I. A macroeconomic perspective on non-performing loans (NPLs)

This chapter focusses on the observation of high non-performing loans (NPLs) in the current context of a slow economic recovery. High levels of NPLs are a legacy of the crisis and a result of a protracted period of sluggish growth. They reflect the fact that credit risk in the economy is still high. This has an impact on both borrowers' risk aversion and banks' willingness to lend, which result in reduced lending at a time when support to the still modest economic recovery is greatly needed. The macroeconomic significance of NPLs arises from the potential of a vicious circle of low asset quality, low bank profitability, rising capital requirements and constrained lending, with negative effects on growth and a worsening of the initial NPL problems.

Through a comparative analysis across groups of EU countries, this section shows that Member States with high NPL ratios have also experienced below average economic growth, the most visible contractions in bank lending and investment ratios below the EU average. While showing causality is fraught with difficulties (as acknowledged in the analysis), these observations support the expectation of a nexus between NPLs and the contraction in bank lending and investment. Since persistently high NPLs in a number of Member States could be contributing to the currently sluggish nature of the recovery, more rapid progress with NPL resolution could help to break such a vicious circle.

In a deeply integrated area like the EU, particularly the euro area, with financial systems highly interconnected, problems with NPLs are likely to negatively impact on credit supply and economic growth not just in the affected Member States but also in the euro area as a whole (though it remains impossible to quantify exactly these channels of cross-border spillovers). These potential broader economic and spillover effects would therefore require not only undertaking important structural measures at Member States level but also, and importantly, a coordinated European approach to the NPL issue, in full respect of the current EU legal framework. This would go a long way in addressing the concerns explained in this analysis. ([1])

I.1. Introduction

The economic and financial crisis that started in 2008 has left scars on the banking sector of many EU countries in the form of elevated levels of non-performing loans (NPLs). ([2]) While the process of repairing bank balance sheets has been going on for the last few years, the overall ratio of NPLs to total loans remains high by historical standards. However, important differences between countries remain both across the EU and in the euro area, with the NPL ratio currently ranging from above 45% in Cyprus and Greece to a ratio between 1 and 2% in Luxembourg, Estonia and Finland. ([3])

Against this background, this section looks at developments in NPL ratios in the EU, and more specifically, it relies on comparative analysis of different groups of Member States to highlight correlations between NPLs on banks' balance sheets and the macroeconomic environment. ([4]) Indicative evidence of the cross-border banking exposure is then used to find indications of potential risks of cross-country spillover effects.

In sub-section I.2 the relationship between NPLs and the real economy is discussed from a theoretical point of view, with reference to the relevant economic literature. Sub-section I.3 describes the evolution of NPLs across Member States, based on which a categorisation of countries is proposed and used to run a comparative analysis.

([1]) This section was prepared by Katia Berti, Christian Engelen and Bořek Vašíček. The authors wish to thank Michael Thiel for constructive and useful comments on this section.

([2]) For the EU as a whole, the weighted average NPL ratio, in June 2016, stood at 5.5% of total on-balance loans and advances (based on the EBA harmonised NPL definition), having declined by less than 1 p.p. since the value first recorded two years and a half before, in December 2014 (when the EBA harmonised definition started being applied). See European Banking Authority (2016), 'Risk dashboard. Data as of Q2 2016', EBA, Department Oversight – Risk Analysis Unit; and European Banking Authority (2015), 'Risk dashboard. Data as of Q3 2015', EBA, Department Oversight – Risk Analysis Unit.

([3]) EBA harmonized definition of NPL, data as of June 2016.

([4]) Due to limitations in data availability, the analysis necessarily relies on simple correlations between the variables at stake, while associations discussed do not derive from a ceteris paribus type of analysis (i.e. controlling for the effects of other variables). Results should therefore be interpreted with caution.

The recent developments in bank lending and investment activity in different groups of Member States, divided according to NPLs ratios and dynamics, are the subject of sub-sections I.4-I.5 respectively. Finally, sub-section I.6 looks at cross-border banking exposures as an illustration of the potential risk of spillover effects related to the quality of bank balance sheets. Sub-section I.7 concludes.

I.2. NPLs and the real economy: a two-way relation

The health status of the financial sector in general, and the share of NPLs in banks' balance sheets in particular, are strongly inter-related with macroeconomic conditions. As well documented in the economic literature, difficult macroeconomic conditions tend to exert negative effects on the financial sector. ([5]) During recessions and periods of weak economic growth, corporates and households are more likely to fall behind with the repayment of their loans, leading to an increase in the share of NPLs in banks' balance sheets.

