes the steps to be followed once the procedure starts. The ex-post dimension refers to the actual, transparent and speedy implementation of the law, e.g. by an effective working of judicial system in resolving commercial disputes, including the presence of out-of-court frameworks.

To measure the ex-ante and ex-post dimensions of insolvency frameworks we use the currently most widely used dataset on insolvency frameworks, i.e. the one collected by the World Bank's Doing Business Survey. This database provides information that is comprehensive in coverage of countries and types of insolvency indicators. It contains quantitative data on insolvency outcomes (i.e. the cost of insolvency proceedings, the time for creditors to recover credit and recovery rates) from 2004 onwards and on the strength of insolvency laws only from 2013 onwards.

Chart 1 – Mode of deleveraging in the private sector

(cumlative change 2009-2017, in pp)



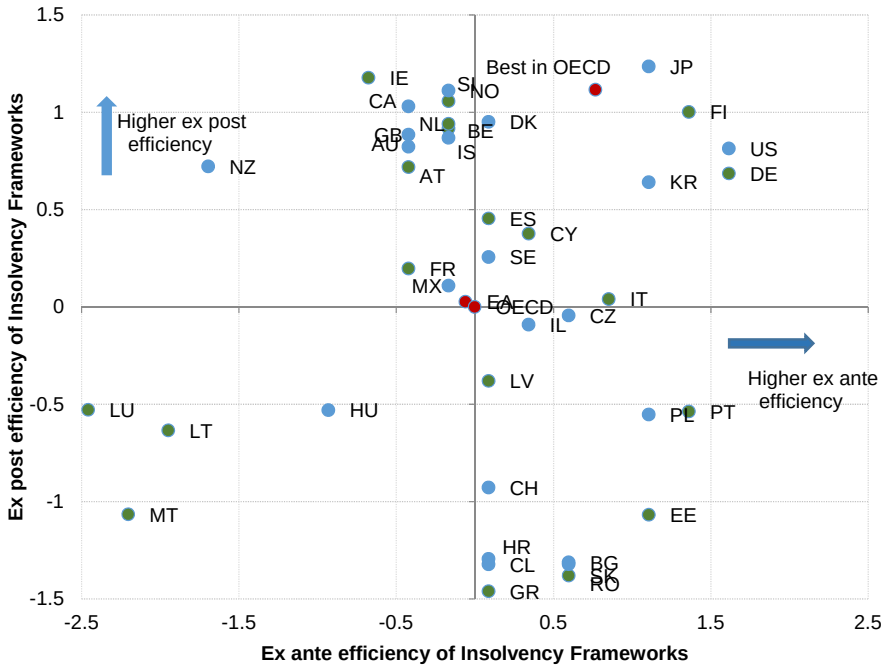
Note: Loans and net debt issuance include also revaluation effects resulting from loans/debt transactions. Source: Eurostat.

Chart 2 shows the relative position of the OECD countries in these two dimensions for the latest available annual data point (2017). Ex-ante efficiency is measured by the World Bank indicator on the strength of the Insolvency Laws according to 4 areas: commencement of proceedings; management of debtor's assets; reorganisation proceedings; creditors' rights. The sum of these indicators is a measure of the strength of the Insolvency Law (World Bank, 2015a). This indicator is then transformed in z-score relative to the OECD average. The ex-post efficiency is measured by taking the unweighted average of the cost, time and recovery rates, after having transformed both indicators in z-scores relative to the OECD average. Chart 2 shows that higher ex-ante efficiency does not necessarily imply higher ex-post efficiency. Likely as a result of the recent reform effort, the chart also shows that, generally, the euro area countries (green dots) are stronger in the ex-ante dimension rather than in the ex-post dimension of efficiency.

When reading these data, it should be born in mind that they have clear limitations, as their construction is based on a number of simplifying assumptions which might be not be representative of the complexity of insolvency regimes across countries.[3]

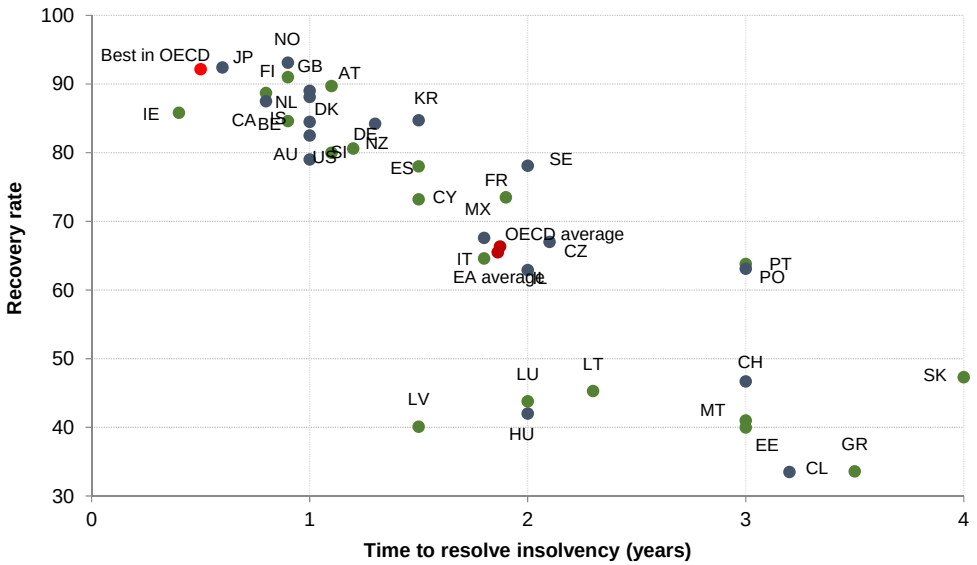
[3] These data are derived from questionnaire responses of insolvency practitioners rather than direct observations from courts and insolvency institutions and therefore need to be interpreted with caution. Moreover they offer a partial picture as they refer only to corporate insolvency (i.e. exclude personal insolvency regimes). The questionnaire is based on ad-hoc case which, for instance, focuses on the recovery rate of secured loans.

Chart 2 – Ex ante and ex-post efficiency of insolvency frameworks (2017)



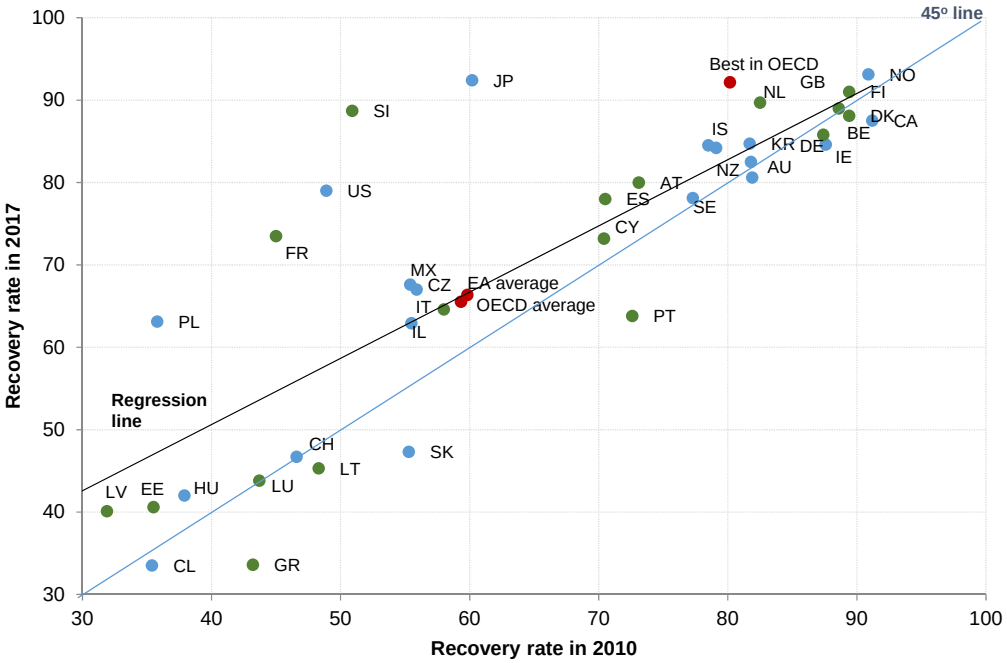
Source: Own computation on World Bank, 2018 Doing Business Indicators.
Notes: Z-score relative to OECD average. EA countries in green, rest of OECD in blue. EA average, OECD average and best performers in OECD in red (NO, JP, IE, FI). Ex-ante efficiency = strength of the Insolvency Laws according to 4 areas: commencement of proceedings; management of debtor's assets; reorganisation proceedings; creditors' rights. Ex-post efficiency = average of the cost, time and recovery rates.

Chart 3 – Recovery rate (in %) and time to resolve insolvency (years), 2017



Note: EA countries in green, rest of OECD in blue. EA average, OECD average and best performers in OECD in red (NO, JP, IE, FI).
Source: World Bank, 2018 Doing Business Indicators.

Chart 4 – Recovery rate (in %) in 2010 and 2017



Note: EA countries in orange, rest of OECD in blue. EA average, OECD average and best performers in OECD in red (NO, JP, IE, FI).
Source: World Bank, 2018 Doing Business Indicators. In blue the 45° line is shown, while in black the regression line is shown.

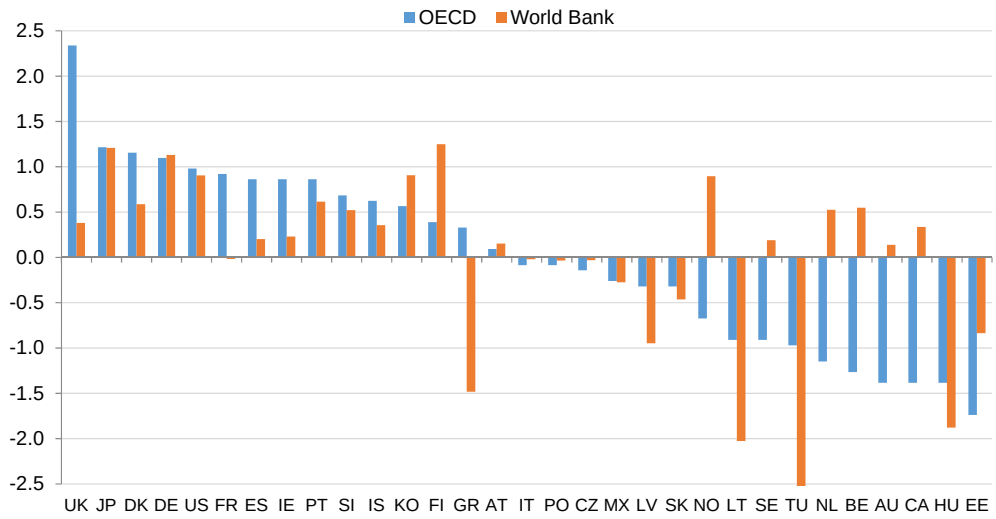
From an implementation point of view, resolving insolvencies in many euro area countries continue to be costly, lengthy and to recover little value. When focusing on the ex-post part of the indicators, Chart 3 shows that there is a strongly negative correlation between the recovery rate and the time to resolve insolvency. It indicates that insolvency frameworks function quite well in some parts of Europe, especially in Ireland, Netherland, Belgium, and the Scandinavian countries, where the time required is short, the cost is relatively low and recovery rates are high. But they are considered to be rather weak elsewhere, especially in some South and Eastern Europe and Baltic countries. The score of the euro area as a whole is very close to the OECD average, but the dispersion across the euro area countries is very large. The recovery rate by secured creditors (through reorganisation, liquidation or debt enforcement proceedings) ranges from about 35% in Greece to 91% in Finland and the time to recover their credit ranges from 4 years in Slovakia to 4 months in Ireland.