In turn, problems in the financial system, and in the banking sector in particular, can negatively impact on the macroeconomic context. ([6]) The existence and the size of this feedback effect is in general related to the extent to which banks can adequately continue fulfilling their role in channelling savings to investment, allocating risks and transmitting monetary policy impulses to the real economy.

Empirical studies ([7]) indeed tend to find a significant relationship between macroeconomic developments and asset quality and credit risk - a relationship that is generally found to be two-sided and highly non-linear. ([8]) Real GDP growth and lending conditions tend to be identified as common drivers of NPLs. Other determinants are nonetheless also identified, like past credit growth; share prices (that are likely correlated with prices of other assets used as collateral, namely housing); current account deficits (debt financed from abroad, with foreign creditors being less sensitive to domestic risks); and the exchange rate (for countries with lending in foreign currencies and significant currency mismatches). ([9]) On top of country-specific determinants of NPLs, some studies also point to bank-specific drivers, such as cost efficiency and the level of capital. ([10]) The evidence available for the euro area points to GDP growth and unemployment as the major drivers of NPLs, though bank-specific variables such as management quality and risk preferences are found to play a role as well. ([11])

Empirical studies show that the main channel of feedback effects from NPLs to macroeconomic developments appears to be subdued lending to the corporate sector, which, for instance, adversely affects the economic recovery after a downturn. ([12]) Additionally, an analysis on corporate-bank relationships conducted for European countries shows that corporate investment is significantly reduced both by a corporate's own debt overhang and by the weak

([5]) Demirguç-Kunt, A. and E. Detragiache (2005), 'The determinants of banking crises and developed countries', IMF Staff Papers, Vol. 45, No. 1, pp. 81–109; Jacobson, T., J. Linde and K. Roszbach (2005), 'Exploring interactions between real activity and the financial stance', Journal of Financial Stability, Vol. 1, No. 3, pp. 308–41.

([6]) European Commission (2016), 'Financial channels and economic activity in the euro area', Quarterly Report on the Euro Area, Vol. 15, No 2, pp. 19-31.

([7]) Unfortunately the empirical evidence on NPLs is constrained by data limitations in terms of restricted time coverage and cross-country comparability of figures due to differences in definitions. It is also inherently difficult to combine aggregated macroeconomic data with disaggregated lending data from individual financial institutions.

([8]) Claudio, B., M. Drehmann and K. Tsatsaronis (2014), 'Stress-testing macro stress testing: does it live up to expectations? ', Journal of Financial Stability, Vol. 12, pp. 3-15.

([9]) Espinoza, R.A. and A. Prasad (2010), 'Nonperforming loans in the GCC banking system and their macroeconomic effects', IMF Working Paper, No. 10/224; Beck, R., P. Jakubik and A. Piloiu (2015), 'Key Determinants of Non-performing Loans: New Evidence from a Global Sample', Open Economies Review, Vol. 26, pp. 525–550; Kauko, K. (2012), 'External deficits and non-performing loans in the recent financial crisis', Economics Letters, Vol. 115, pp. 196–199.

([10]) Berger, A. and R. DeYoung (1997), 'Problem loans and cost efficiency in commercial banks', Journal of Banking and Finance, Vol. 21, pp. 849–870; Louzis, D., A. Vouldis and V. Metaxas (2010), 'Macroeconomic and bank-specific determinants of non-performing loans in Greece: a comparative study of mortgage, business and consumer loan portfolios', Journal of Banking and Finance, Vol. 36, pp. 1012–1027.

([11]) Makri, V., A. Tsagkanos and A. Bellas (2014), 'Determinants of Non-Performing Loans: The Case of the Eurozone', PANOECONOMICUS, No. 2, pp. 193-206; Anastasiou, D., H. Louri and M. Tsionas (2016), 'Determinants of non-performing loans: Evidence from Euro-area countries', Finance Research Letters, forthcoming.

([12]) Bending, T., M. Berndt, F. Betz, P. Brutscher, O. Nelvin, D. Revoltella, T. Slacik and M. Wolski. (2014), 'Unlocking investment in Europe', EIB Report; Klein, N. (2013), 'Non-performing loans in CESEE: Determinants and impact on macroeconomic performance', IMF Working Paper, No. 13/72.

balance sheets of banks previously engaged in credit relations with the corporate. ([13])

Overall, while financial developments can affect macroeconomic developments via a variety of channels, two channels appear particularly important when it comes to NPLs. The first channel (the so-called bank balance sheet channel) works through the rationing of bank lending (thus credit supply) to the real economy due to capacity constraints in the underlying risk capital of banks. This channel also includes the effects generated by an increase in bank lending rates resulting from an increase in the credit riskiness of firms, and in changes in risk aversion in banking lending practices, which increase collateral requirements and result in higher rejection rates. The second channel (the so-called borrower balance-sheet channel) works through the impact on firms' and households' willingness to invest (credit demand) in times of perceived debt overhang. The latter effect is due to the need for economic agents to adjust impaired balance sheets (deleveraging) and possibly also to the expectation of less flexibility on the part of banks to accommodate temporary difficulties for borrowers, or increasingly demanding collateral requirements asked by banks.

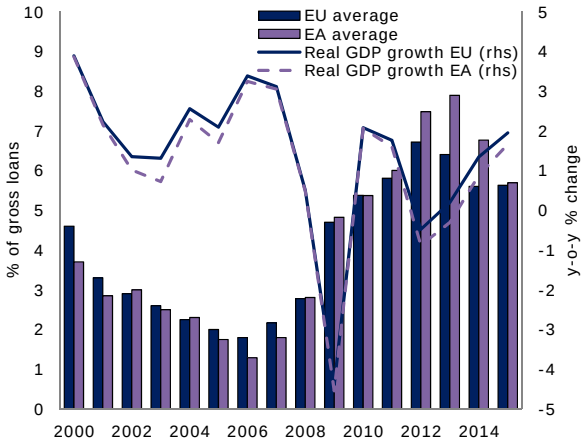
The effects referred to above can give rise to the emergence of a vicious circle in which low asset quality (i.e. high NPL ratios) and decreasing lending activity due to higher credit risk result in low bank profitability, which leads to insufficient growth in bank capital and subdued new lending to the real economy, negatively affecting GDP growth and thus leading to more NPLs. Such a situation can be additionally compounded by the need to strengthen capital due to a tightening of regulatory requirements and/or pressures for change in business models (e.g. to reduce overcapacities in banking systems), which is typical in a post-crisis situation when supervisory and capital requirement models are usually upgraded. The understanding of the mechanics at stake is particularly important in order to break such a vicious circle before it gets out of control with long-term effects.

([13]) Kalemli-Ozcan, L. Leaven and D. Moreno (2015), 'Debt overhang in Europe: Evidence from firm-bank-sovereign linkages', unpublished manuscript.

I.3. NPLs in EU Member States

While elevated NPL ratios are not a new phenomenon in EU Member States, the last economic and financial crisis was followed by a notable increase in NPLs in a number of countries. As already said, patterns of NPL developments have nonetheless varied significantly across Member States, reflecting different problems and cycles in national banking systems. ([14]) In addition, Member States have to different degrees pro-actively addressed the emerging NPL problems through policy measures, including legislative reforms, which also partly explains different developments across countries. ([15])

Graph I.1: **The evolution of the NPL ratio and real GDP growth, EU and EA**
(2000 - 2015)



Source: Worldbank, ECB, DG ECFIN calculations.

NPL ratios appear to have peaked in 2012/2013 for the EU/euro area respectively (see Graph I.1). Since then, in both cases, NPL ratios have fallen or have broadly stabilised, but remain more than twice higher than they were before the crisis (an average above 5.5% for both the EU and euro area in 2015, compared to an average at around or below 2% in 2007). Moreover, significant differences in the evolution of NPLs are observed within the euro area. The euro area countries that were relatively more stung by the debt crisis (Cyprus, Greece, Ireland, Italy, Portugal, Slovenia and Spain)

([14]) For a description of differences in financial cycle of European countries see: Schüler, Y. S., P. Hiebert, and T. A. Peltonen (2015), 'Characterising the financial cycle: a multivariate and time-varying approach', ECB Working Paper No. 1846.

([15]) Aiyar, S., W. Bergthaler, J. M. Garrido, A. Ilyina, A. Jobst, K. Kang, D. Kovtun, Y. Liu, D. Monaghan and M. Moretti (2015), 'A Strategy for Resolving Europe's Problem Loans', IMF Staff Discussion Notes, No. 15/19.