Chart 4 shows that, as a result of past reforms, there has been an increase in absolute values of recovery rates across a number of euro area countries (countries above the 45^0 line), however only a few countries saw an increase relative to the OECD average (countries above the regression line). These countries are France, Slovenia, Spain, Austria and the Netherlands. All these countries undertook reforms, in particular on the corporate side, to facility the early restructuring of debt.

It should be noted that the World Bank insolvency framework indicator used in the above graphical analysis refers to corporate insolvency and it is based on resolving just one stylised business insolvency. A new survey from the OECD on insolvency regimes available for the years 2010 and

2016 provides an alternative source of homogeneous information across countries on the legal structure of insolvency frameworks for corporations, based on four pillars: treatment of failed entrepreneurs, prevention tools, restructuring tools, and other factors, such us the degree of court involvement, right of employee, etc. (see Adalet-McGowan, 2018 and 2017b). The OECD data broadly confirms the picture emerging from the ex-ante measure of insolvency framework included in the World Bank database with a few exceptions. Chart 5 shows that generally the countries for which the OECD indicator performs better than the sample average correspond to those for which also the World Bank indicator perform better than the sample average with the exception of France and Greece. For these two countries the OECD indicator signals a better than average performance, while the World Bank indicator signals for France a performance equal to the sample average and for Greece a performance worse than the sample average. Chart 5 shows a lower degree of correspondence between the OECD and World Bank indicators for the countries for which the OECD indicator signals a worse performance than the sample average. In particular, discordances emerge for Norway, Sweden, Netherlands, Belgium, Austria and Canada. These countries perform relatively poorly in the OECD indicators while they perform better than the sample average according to the World Bank indicator.

Chart 5 – OECD composite insolvency indicator and World Bank overall rank for resolving insolvencies



Note: z-score computed for the two indexes. OECD is a composite indicator based on 12 components of the insolvency indicator; World Bank is the aggregate Distance to Frontier of the block resolving insolvencies. Higher values means stronger and more efficient insolvency frameworks, Source: World Bank, 2018 Doing Business Indicators, OECD Insolvency Indicator database.

A key difference between then OECD and the World Bank indicator is that the former is assessing the efficiency of insolvencies only on the basis of the legal structure while the latter, despite focusing on a case study, assesses the efficiency of insolvencies on the basis of the legal structure and the practical implementation of the law.

This paper does not take a stance on which of the two dataset is preferable in terms of accuracy, however, since the data in the OECD database are publicly available only for 2 data points (2010 and 2016) and they do not cover all EU countries (i.e. those not part of the OECD group), the econometric

analysis of this paper relies on the Word Bank database. This allows having a longer time series and also considering the ex-ante and ex-post dimension of insolvency frameworks.

In our paper we are not only interested in modelling the deleveraging behaviour of corporate but also that of households, moreover given that data on NPL are only available at the aggregate level (i.e. the disaggregation between households and NFC is not available) we need to compute a broader indicator for insolvency frameworks which accounts for both sectors. Against this background, the next section describes the composite insolvency framework index (IFI) used in the paper.

Data for households (HH) and non-financial corporation (NFC) debt are from Eurostat and include loans and securities. Data on NPL have been compiled from different databases (IMF and ECB Balance Sheet data). The remaining macroeconomic data (GDP, unemployment rate) used in the econometric exercises are from the European Commission database.

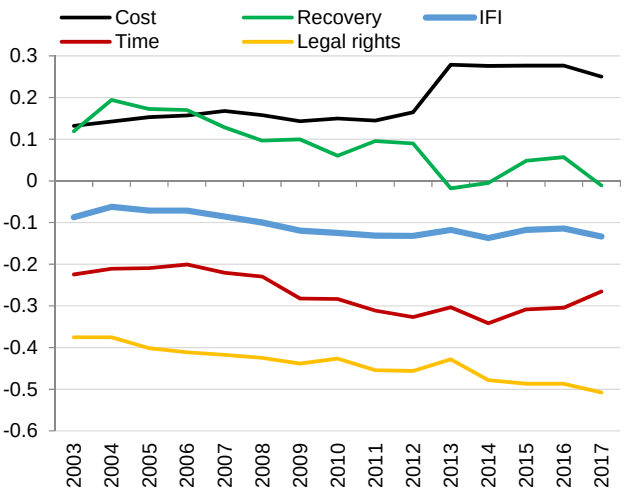
3. Statistical properties of the insolvency framework index

The empirical models aim at testing the importance of insolvency frameworks for deleveraging and NPL resolution. The chosen indicator of insolvency framework (IFI) is an aggregate index which includes not only aspects of insolvency regimes but also broader elements of enforcing contracts as measured by the World Bank. IFI is calculated as the composite indicator of four indicators measuring: the cost of resolving insolvency (ex-post); the strength of legal rights in getting credits (ex-ante); the time needed to enforce contracts (ex-post); and the cost of enforcing contracts (ex-post). For each of the sub-indicators the z-score relative to the OECD average is computed and aggregated with equal weights to form the IFI. Data on each of the individual indicators have an annual frequency and are available from 2003 to 2017.

To compute the aggregate IFI, all four indicators have been standardised in a way that higher values means more efficient insolvency laws / practices, the IFI is then computed as the simple average of these indicators (Chart 6).

Out of the four indicators included in the IFI, three have an ex-post dimension and one an ex-ante dimension. The rational for giving a higher weight to the ex-post dimension is two-fold: first we want to make sure that the index adequately reflects efficiencies and inefficiencies for the economy at large and this is best reflected

Chart 6 – IFI and components for the euro area aggregate
(z-scores)

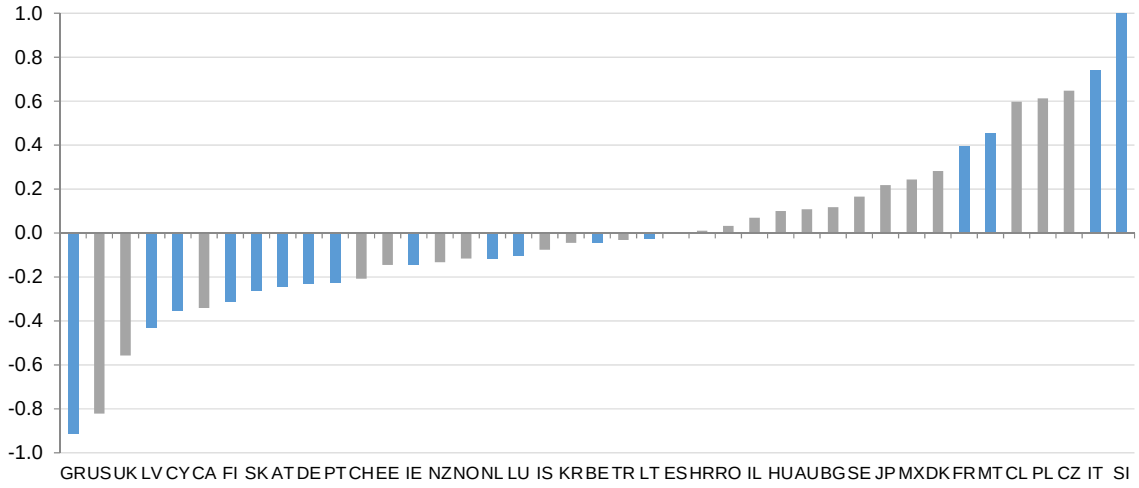


Source: Own computations on the 2018 World Bank doing business indicators.
Notes: Recovery = recovery of debt in insolvency; Cost = cost of the proceeding, Time = average duration of 3 different stages of disputes: the completion of the process, the issuance of judgment and the recovery of the claim value. Legal rights = degree with which the collateral and bankruptcy law protect lenders and borrowers in getting credits. Z-scores centred on the OECD average. Higher values mean more efficient indicators. Values above zero means that the indicators are better than the OECD average.

by looking at the ex-post aspect of insolvency frameworks, second the time dimension of the ex-ante indicators is more limited than that of the ex-post indicator, e.g. the strength of insolvency law index and its sub-indicators is only available as of 2013 for most countries.

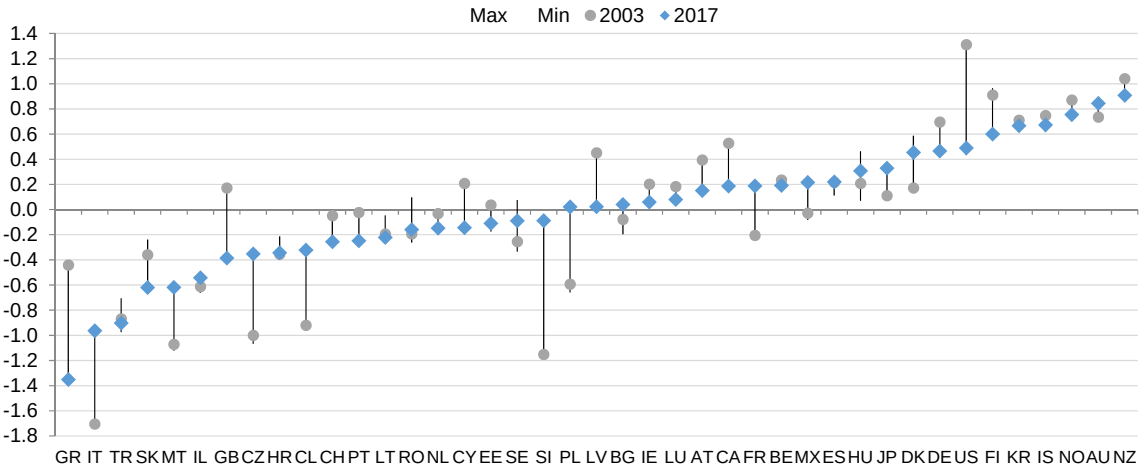
Chart 6 shows the evolution of IFI and its components for the euro area aggregate relative to the OECD (z-scores). Each of the components and the aggregate IFI show some limited variability through time. It is interesting to note that the relative position of the euro area aggregate IFI has been deteriorating between 2004 and 2014, while the index has stabilised since then. Across the four components the deterioration has been significant in the recovery of debt in insolvency proceedings and in the legal frameworks of lenders and borrowers relative to the OECD.

Chart 7 – Change in the IFI between 2003 and 2017 relative to the OECD average



Source: Own computation on the World Bank, 2018 Doing Business Indicators. Notes: Z-scores centred on the OECD average. Higher values mean an improvement compared to the OECD average. In blue are euro area countries. Countries ranked in ascending order.

Chart 8 – Maximum, minimum, first and latest observation of the IFI (2003 – 2017)



Source: Own computation on the World Bank, 2018 Doing Business Indicators. Notes: Z-scores centred on the OECD average. Higher values mean more efficient insolvency frameworks compared to the OECD average. Countries ranked in ascending order for the year 2017.

Chart 7 shows the change of IFI between 2003 and 2017 in the OECD countries relative to their average. It shows that in relative terms the change in efficiency of insolvency frameworks in the euro area countries has been largely underperforming that of the OECD average. Chart 7 also shows that for about one-third of the countries there has been relatively limited change of the IFI during the past 15 years (i.e. the countries in the middle of the chart), the change has been however not negligible for the large majority of the OECD countries, including the euro area. Finally Chart 8 shows the volatility of the index between 2003 (first observation) and 2017 (last observation) captured by its minimum and maximum values across all OECD countries. It indicates that, despite it is not particularly high, the volatility of the IFI varies across countries (Annex 1 reports the volatility of the four components of the index across countries).

4. The empirical models and estimation results

This section shows some empirical exercises aiming at linking the evolution of debt in the private sector and NPL to the efficiency of insolvency frameworks. Data cover developments from 2003 to 2016. The start of the sample period is constrained by the availability of data on insolvency frameworks while the end of the sample period is determined by the still limited availability of data for NPL in most recent years. The country coverage includes all OECD countries. To assess if there is a specific European story, the estimates are carried out separately for the EU and for the entire OECD.

We are interested in three sets of empirical relationships: (1) linking the changes in private debt to insolvency frameworks; (2) linking the stock of NPL to insolvency frameworks; (3) linking the evolution of NPL to insolvency frameworks. Starting with the first relationship, the benchmark model can be represented as follows:

(1) $$\Delta D_{c,t,i} = \alpha_{0,i} + \alpha_{t,i} + \alpha_{1,i}\Delta Y_{c,t,i} + \alpha_{2,i}D_{c,t-1,i} + \alpha_{3,i}IFI_{c,t-1} + \alpha_{4,i}IFI_{c,t-1}D_{c,t-1,i} + \alpha_{5,i}NPL_{c,t-1} + \varepsilon_{t,i}$$

where:

$\Delta D_{c,t,i}$ is the one-year change in private debt at time *t*, for country *c* and sector *i* = HH, NFC;

$\Delta Y_{c,t,i}$ is the lagged change in real income (GDP for NFCs and Disposable Income for HH);

$D_{c,t-1,i}$, $NPL_{c,t-1}$ and $IFI_{c,t-1}$ are respectively the lagged levels of the private debt ratio, of the NPL ratio and of the insolvency framework index for country *c*.

$IFI_{c,t-1}D_{c,t-1}$ is the interaction term between the level of the insolvency framework index and private sector debt.

In equation (1) we estimate separately changes in NFC and HH debt. For each of the two sectors we are interested in analysing the determinants of the evolution of debt, which are not only related to macroeconomic conditions, initial levels of debt and asset quality but also to the quality of insolvency frameworks. The IFI index enters directly and as interaction with the level of private sector debt. The main testing hypothesis is that better IFI helps deleveraging, in particular in the presence of high debt.

The second benchmark relationship links the NPL ratio to macro and financial sector conditions and the IFI, as follows:

(2) $$NPL_{c,t} = \beta_0 + \beta_t + \beta_1 U_{c,t-1} + \beta_2 \Delta U_{c,t-3} + \beta_3 IFI_{c,t-1} + \beta_4 IFI_{c,t-1}(U_{c,t} - U_c^*)_{t-1} + \beta_5 Z_{c,t-1} + \epsilon_t$$

where:

$NPL_{c,t}$ is the NPL over total loans ratio at time *t*, for country *c,*

$U_{c,t-1}$ is the lagged unemployment rate,

$\Delta U_{c,t-3}$ is the change of the unemployment rate between time t and t-3. The choice to consider the 3-year change is related to the fact that the sample data show little variability of the unemployment rate from one year to another, with the exception of the most recent period.

$IFI_{c,t-1}$ is the lagged level of insolvency framework index (as used in equation (1))

$IFI_{c,t-1}(U_c - U_c^*)_{t-1}$ is the interaction term between the insolvency framework index and the unemployment rate in deviation from its historical average. The decision to take the deviation from the historical country average is done to reduce collinearity problems between the interaction term and the unemployment rate.

$Z_{c,t-1}$ is a financial sector or NFC-specific variable (solvency ratios, debt to equity).

In equation (2) we are interested in analysing the determinants of NPL ratios, which can be related to macroeconomic and financial sector conditions but also to the quality of insolvency frameworks. Like in equation (1), the IFI enters directly and as well as interaction term with the unemployment in deviation from the country-specific historical average. The main testing hypothesis is that better insolvency frameworks are associated with lower levels of NPL ratios even when the level of slack in the economy is particularly high by historical standards.

The third benchmark relationship links the change in NPL ratio to macro and financial sector conditions and to the quality of insolvency frameworks.

(3) $$\Delta NPL_{c,t-i} = \gamma_0 + \gamma_1 U_{c,t-i} + \gamma_2 \Delta U_{c,t-3} + \gamma_3 IFI_{c,t-i} + \gamma_4 IFI_{c,t-i}(U_c - U_c^*)_{t-i} + \gamma_5 NPL_{c,t-i} + \gamma_6 Z_{c,t-i} + \vartheta_t$$

Equation (3) tests the significant of the explanatory variables included in (2) for the change in NPL ratios. This is done because the definition of NPLs might differ across OECD countries, thus it is important to check not only the cross-country variability of the NPL ratios but also their dynamics.

The three benchmark models are estimated by means of panel estimates, including time effects, and by using ordinary least squares. The omission of country-fixed effects is due to the use of country-specific IFI, which contain relatively little variability trough time and, thus, can be considered to play the role of a country-specific constant. It should be also noted that the selected group of countries is relatively similar in terms of level of development and other fundamental factors, e.g. compared to a world-wide sample, calling for not abusing the use of country fixed effects in the regression analysis.[4]

[4] Focusing on the key sources of variations of variables we are interested in explaining has been recently advocated by Cochrane (2017).

To take care of possible endogeneity problems, all explanatory variables are lagged. Despite the inclusion of one-year lagged variable, there is a well-known literature arguing about the endogeneity of institutional variables to macroeconomic outcomes on account of the fact that these variables have been generally measured ex-post (Blanchard and Wolfers, 2000). While using lagged indicators might only partially take care of endogeneity issues, we think that the endogeneity problem of the IFI indicator is significantly less severe than in other cases making use of institutional variables. First, generally, the literature argues that there exists endogeneity between institutional variables and the level of GDP, which is not the variable of interest in our paper and, second, contrary to other institutional variables, the IFI is not based on perception but on actual practices, which are rooted in existing legislations.

4.1 IFI and changes in private sector debt

The output of the estimates of the benchmark equation (1) is shown in Table 2 (for the EU countries) and Table 3 (for the whole EU and OECD countries). In each table results are reported separately for the HH and NFC sectors. Two types of specifications are tested. First, we analyse the impact of macro versus structural indicators on the change in private debt in the period 2003-2016; second, we analyse the impact of macro versus structural indicators on the change in private debt, focusing only on deleveraging episodes. Accordingly, deleveraging episodes are those characterised by negative changes of private debt.

We first describe the results for the change in debt (i.e. columns 1 and 3) of Tables 2 and 3. The comparison between column (1) and (3) reveals that while the signs of the estimated coefficients are the same for HH and NFCs, their significant is higher in the case of households. In particular, for both the EU and OECD countries, over the sample period considered one can find a negative link between insolvency frameworks ($IFI_{c,t-1}$) and change in HH debt. In other words, for positive values of the IFI, i.e. better than average institutions, debt is declining, for negative values of the IFI, i.e. worse than average institutions, debt is increasing. Irrespective of the country group (EU or OECD), the coefficients are significant only for the household sector. Columns 1 and 3 of Tables 2 and 3 also show that the initial level of debt ($D_{c,t-1}$) is negatively associated with the change in debt and again it is significant only for HH and not for NFC. In both cases, HH and NFC, there is not a clear cut relationship between income growth ($\Delta Y_{c,t,i}$) and changes in debt (i.e. in column 1 and 3 the coefficient is not significant). Tables 2 and 3 show that the interaction term between the debt ratio and insolvency frameworks ($IFI_{c,t-1}D_{c,t-1,i}$) is negative and significant (when looking at the larger EU and OECD group) only for the household sector. This means that better than average insolvency frameworks coupled with high debt are found to lead to a reduction of debt, by contrast worse than average insolvency frameworks coupled with high debt are found to lead to an increase in debt. Finally, for both sectors, the initial level of NPL ($NPL_{c,t-1}$) appears to be an important determinant for the subsequent decline in debt.