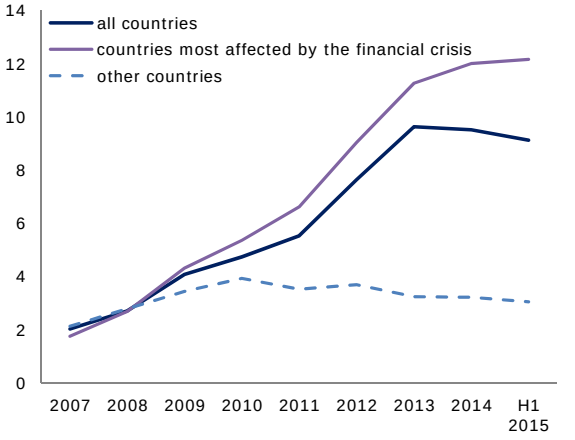
Table I.1: **Categories of EU Member States based on NPL level and evolution**

Category	Member States
Category 1: currently not showing high NPL ratios (<=10% of banks' loan portfolio) and not done so in the last 15 years	BE, DK, FI, DE, LU, NL, FR, SE, UK
Category 2: currently not showing a high NPL ratio (<=10% of banks' loan portfolio) but have done so in the last 15 years and/or NPL ratios rose strongly in a short period of time (at least a doubling between 2008 and 2013)	AT, EE, CZ, PL, HU, SK, ES, LV, LT
Category 3: currently showing a high NPL ratio (>10% of banks' loan portfolio)	BG, HR, CY, EL, IE, IT, MT, PT, RO, SI

Source: DG ECFIN.

experienced substantial increases in NPL ratios since 2010, lasting until recently, though at a decreasing marginal rate. For the other euro area countries, by contrast, a downward trend started as early as 2012. There seems to be therefore indicative evidence of the relationship between real economic developments and NPLs dynamics (see Graph I.2).

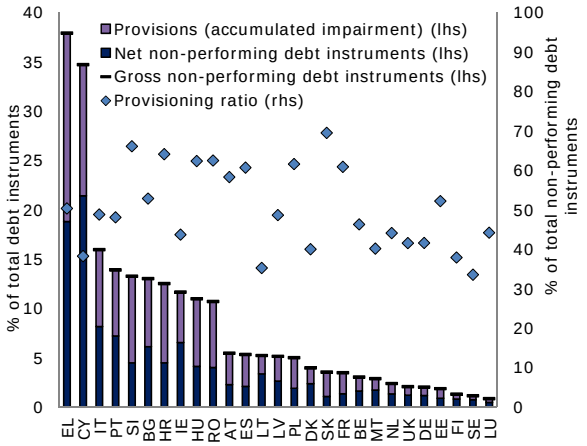
Graph I.2: **Impaired loan ratios for euro area significant banking groups**
(2007 – 2015H1,% of loans, median values)



(1) Based on publicly available data for a sample of 55 significant banking groups. Countries most affected by the crisis include Cyprus, Greece, Ireland, Italy, Portugal, Slovenia and Spain.
Source: ECB – Financial Stability Review (November 2015) based on SNL Financial.

It should be noted that provisioning ratios also differ significantly among countries, even for broadly similar NPL levels (see Graph I.3, which also reports 2015 levels of NPL ratios by country), leaving banks in some countries in a much more vulnerable situation than others, affecting in turn their capacity to lend.

Graph I.3: **NPLs per EU member state**
(2015)



Source: ECB and DG ECFIN calculations.

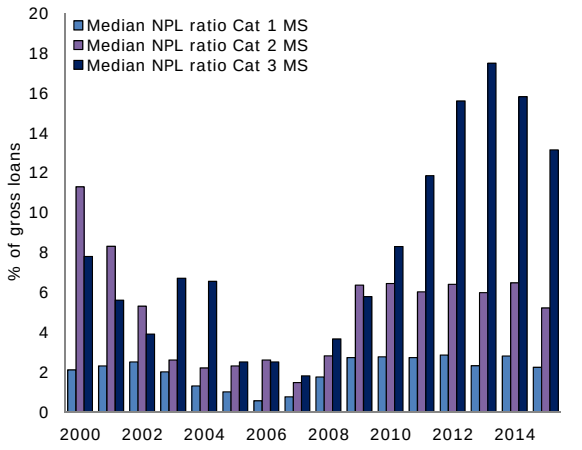
At present, EU Member States can be divided into three broad categories (see Table I.1) based on i) the current level of NPLs, and ii) the speed at which NPL ratios have evolved over the past (last 15 years). ([16]) A fast rising NPL ratio can have significant feedback effects on the macroeconomic environment, even when the NPL ratio itself does not reach an unusually high level. This is because, with rising NPLs, banks need to promptly increase their provisioning, which lowers profitability and/or weakens capital positions. In such cases banks will be more constrained in engaging in new lending until the appropriate provisioning level has been achieved and/or the capital position restored.