Table 2 – Changes in private sector debt and determinants: EU (regression output)

	HH		NFC	
	(1) Change in HH debt	(2) HH deleveraging episodes	(3) Change in NFC debt	(4) NFC deleveraging episodes
IFI (-1)	**-0.0217***	**0.0196*****	**-0.0062**	**0.0135****
	(0.0119)	*(0.00742)*	*(0.00680)*	*(0.00534)*
Debt over income (-1)	-0.0662***	0.0013	-0.0008	0.0126**
	(0.00988)	*(0.00514)*	*(0.0117)*	*(0.00633)*
Income growth	-0.0437	0.836***	0.108	0.417***
	(0.196)	*(0.0674)*	*(0.160)*	*(0.0898)*
Debt * IFI (-1)	**-0.0200**	**-0.0494*****	**0.0089**	**0.0219***
	(0.0214)	*(0.0118)*	*(0.0186)*	*(0.0112)*
NPL Ratio (-1)	-0.0053***	0.0031***	-0.0023**	0.0024***
	(0.00108)	*(0.000504)*	*(0.000936)*	*(0.000583)*
Constant	0.119***	-0.0282***	0.0113	0.0165
	(0.0223)	*(0.00631)*	*(0.0175)*	*(0.0103)*
Observations	*319*	*110*	*335*	*134*
Number of countries	*26*	*21*	*26*	*26*
R-squared	*0.600*	*0.676*	*0.268*	*0.369*
Time FE	*YES*	*YES*	*YES*	*YES*

*Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*
Note: IFI is calculated as the composite indicator of four World Bank 2017 Doing Business sub-indicators: Getting Credit - Strength of legal rights index (0-12); Enforcing Contracts - Time (days); Enforcing Contracts - Cost (% of claim); Resolving Insolvency - Cost (% of estate), with each sub-indicator weighted equally. The deleveraging episodes are identified as the absolute value of negative growth of debt over income.
The sample includes EU countries over the period 2003-2016.

Table 3 – Changes in private sector debt and determinants: EU and OECD countries (regression output)

	HH		NFC	
	(1) Change in HH debt	(2) HH deleveraging episodes	(3) Change in NFC debt	(4) NFC deleveraging episodes
IFI (-1)	**-0.0277*****	**0.0154*****	**-0.0026**	**0.0134****
	(0.00657)	*(0.00551)*	*(0.00759)*	*(0.00587)*
Debt over income (-1)	-0.0201***	-0.0077**	-0.0065	0.0208***
	(0.00553)	*(0.00370)*	*(0.00718)*	*(0.00709)*
Income growth	0.241	0.720***	0.152	0.421***
	(0.196)	*(0.0990)*	*(0.129)*	*(0.0848)*
Debt * IFI (-1)	**-0.0204*****	**-0.0185*****	**0.007**	**0.0571*****
	(0.00723)	*(0.00443)*	*(0.0204)*	*(0.0160)*
NPL Ratio (-1)	-0.0028***	0.002***	-0.0019***	0.0020***
	(0.000870)	*(0.000474)*	*(0.000711)*	*(0.000717)*
Constant	0.111***	-0.0054	-0.0027	0.0184**
	(0.0215)	*(0.0102)*	*(0.0151)*	*(0.00888)*
Observations	*435*	*139*	*498*	*198*
Number of countries	*38*	*30*	*40*	*39*
R-squared	*0.447*	*0.568*	*0.225*	*0.266*
Time FE	*YES*	*YES*	*YES*	*YES*

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1*
See Notes in Table 2. The sample includes EU countries over the period 2003-2016.

A plausible explanation for the finding that the significance of the coefficients has been found to be superior for households than for firms might be related to the fact that the number of observations including debt increases is significantly higher than the number of observation including debt reductions, and it is likely that institutional factors counts less when firms are leveraging than deleveraging, contrary to the households sector. Therefore the econometric investigation continues by isolating the periods of deleveraging.

The outcomes of the econometric exercise where the dependent variable is "episodes of deleveraging" are reported in columns 2 and 4 of Tables 2 and 3. Two results are worth mentioning.

First, when isolating the deleveraging episodes, IFI becomes significant also for NFCs. This finding seems to confirm the hypothesis that institutional factors matters more in cases of debt reductions than in cases of debt increases. The positive sign of IFI means that better insolvency frameworks leads to faster deleveraging both in the case of households and NFCs. Instead the pace of deleveraging is reduced for negative IFI, i.e. in cases where the insolvency frameworks are worse than the sample average. When comparing the size of the coefficients on insolvency frameworks obtained for the NFC and HH sectors (columns 2 and 4), the estimation output shows very similar coefficients, suggesting that more efficient insolvency frameworks appear to have been equally important to foster deleveraging in the two sectors.

Second, when isolating the deleveraging episodes the interaction term between IFI and debt levels has a negative sign for HH and a positive sign for NFC. This finding means that for the household sector there is less evidence of deleveraging in the presence of high debt and better than average insolvency frameworks. This result seem to suggest that for the household sector pressure for deleveraging when debt is high is less strong when there is an efficient insolvency frameworks in place. This result might be due to the fact that for the households sector the IFI captures better the creditors and borrowers protection in time of debt increases than decreases. For the NFC sector, instead, the positive coefficient found for the interaction term between IFI and the initial level of debt suggests that insolvency frameworks are particularly important for increasing the speed of deleveraging in the presence of high debt.

4.2 IFI components and changes in private sector debt

Several robustness checks have been carried out to test the relevance of the findings reported in Tables 2 and 3. Given that no significant difference has been found between the EU and larger EU+OECD group, robustness checks are reported for the second group. Tables 4 to 7 show, respectively, the results for the change in HH debt for the whole period and during deleveraging episodes, and the change in NFC debt for the whole period and during deleveraging episodes for each of the four components of the IFI (Comp-IFI). To facilitate the comparison with the results obtained with the aggregate IFI, the first column of each of the Tables 4-7 reports the results obtained with the aggregate IFI.

Table 4 – Changes in HH debt and sub-components of IFI: EU and OECD countries (regression output)

	Aggregate IFI	Strength of legal right	Recovery rate	Cost of enforcing contracts	Time of enforcing contracts
Comp-IFI (-1)	**-0.0277*** **	**-0.0031**	**-0.0178*** **	**-0.0003**	**-0.0293*** **
	(0.00657)	*(0.00354)*	*(0.00430)*	*(0.00299)*	*(0.00555)*
Debt over income (-1)	-0.0201***	-0.0222***	-0.0109**	-0.0326***	-0.0129**
	(0.00553)	*(0.00465)*	*(0.00537)*	*(0.00591)*	*(0.00575)*
Income growth	0.241	0.174	0.143	0.177	0.258
	(0.196)	*(0.195)*	*(0.196)*	*(0.182)*	*(0.188)*
Debt * Comp-IFI (-1)	**-0.0204*** **	**-0.0128*** **	**-0.0001**	**-0.0214*** **	**-0.0243*** **
	(0.00723)	*(0.00417)*	*(0.00491)*	*(0.00662)*	*(0.00888)*
NPL Ratio (-1)	-0.0028***	-0.0022***	-0.0026***	-0.0023***	-0.0039***
	(0.000870)	*(0.000791)*	*(0.000817)*	*(0.000860)*	*(0.000915)*
Constant	0.111***	0.106***	0.117***	0.102***	0.118***
	(0.0215)	*(0.0215)*	*(0.0220)*	*(0.0212)*	*(0.0225)*
Observations	*435*	*435*	*435*	*435*	*435*
Number of countries	*38*	*38*	*38*	*38*	*38*
R-squared	*0.447*	*0.439*	*0.435*	*0.437*	*0.448*
Time FE	*YES*	*YES*	*YES*	*YES*	*YES*

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

The sample includes EU and OECD countries over the period 2003-2016

In Table 4 the dependent variable is the change in HH debt, which is regressed against the individual components of the IFI, macroeconomic and financial variables. Focusing on the Comp-IFI coefficients, only the recovery rate and the time of enforcing contracts appear to be significant. The significance of the aggregate IFI appears therefore mainly determined by these two indicators. Both indicators have an "ex-post" nature, with the "recovery rate" being more relevant for debt decreases and the "time of enforcing contract" being more relevant for debt increases. The interaction term between debt and each of the IFI components is instead significant in three out of the four cases, two of which are the strength of legal rights and the cost of enforcing contracts, which individually had not been found significant. Therefore, all four indicators appear to have some explanatory power either directly or via the interaction term. The results justify the need to consider all of them in the aggregate index.

In Table 5 the dependent variable is HH deleveraging, which is also regressed against the individual components of the IFI, macroeconomic and financial variables. Focusing on the Comp-IFI coefficients, also in this case only the recovery rate and the time of enforcing contracts appear to be significant. However, the sign of the recovery rate is not consistent with that found for the aggregate IFI and it suggests that better than average recovery rates are not associated with faster deleveraging. This can be justified by the fact that, in the presence of high recovery rates, a strategy of fast deleveraging might not be needed. As seen in Table 4, the interaction term between debt and each of the IFI components is significant in three out of the four cases and the coefficients suggest that pressures for deleveraging when debt is high is less strong when there is an efficient insolvency frameworks in place, measured by the strength of legal right, recovery rate and the cost of enforcing contracts.

Table 5 –Households deleveraging episodes and sub-components of IFI: EU and OECD (regression output)

	Aggregate IFI	Strength of legal right	Recovery rate	Cost of enforcing contracts	Time of enforcing contracts
Comp-IFI (-1)	**0.0154*** **	**0.0042**	**-0.0089** **	**0.0037**	**0.0154*** **
	(0.00551)	*(0.00289)*	*(0.00386)*	*(0.00237)*	*(0.00436)*
Debt over income (-1)	-0.0077**	-0.0017	0.0039	-0.0045	-0.0001
	(0.00370)	*(0.00318)*	*(0.00355)*	*(0.00489)*	*(0.00350)*
Income growth	0.720***	0.676***	0.714***	0.764***	0.658***
	(0.0990)	*(0.100)*	*(0.106)*	*(0.100)*	*(0.115)*
Debt * Comp-IFI (-1)	**-0.0185*** **	**-0.0082*** **	**-0.0051***	**-0.0103** **	**0.005**
	(0.00443)	*(0.00239)*	*(0.00280)*	*(0.00513)*	*(0.00612)*
NPL Ratio (-1)	0.002***	0.0017***	0.0014***	0.0017***	0.0028***
	(0.000474)	*(0.000391)*	*(0.000424)*	*(0.000370)*	*(0.000509)*
Constant	-0.0054	0.0025	0.0087*	0.0003	-0.0140**
	(0.0102)	*(0.00766)*	*(0.00510)*	*(0.00781)*	*(0.00559)*
Observations	*139*	*139*	*139*	*139*	*139*
Number of countries	*30*	*30*	*30*	*30*	*30*
R-squared	*0.568*	*0.544*	*0.534*	*0.522*	*0.555*
Time FE	*YES*	*YES*	*YES*	*YES*	*YES*

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

The sample includes EU and OECD countries over the period 2003-2016

In Table 6 the dependent variable is the change in NFC debt, which is regressed against the individual components of the IFI, macroeconomic and financial variables. Focusing on the Comp-IFI coefficients, only the time of enforcing contracts appears to be significant. This explains why the aggregate IFI is not significant. The interaction term between debt and each of the IFI components is instead significant only for the variable measuring the recovery rate.

Finally, in Table 7 the dependent variable is NFC deleveraging, regressed against the individual components of the IFI, macroeconomic and financial variables. Focusing on the Comp-IFI coefficients it is noteworthy each individual component is not significant but the aggregate IFI is. This finding supports the use of the aggregate index. The interaction term between debt and each of the IFI components is significant for the variable measuring the recovery rate and the cost of enforcing contracts. In both cases, the positive coefficient suggests that the lower are the costs of resolving insolvencies and enforcing contracts the higher is the speed of deleveraging in the presence of high debt.

All in all, the regressions output obtained using the single components of the IFI show results which are consistent with those obtained with the aggregate index. In particular, when replacing the IFI by its individual components one can notice a drop in the significance in some of them. However, the regressions show that the drop in significance is not linear, i.e. some variables are directly significant and other are indirectly significant (i.e. via the interaction term with debt), making it stronger the case for the use of the aggregate IFI.

Table 6 –Change in NFC debt and sub-components of IFI: EU and OECD (regression output)

	Aggregate IFI	Strength of legal right	Recovery rate	Cost of enforcing contracts	Time of enforcing contracts
Comp-IFI (-1)	**-0.0026**	**-0.003**	**-0.0028**	**0.0047**	**-0.0095****
	(0.00759)	*(0.00469)*	*(0.00487)*	*(0.00358)*	*(0.00405)*
Debt over income (-1)	-0.0065	**-0.008**	**-0.0019**	**-0.0097**	**-0.0025**
	(0.00718)	*(0.00789)*	*(0.00838)*	*(0.00792)*	*(0.00769)*
Income growth	0.152	0.159	0.0776	0.164	0.173
	(0.129)	*(0.129)*	*(0.126)*	*(0.131)*	*(0.131)*
Debt * Comp-IFI (-1)	**0.007**	**-0.0044**	**0.0212***	**-0.0016**	**-0.0126**
	(0.0204)	*(0.0108)*	*(0.0127)*	*(0.00789)*	*(0.00813)*
NPL Ratio (-1)	-0.0019***	-0.0017**	-0.0024***	-0.0018***	-0.0024***
	(0.000711)	*(0.000666)*	*(0.000764)*	*(0.000647)*	*(0.000687)*
Constant	-0.0027	-0.0047	0.0015	-0.0043	0.0004
	(0.0151)	*(0.0152)*	*(0.0154)*	*(0.0149)*	*(0.0149)*
Observations	*498*	498	498	498	498
Number of countries	*40*	40	40	40	40
R-squared	*0.225*	0.225	0.235	0.226	0.229
Time FE	*YES*	YES	YES	YES	YES

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

The sample includes EU and OECD countries over the period 2003-2016

Table 7 –NFC deleveraging episodes and sub-components of IFI: EU and OECD (regression output)

	Aggregate IFI	Strength of legal right	Recovery rate	Cost of enforcing contracts	Time of enforcing contracts
Comp-IFI (-1)	**0.0134****	**0.00731**	**-0.00229**	**0.00146**	**0.00653**
	(0.00587)	*(0.00778)*	*(0.00587)*	*(0.00412)*	*(0.00415)*
Debt over income (-1)	0.0208***	0.0301**	0.0285***	0.0214***	0.0212**
	(0.00709)	*(0.0119)*	*(0.00982)*	*(0.00688)*	*(0.0101)*
Income growth	0.421***	0.448***	0.380***	0.405***	0.436***
	(0.0848)	*(0.0916)*	*(0.0990)*	*(0.0860)*	*(0.0936)*
Debt * Comp-IFI (-1)	**0.0571*****	**0.000710**	**0.0189***	**0.0232*****	**0.0186**
	(0.0160)	*(0.0113)*	*(0.0107)*	*(0.00644)*	*(0.0117)*
NPL Ratio (-1)	0.00200***	0.00223***	0.00165**	0.00207**	0.00252***
	(0.000717)	*(0.000833)*	*(0.000779)*	*(0.000800)*	*(0.000691)*
Constant	0.0184**	0.0212**	0.0237**	0.0172**	0.0162*
	(0.00888)	*(0.0101)*	*(0.0102)*	*(0.00867)*	*(0.00846)*
Observations	*198*	*198*	*198*	*198*	*198*
Number of countries	*39*	*39*	*39*	*39*	*39*
R-squared	*0.266*	*0.218*	*0.226*	*0.263*	*0.220*
Time FE	*YES*	*YES*	*YES*	*YES*	*YES*

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

The sample includes EU and OECD countries over the period 2003-2016.

Additional robustness checks for equation (1) are reported in Annex 2. In particular, the validity of the results is checked against splitting the sample-period in two, before and after 2009, changing the lag structure of the explanatory macro variable, including the unemployment rate as an additional control variable that captures macro conditions, increasing the time-span used for the change in HH and NFC debt (from one to three years), replacing IFI with an alternative measure of institutional quality from the World Bank (i.e. rule of law). All these changes do not alter the results shown in Tables (2) and (3). In particular, the regressions where the sample period has been split in two: 2003-2009 and 2010-2016 shows that results are generally more significant for the second than for the first sample period. This

finding corroborates the findings in Tables (2) and (3) which show that the significance of the results is higher during deleveraging episodes. In fact, the period 2010-16 was characterised by a significantly higher number of deleveraging episodes than the period 2003-09.

4.3 IFI and NPL

The output of the estimates of the benchmark equations (2) and (3) linking the NPL ratio (and its change) to insolvency frameworks is shown in Table 8 (EU) and Table 9 (OECD). Given that also in this case extending the country coverage does not alter the results, here we focus on describing the results of Table 8.

In the first two columns of Table 8 the NPL ratios are found to be positively correlated with both the level of the unemployment rate and its change over a three-year period. By contrast, the NPL ratios are found to be negatively correlated with insolvency frameworks and their interaction with the unemployment gap. Banks' specific variables are not found to be significant, thus excluded from the final regression. However, high NFCs debt to equity ratios are associated to high NPL ratios.

The results in Table 8 suggest that better insolvency frameworks are not only related to lower NPL ratios per se, but they are also particularly important for NPL in the presence of high unemployment. In other words, in a situation of high unemployment relative to its historical average, the NPL ratio is found to be generally lower when more efficient insolvency frameworks are in place. The last two columns of Table 8 show also that the change in the NPL ratio over a three year period is positively related to the level of the unemployment rate and to its change.[5] The change in the NPL ratio is negatively correlated with insolvency frameworks and their interaction with the unemployment gap. This suggests that a further reduction in the NPL ratio could come about in the presence of better insolvency frameworks even when the unemployment rate is high relative to its historical average. Thus, this finding suggests that better insolvency frameworks allow a country to be better equipped in the presence of adverse macroeconomic shocks.

The results shown in Table 8 are also robust when adding all OECD countries (Table 9). All signs remain highly significant when extending the sample to 41 countries, suggesting that the findings are not only EU specific but, for the period analysed, they hold also for a larger and more heterogeneous group of countries.

A number of robustness checks have been carried out to test the validity of the results reported in Tables 8 and 9. Robustness checks include replacing the IFI with its components, reducing the time-span for the change in the NPL ratio (from 3 to 1 year), and replacing IFI with a variable that measures the overall institutional quality. All these robustness checks confirm the main conclusions derived from Tables 8 and 9 (Annex 3).

[5] Equation (3) has been tested for different horizons and found that the horizon where coefficient becomes significant is from 3 years onwards. This is an indication that there is too little variability at shorter frequencies in the change of the NPL ratio.

Table 8 – NPL and insolvency frameworks: EU (regression output)

	(1) NPL ratio	(2) NPL ratio	(3) NPL ratio 3yr change	(4) NPL ratio 3yr change
Unemployment rate	0.586***	0.585***	0.219***	0.226***
	(0.105)	*(0.103)*	*(0.0816)*	*(0.0806)*
Unemployment rate (3yr change)	0.549***	0.475***	0.784***	0.749***
	(0.133)	*(0.138)*	*(0.141)*	*(0.142)*
IFI	**-3.407*** **	**-3.066*** **	**-0.932***	**-0.784**
	(0.335)	*(0.354)*	*(0.475)*	*(0.484)*
IFI * Unemployment gap	**-0.587*** **	**-0.519*** **	**-0.363*** **	**-0.336** **
	(0.179)	*(0.178)*	*(0.138)*	*(0.138)*
NFC Debt-to-Equity Ratio		3.062***		1.462**
		(0.797)		*(0.684)*
NPL Ratio (-3)			-0.317***	-0.281**
			(0.112)	(0.117)
Constant	-2.472**	-4.607***	-2.586***	-3.620***
	(0.970)	*(1.196)*	*(0.985)*	*(1.210)*
Observations	*356*	*356*	*380*	*380*
Number of countries	*28*	*28*	*28*	*28*
R-squared	*YES*	*YES*	*YES*	*YES*
Time FE	*356*	*356*	*380*	*380*

*Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Note: In column 1 and 2, all independent variables (except unemployment rate 3yr change) are lagged (t-1). The sample period includes EU countries over the period 2003-2016.

Table 9 – NPL and insolvency frameworks: EU and OECD (regression output)

	(1) NPL ratio	(2) NPL ratio	(3) NPL ratio 3yr change	(4) NPL ratio 3 change
Unemployment rate	0.646***	0.624***	0.275***	0.252***
	(0.0930)	*(0.0934)*	*(0.0696)*	*(0.0708)*
Unemployment rate (3yr change)	0.577***	0.520***	0.768***	0.774***
	(0.121)	*(0.126)*	*(0.118)*	*(0.126)*
IFI	**-1.906*** **	**-2.354*** **	**-0.452**	**-0.673** **
	(0.311)	*(0.309)*	*(0.297)*	*(0.325)*
IFI * Unemployment gap	**-0.497*** **	**-0.521*** **	**-0.333*** **	**-0.345*** **
	(0.182)	*(0.166)*	*(0.127)*	*(0.119)*
NFC Debt-to-Equity Ratio		1.690***		0.899***
		(0.374)		*(0.193)*
NPL Ratio (-3)			-0.290***	-0.274***
			(0.0954)	*(0.101)*
Constant	-2.559***	-3.659***	-2.671***	-3.241***
	(0.810)	*(0.876)*	*(0.752)*	*(0.830)*
Observations	*518*	*456*	*551*	*485*
Number of countries	*41*	*37*	*41*	*37*
R-squared	*0.482*	*0.526*	*0.513*	*0.535*
Time FE	*YES*	*YES*	*YES*	*YES*

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1*

Note: See notes in Table 8. The sample includes EU and OECD countries over the period 2003-2016.

4.4 Distinguishing between NPL reductions and increases and the role of IFI

The analysis of determinants of NPL is further deepened by distinguishing between episodes of NPL increases and NPL declines. The outcome of this exercise is shown in Table 10.

In the period under analysis, i.e. 2003-2016 the two episodes of NPL declines and increases have broadly the same number of observations. When focusing on the accumulation of NPL (positive changes in the NPL ratio), the IFI variable loses its significance; however, the interaction term with the unemployment gap (a measure of adverse economic times) remains significant. The result suggests that better insolvency frameworks appear particularly important for reducing the pace of NPL accumulation during crises periods.

When focusing on the reduction of NPLs (negative changes in the NPL ratio), the variable on insolvency frameworks is significant with a positive sign, indicating that better insolvency frameworks facilitate NPL reductions. However, in this case, the interaction term with the unemployment gap loses its significance. All in all, we can conclude that better insolvency frameworks are important for both NPL increases and reductions; however, in the case of NPL increases their importance seems to be state-dependent, i.e. better insolvency frameworks seem to reduce the pace of accumulation of NPL in bad economic times. This result holds irrespective of the fact that other control variables are added (debt-to-equity ratio).

Table 10 – Changes in NPL and insolvency frameworks: distinguishing between episodes of NPL increase and of NPL declines (EU and OECD sample)

	NPL ratio 3yr pos. change	NPL ratio 3yr neg. change (absolute value)	NPL ratio 3yr pos. change	NPL ratio 3yr neg. change (absolute value)
Unemployment Rate	0.494***	-0.139**	0.490***	-0.123*
	(0.109)	*(0.0545)*	*(0.108)*	*(0.0636)*
IFI	**0.416**	**0.346****	**0.401**	**0.604****
	(0.331)	*(0.174)*	*(0.358)*	*(0.256)*
Unemployment gap * IFI	**-0.345***	**-0.192**	**-0.410****	**-0.164**
	(0.199)	*(0.127)*	*(0.198)*	*(0.163)*
Debt-to-Equity Ratio			1.023***	-0.503
			(0.139)	*(0.486)*
NPL ratio (-3)	0.295*	0.630***	0.293*	0.614***
	(0.158)	*(0.0495)*	*(0.167)*	*(0.0550)*
Constant	-3.640***	0.667	-4.612***	0.947
	(0.844)	*(0.565)*	*(0.851)*	*(0.839)*
Observations	*229*	*262*	*213*	*212*
R-squared	*41*	*39*	*37*	*34*
Time FE	*0.387*	*0.818*	*0.416*	*0.797*
Number of countries	*YES*	*YES*	*YES*	*YES*

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

The sample includes EU and OECD countries over the period 2003-2016

5. Conclusions

This paper has presented some new evidence on the importance of insolvency frameworks for private sector debt deleveraging and for the resolution of non-performing loans. The paper first computes a synthetic insolvency frameworks index (IFI), based on four indicators: strength of legal rights in getting credit, the recovery rate of debt in an insolvency procedure, cost and time of enforcing contracts, collected by the World Bank. This aggregate indicator encompasses different aspects of the insolvency frameworks which are relevant for both households and corporations. The IFI is used as explanatory variable in several econometric exercises, where the dependent variables are the change in household and NFC debt and the change and level of NPLs. For the period 2003-2016 the paper shows that countries with better IFI than the sample average deleverage faster and are able to adjust their NPL more rapidly than countries with worse than sample average IFI. This is shown both for the EU countries and for a larger sample including other OECD countries.

The estimation output also indicates that more efficient insolvency frameworks appear to have been equally important to foster deleveraging in the NFC and in the household sector. However, only in the case of the NFC sector better than average IFI are accelerating the deleveraging process when debt is high.

The paper also shows that there is a strong correlation between the level of NPLs and insolvency frameworks, which appears to be state-dependent. In particular, after controlling for macro and balance-sheet developments, in a situation of high unemployment relative to its historical average, the NPL ratio is generally lower when more efficient insolvency frameworks are in place. These results support the call for reforms addressing inefficiencies in insolvency regimes.

Several robustness checks have been carried out, by distinguishing between episodes of NPL increases and declines, by using different proxy for insolvency frameworks, by changing lags of control variables and by adding variables which include more encompassing definitions of institutional quality. Better insolvency frameworks appear able to affect both NPL declines and increases. While in the first case there is a significant direct link between better insolvency frameworks and NPL reductions, in the second case, the link is indirect, i.e. the accumulation of NPL is reduced in the presence of better insolvency frameworks during bad times (i.e. when unemployment is higher than its historical average).

As all empirical analyses, the exercises carried out in this paper carry some important caveats, related to measurement and parameter uncertainty. This latter problem is mainly related to the limited time series dimension of the econometric analysis. Due care has been devoted in dealing with potential endogeneity problems, i.e. by always reporting lagged explanatory variables. While in general one cannot exclude endogeneity problems of institutional and structural variables to macroeconomic outcomes, in particular on account of the fact that these variables are generally measured ex-post, the indicator of insolvency frameworks should suffer less from these problems as it is not based on perceptions but on the actual observations of specific insolvency regimes which tend not to react to short-term variations in economic and financial variables.

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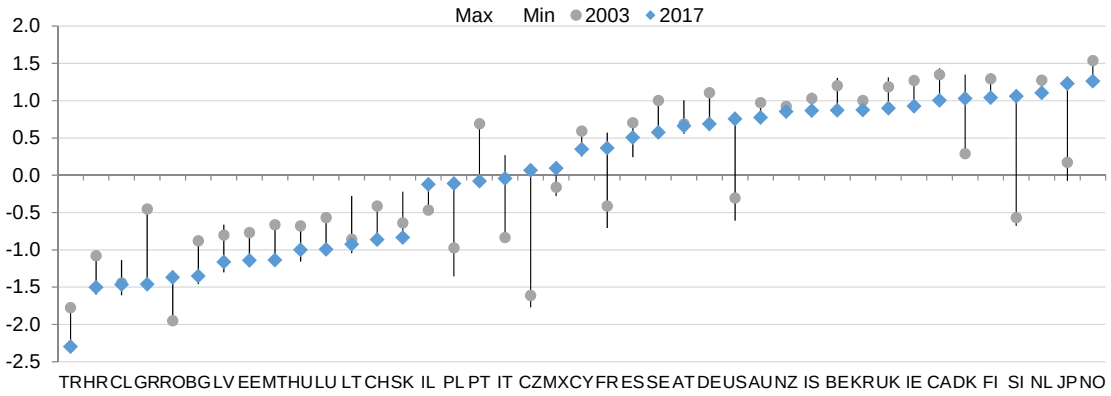
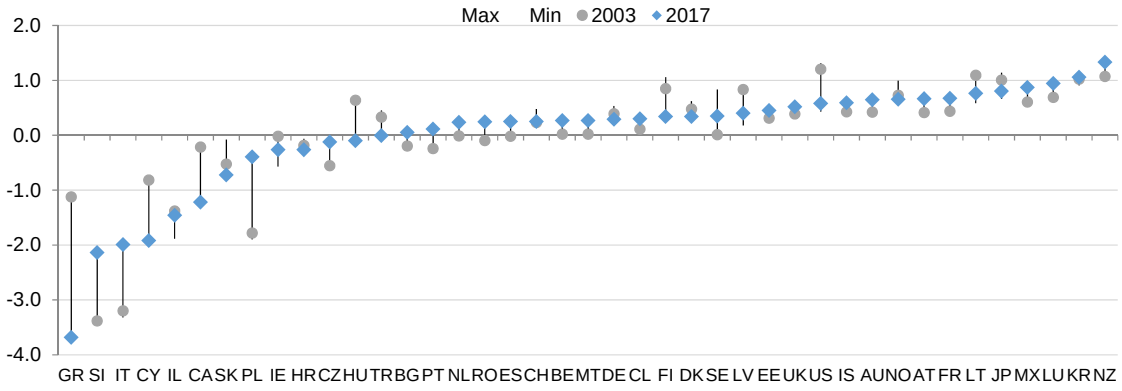
Annex 1. Components of the IFI

Chart A1 – Minimum, maximum, first and latest data for the recovery rate (2003-2017)



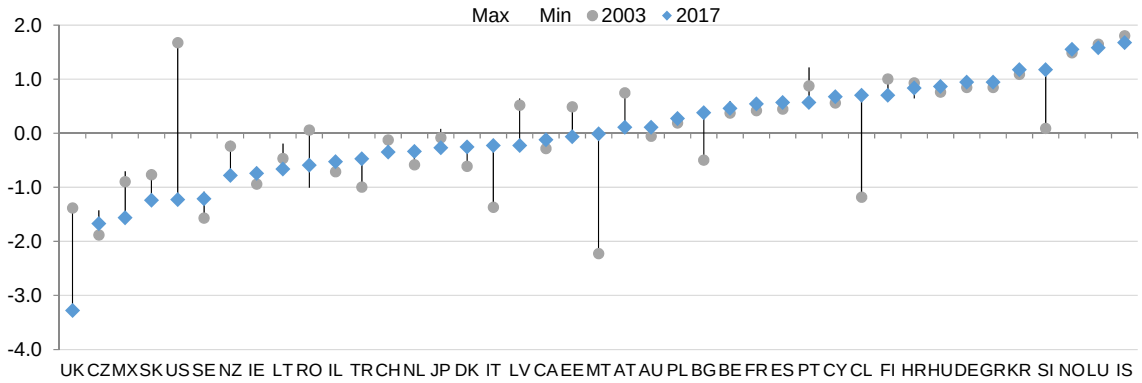
Source: Own computation on the World Bank, 2018 Doing Business Indicators. Notes: Z-scores centred on the OECD average. Higher values mean more efficient insolvency frameworks compared to the OECD average. Countries ranked in ascending order for the year 2017.

Chart A2 – Minimum, maximum, first and latest data for the time to enforce contracts (2003-2017)



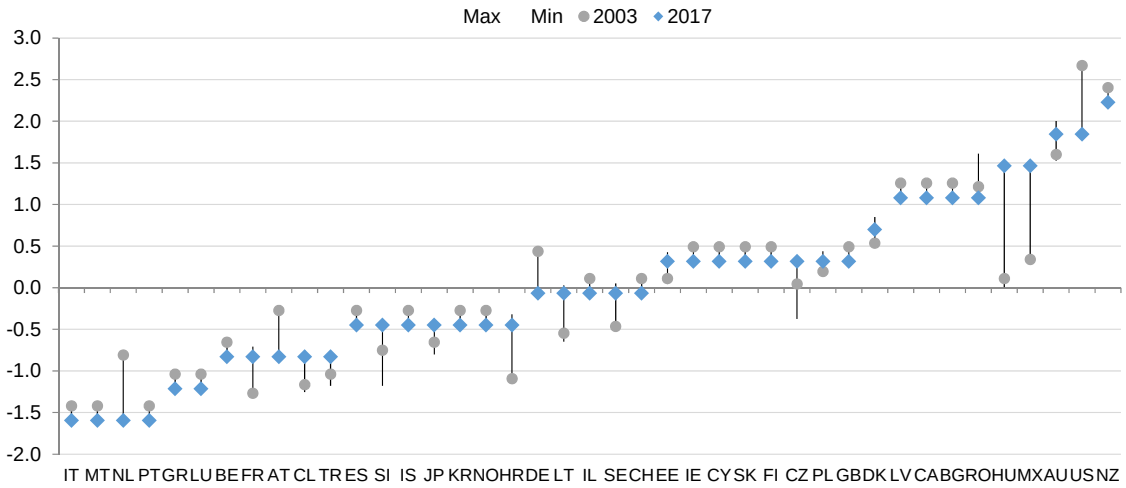
Source: Own computation on the World Bank, 2018 Doing Business Indicators. Notes: Z-scores centred on the OECD average. Higher values mean more efficient insolvency frameworks compared to the OECD average. Countries ranked in ascending order for the year 2017.

Chart A3 – Minimum, maximum, first and latest data for the cost of enforcing contracts (2003-2017)



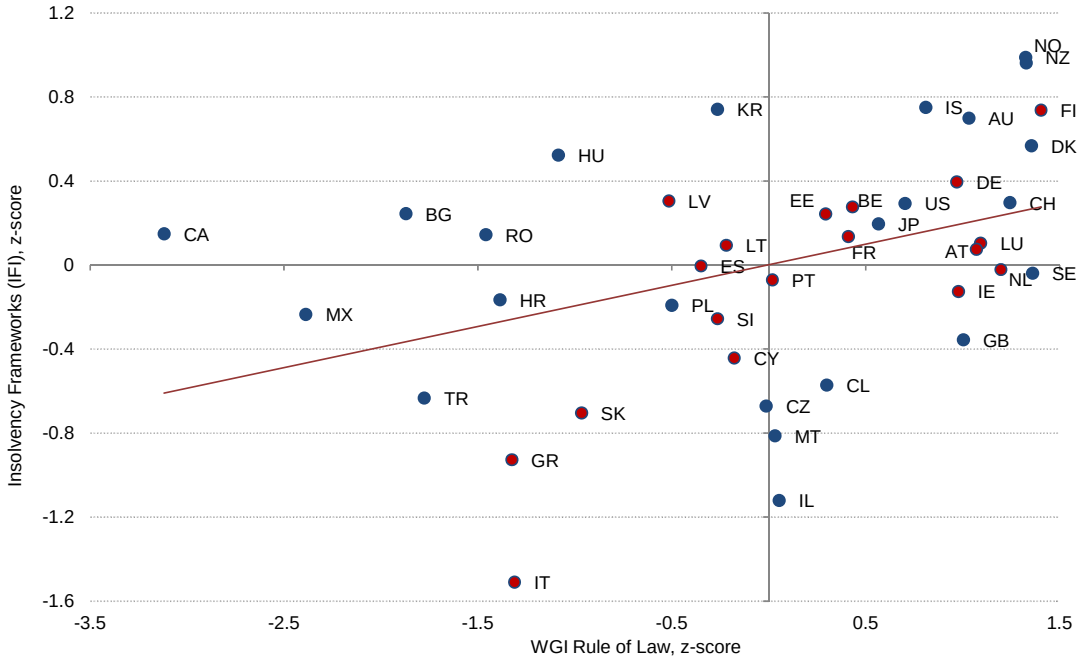
Source: Own computation on the World Bank, 2018 Doing Business Indicators. Notes: Z-scores centred on the OECD average. Higher values mean more efficient insolvency frameworks compared to the OECD average. Countries ranked in ascending order for the year 2017.

Chart A4 – Minimum, maximum, first and latest data for the strenght of legal rights in getting credits (2003-2017)



Source: Own computation on the World Bank, 2018 Doing Business Indicators. Notes: Z-scores centred on the OECD average. Higher values mean more efficient insolvency frameworks compared to the OECD average. Countries ranked in ascending order for the year 2017.

Chart A4 – Insolvency frameworks (IFI) and WDI rule of law (2016)



Note: IFI is calculated as the composite indicator (z-score relative to OECD average) of four Doing Business sub-indicators: Getting Credit - Strength of legal rights index (0-12); Enforcing Contracts - Time (days); Enforcing Contracts - Cost (% of claim); Resolving Insolvency - Cost (% of estate), with each sub-indicator weighted equally. WGI Rule of Law is calculated as the z-score (relative to the OECD average) of the World Bank's WGI indicator. Data refers to 2016.

Annex 2 – Robustness checks carried out on equation (1)

Table A1 – Changes in HH debt and determinants before and after 2009: EU and OECD countries (regression output)

	Before 2009		After 2009	
	(1) Change in HH debt	(2) HH deleveraging episodes	(3) Change in HH debt	(4) HH deleveraging episodes
IFI (-1)	**-0.00151**	**0.0393****	**-0.0288*****	**0.0149****
	(0.0109)	*(0.0145)*	*(0.00686)*	*(0.00570)*
Debt over income (D) (-1)	-0.0747***	-0.0153	0.00576**	-0.00892**
	(0.0138)	*(0.00872)*	*(0.00268)*	*(0.00426)*
Income growth	0.578**	0.258	-0.546***	0.761***
	(0.226)	*(0.226)*	*(0.132)*	*(0.0900)*
D * IFI (-1)	**0.0156**	**0.00206**	**0.0137*****	**-0.0207*****
	(0.0159)	*(0.0213)*	*(0.00410)*	*(0.00499)*
NPL Ratio (-1)	-0.00775**	-0.0147	-0.00346***	0.00201***
	(0.00319)	*(0.00949)*	*(0.000615)*	*(0.000468)*
Constant	0.0619***	0.0770	0.0334***	0.0131***
	(0.0206)	*(0.0510)*	*(0.00511)*	*(0.00387)*
Observations	*161*	*19*	*274*	*120*
Number of countries	*33*	*11*	*38*	*29*
R-squared	*0.574*	*0.559*	*0.408*	*0.590*
Time FE	*YES*	*YES*	*YES*	*YES*

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

The sample includes EU and OECD countries over the period 2003-2016

Table A2 – Changes in NFC debt and determinants before and after 2009: EU and OECD countries (regression output)

	Before 2009		After 2009	
	(1) Change in NFC debt	(2) NFC deleveraging episodes	(3) Change in NFC debt	(4) NFC deleveraging episodes
IFI (-1)	**0.0226**	**-0.0192**	**-0.0144****	**0.0132****
	(0.0151)	*(0.0169)*	*(0.00722)*	*(0.00594)*
Debt over income (D) (-1)	0.0129	0.00525	-0.0129*	0.0240***
	(0.0135)	*(0.00964)*	*(0.00683)*	*(0.00794)*
Income growth	0.572**	0.184	-0.178	0.515***
	(0.220)	*(0.158)*	*(0.188)*	*(0.0942)*
D * IFI (-1)	**0.0691****	**-0.0108**	**-0.0150**	**0.0687*****
	(0.0302)	*(0.0275)*	*(0.0222)*	*(0.0182)*
NPL Ratio (-1)	-0.00356	0.00294	-0.00202***	0.00188**
	(0.00317)	*(0.00241)*	*(0.000762)*	*(0.000721)*
Constant	-0.0247	0.0273*	0.0429***	0.0427***
	(0.0205)	*(0.0139)*	*(0.0114)*	*(0.0108)*
Observations	185	48	313	150
Number of countries	37	25	40	38
R-squared	0.235	0.379	0.164	0.278
Time FE	YES	YES	*YES*	*YES*

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

Table A3 – Changes in private sector debt and determinants: including lagged income growth

	HH		NFC	
	(1) Change in HH debt	(2) HH deleveraging episodes	(3) Change in NFC debt	(4) NFC deleveraging episodes
IFI (-1)	**-0.0164*** **	**0.0208*** **	**-0.0133**	**0.0156** **
	(0.00514)	*(0.00521)*	*(0.00844)*	*(0.00637)*
D (-1)	-0.0297***	-0.00824	-0.00700	0.0280***
	(0.00660)	*(0.00610)*	*(0.0108)*	*(0.00787)*
Income growth (-1)	0.391***	0.153*	0.204*	0.205***
	(0.140)	*(0.0833)*	*(0.111)*	*(0.0697)*
D * IFI (-1)	**-0.00327**	**-0.0173** **	**-0.0330**	**0.0622*** **
	(0.0101)	*(0.00764)*	*(0.0257)*	*(0.0179)*
NPL Ratio (-1)	-0.00227**	0.00281***	-0.00180**	0.00283***
	(0.00113)	*(0.000747)*	*(0.000829)*	*(0.000816)*
Constant	0.0799***	-0.0143*	-0.00333	0.0348***
	(0.0168)	*(0.00825)*	*(0.0139)*	*(0.00938)*
Observations	*405*	*129*	*443*	*175*
Number of countries	*38*	*31*	*40*	*39*
R-squared	*0.493*	*0.314*	*0.230*	*0.261*
Year FE	*YES*	*YES*	*YES*	*YES*

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1*
The sample includes EU and OECD countries over the period 2003-2016.

Table A4 – Changes in private sector debt and determinants: including lagged unemployment rate

	HH		NFC	
	(1) Change in HH debt	(2) HH deleveraging episodes	(3) Change in NFC debt	(4) NFC deleveraging episodes
IFI (-1)	**-0.00874**	**0.0166*** **	**-0.0129**	**0.0177*** **
	(0.00533)	*(0.00416)*	*(0.00829)*	*(0.00576)*
D (-1)	-0.0381***	0.000709	-0.00888	0.0313***
	(0.00647)	*(0.00395)*	*(0.0104)*	*(0.00796)*
Income growth	0.0764	0.734***	0.114	0.446***
	(0.166)	*(0.0883)*	*(0.131)*	*(0.0783)*
D * IFI (-1)	**-0.000884**	**-0.0256*** **	**-0.0322**	**0.0619*** **
	(0.0109)	*(0.00751)*	*(0.0251)*	*(0.0178)*
NPL Ratio (-1)	-0.00444***	0.00229***	-0.00217**	0.00256***
	(0.00152)	*(0.000571)*	*(0.000991)*	*(0.000958)*
Unemployment rate (-1)	0.00314**	0.00199***	0.000139	0.000416
	(0.00143)	*(0.000570)*	*(0.00110)*	*(0.000905)*
Constant	0.0687***	-0.0301***	-0.000608	0.0129
	(0.0175)	*(0.0113)*	*(0.0163)*	*(0.0102)*
Observations	*410*	*130*	*443*	*175*
Number of countries	*38*	*32*	*40*	*39*
R-squared	*0.482*	*0.663*	*0.224*	*0.308*
Year FE	*YES*	*YES*	*YES*	*YES*

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1*

The sample includes EU and OECD countries over the period 2003-2016.

Table A5 – Changes in private sector debt and determinants: 3-year change

	HH		NFC	
	(1) Change in HH debt	(2) HH deleveraging episodes	(3) Change in NFC debt	(4) NFC deleveraging episodes
IFI (-3)	**-0.0417*** **	**0.0270** **	**-0.0382***	**0.0391*** **
	(0.0128)	*(0.0110)*	*(0.0211)*	*(0.0114)*
D (-3)	-0.113***	0.0158	-0.0371*	0.0657***
	(0.0157)	*(0.0105)*	*(0.0210)*	*(0.0151)*
Income growth 3yr	0.327**	0.545***	0.302**	0.394***
	(0.143)	*(0.0649)*	*(0.133)*	*(0.0884)*
D * IFI (-3)	**0.00901**	**-0.109*** **	**-0.0796**	**0.110*** **
	(0.0263)	*(0.0180)*	*(0.0611)*	*(0.0356)*
NPL Ratio (-3)	-0.0135***	0.0104***	-0.00883***	0.00924***
	(0.00318)	*(0.00207)*	*(0.00249)*	*(0.00161)*
Constant	0.260***	-0.0445**	0.0535	-0.0201
	(0.0402)	*(0.0173)*	*(0.0401)*	*(0.0241)*
Observations	*336*	*101*	*366*	*121*
Number of countries	*38*	*24*	*40*	*35*
R-squared	*0.597*	*0.664*	*0.338*	*0.440*
Year FE	*YES*	*YES*	*YES*	*YES*

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1*
The sample includes EU and OECD countries over the period 2003-2016

Table A6 – Changes in private sector debt and determinants: including an indicator of institutional quality – EU countries

	Growth in HH debt	HH deleveraging episodes	Growth in NFC debt	NFC deleveraging episodes
WGI Rule of Law (-1)	**-0.0159**	**-0.0103**	**-0.0192**	**-0.0168**
	(0.0105)	*(0.00739)*	*(0.0145)*	*(0.0291)*
Insolvency Frameworks (IF) (-1)	**-0.0211***	**0.0145** **	**-0.0132**	**0.0260** **
	(0.0113)	*(0.00627)*	*(0.0105)*	*(0.0109)*
Debt over income (D) (-1)	-0.0489***	0.0108*	0.00614	0.0301**
	(0.0113)	*(0.00632)*	*(0.0175)*	*(0.0128)*
Income growth 1yr	-0.148	0.768***	0.0342	0.330***
	(0.190)	*(0.0723)*	*(0.162)*	*(0.106)*
D * IF (-1)	**-0.0387***	**-0.0280*** **	**-0.0448**	**0.0447** **
	(0.0200)	*(0.0100)*	*(0.0358)*	*(0.0219)*
NPL Ratio (-1)	-0.00400***	0.00255***	-0.00225*	0.00154
	(0.00141)	*(0.000555)*	*(0.00119)*	*(0.00147)*
Constant	0.134***	-0.00684	0.0406	0.0476
	(0.0273)	*(0.0139)*	*(0.0299)*	*(0.0534)*
Observations	*307*	*104*	*314*	*121*
R-squared	*0.562*	*0.652*	*0.245*	*0.228*
Year FE	*YES*	*YES*	*YES*	*YES*
Number of countries	*27*	*24*	*28*	*28*

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1*

Table A7 – Changes in private sector debt and determinants: including an indicator of institutional quality – EU and OECD countries

	Growth in HH debt	HH deleveraging episodes	Growth in NFC debt	NFC deleveraging episodes
WGI Rule of Law (-1)	**-0.0177****	**-0.00843**	**-0.0200**	**-0.0154**
	(0.00839)	*(0.00622)*	*(0.0125)*	*(0.0235)*
Insolvency Frameworks (IF) (-1)	**-0.0102***	**0.0156*****	**-0.00953**	**0.0198*****
	(0.00533)	*(0.00420)*	*(0.00860)*	*(0.00711)*
Debt over income (D) (-1)	-0.0291***	0.00844*	0.00245	0.0387***
	(0.00787)	*(0.00468)*	*(0.0117)*	*(0.0142)*
Income growth 1yr	0.0339	0.691***	0.0512	0.427***
	(0.173)	*(0.0824)*	*(0.135)*	*(0.0880)*
D * IF (-1)	**-0.00666**	**-0.0344*****	**-0.0370**	**0.0578*****
	(0.0112)	*(0.00742)*	*(0.0260)*	*(0.0204)*
NPL Ratio (-1)	-0.00378***	0.00276***	-0.00298***	0.00196*
	(0.00125)	*(0.000528)*	*(0.00105)*	*(0.00113)*
Constant	0.121***	-0.00440	0.0358	0.0423
	(0.0245)	*(0.0106)*	*(0.0264)*	*(0.0416)*
Observations	411	131	444	176
R-squared	0.477	0.639	0.232	0.315
Year FE	YES	YES	YES	YES
Number of countries	38	32	40	39

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

Annex 3 – Robustness checks carried out on equations (2) and (3)

Table A8 – NPL and insolvency frameworks: one-year change in NPL ratio

	(1) NPL ratio 1yr change	(2) NPL ratio 1yr change	(3) NPL ratio 1yr change	(4) NPL ratio 1yr change
Unemployment rate	0.0335	0.0231	-0.000654	-0.00119
	(0.0320)	*(0.0333)*	*(0.0373)*	*(0.0366)*
Unemployment rate 3yr change	0.316***	0.323***	0.332***	0.310***
	(0.0576)	*(0.0625)*	*(0.0648)*	*(0.0681)*
Insolvency Framework (IF)	**-0.284*** **	**-0.401*** **	**-0.253**	**-0.250**
	(0.109)	*(0.126)*	*(0.199)*	*(0.194)*
IFI * Unemp. Gap	**-0.167*** **	**-0.199*** **	**-0.180** **	**-0.163** **
	(0.0640)	*(0.0672)*	*(0.0800)*	*(0.0777)*
NFC Debt-to-Equity Ratio		0.355		1.088***
		(0.418)		*(0.417)*
NPL Ratio (-1)	-0.0628*	-0.0686*	-0.0492	-0.0548
	(0.0355)	*(0.0378)*	*(0.0403)*	*(0.0400)*
Constant	-0.413	-0.556	-0.0178	-0.775
	(0.299)	*(0.489)*	*(0.437)*	*(0.555)*
Observations	*496*	*428*	*336*	*334*
Number of countries	*41*	*37*	*28*	*28*
R-squared	*0.336*	*0.359*	*0.366*	*0.383*
Time FE	*YES*	*YES*	*YES*	*YES*

*Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

See note in Table 4. Columns 1-2 include all EU and OECD; columns 3-4 include the EU sample.

Table A9 – NPL and insolvency frameworks: including DBI sub-indicator "Enforcing Contracts: Time (days)"

	(1) NPL ratio	(2) NPL ratio	(3) NPL ratio 3yr change	(4) NPL ratio 3yr change
Unemployment rate	0.361***	0.364***	0.173**	0.149*
	(0.0764)	*(0.0803)*	*(0.0711)*	*(0.0767)*
Unemployment rate 3yr change	0.547***	0.481***	0.563***	0.578***
	(0.104)	*(0.112)*	*(0.0999)*	*(0.110)*
Enforcing Contracts (EC): Time	**0.00620*** **	**0.00657*** **	**0.00393*** **	**0.00393*** **
	(0.000751)	*(0.000803)*	*(0.000663)*	*(0.000729)*
EC Time * Unemp. gap	**0.000798*** **	**0.000741*** **	**0.000608*** **	**0.000577*** **
	(0.000167)	*(0.000167)*	*(0.000143)*	*(0.000141)*
NFC Debt-to-Equity Ratio		1.322***		0.756***
		(0.273)		*(0.166)*
NPL ratio (-3)			-0.469***	-0.438***
			(0.0789)	*(0.0885)*
Constant	-3.433***	-4.568***	-2.885***	-3.411***
	(0.641)	*(0.699)*	*(0.637)*	*(0.753)*
Observations	460	397	490	424
Number of countries	41	37	41	37
R-squared	0.585	0.616	0.591	0.600
Time FE	YES	YES	YES	YES

*Robust standard errors in parentheses. ** p<0.01, ** p<0.05, * p<0.1*

See note in Table 4. The sample includes all EU and OECD countries.

Table A10 – NPL and insolvency frameworks: including an indicator of institutional quality

	EU+OECD countries	EU countries
Unemp. Rate	0.342***	0.274***
	(0.0946)	*(0.0977)*
Unemp. rate 3yr chg	0.689***	0.644***
	(0.120)	*(0.136)*
WGI Rule of Law	**-3.018*** **	**-3.288*** **
	(0.532)	*(0.538)*
Insolvency Framework (IF)	**-0.938*** **	**-1.497*** **
	(0.293)	*(0.398)*
Unemp. gap * IFI	**-0.713*** **	**-0.858*** **
	(0.181)	*(0.182)*
Debt-to-Equity Ratio	1.673***	2.546***
	(0.285)	*(0.777)*
Constant	2.430*	2.452
	(1.411)	*(1.626)*
Observations	*402*	*310*
R-squared	*0.610*	*0.617*
Time FE	*YES*	*YES*
Number of countries	*37*	*28*

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1*

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