([16]) The threshold chosen for the NPL ratio is 10%. This level is admittedly chosen arbitrarily and might be considered relatively high in historical comparison. There are, however, a number of Member States that have crossed this threshold during the recent past. An NPL ratio of 10% or higher is nonetheless not necessarily creating the same level of pressure in all banking sectors. If banks have sufficient capital and other sources of profitable lending are available, coping with higher NPL ratios is easier compared to a situation where banks suffer from a weak capital position or lack profitable lending opportunities. This caveat should therefore be kept in mind.

This categorisation of countries is used to comparatively look at NPL developments and output gaps across groups, with the aim of highlighting possible correlations between the two.

NPL developments for the three groups of EU countries are displayed in Graph I.4. Member States in Category 3 experienced a sharp rise in NPL ratios during the crisis, followed by a visible decline over 2014-2015, which was nonetheless insufficient to bring the ratios down towards mean values. On the contrary, Member States in intermediate Category 2 who also saw a significant rise in NPLs in the first stage of the financial crisis (2008/2009) later experienced several years of stability before entering a gradual downward path in 2015. ([17])

Graph I.4: **NPL ratios in different categories of EU Member States**
(2000 - 2015,% of gross loans)

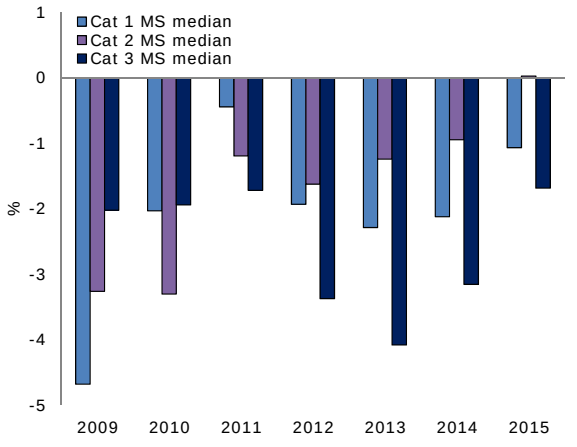


Source: ECB, World Bank, DG ECFIN calculations.

Finally, the median NPL ratio for Category 1 Member States recorded a milder increase in 2009, followed by broad stabilisation. A whole series of factors can of course lie behind these significant differences in NPL dynamics. These include different structural features across groups of countries, which facilitated the build-up of unsustainable loan exposures in the banking sector and/or have been hampering the timely resolution of NPLs, as well as differences in policy approaches (e.g. changing supervisory guidance, accounting requirements, or the establishment of public Asset Management Companies) adopted to address problems in the banking sector (e.g. in the context of a macroeconomic adjustment programme).

Graph I.5 points to a functional relationship between NPL ratios on banks' balance sheet and growth performance. Specifically, over the last five years, Member States with high NPL ratios (Category 3) have also experienced below average GDP growth. ([18]) These economies have shown a larger negative median output gap than the other categories of countries since 2011, when broad-based problems in euro area sovereign debt markets emerged. Category 1 Member States have also recorded a negative output gap, but to a much smaller scale than Category 3 countries and have recently shown a stronger economic recovery. Intermediate Category 2 countries have shown a steady recovery since the peak in negative output gaps in 2012 and eliminated their negative output gaps in 2015.

Graph I.5: **Output gap in different categories of EU Member States per NPL level and dynamics**
(2009 – 2015)



Source: Eurostat, DG ECFIN calculations.

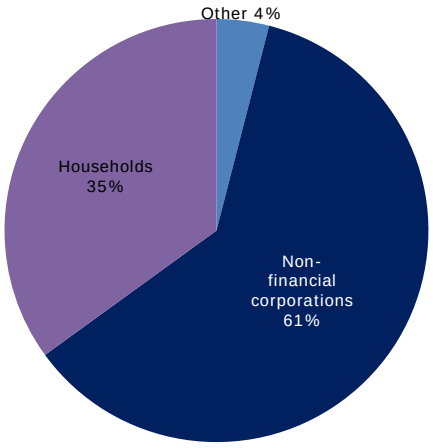
Beyond NPL dynamics, the distribution of NPLs across sectors is another interesting aspect to look at, also from the point of view of possible solutions. For instance, from an economic perspective, the realisation of value may be more

([17]) The difference with Category 3 countries can partly be explained by the fact that the latter also include programme countries with a more permanent impairment level.

([18]) As already mentioned, it is important to bear in mind that this type of analysis can only indicate coincidental developments between NPLs and the real economy, and not necessarily causality. Hence, the decisive question still remains as to what extent high NPLs ratios are merely a reflection of the unfavourable macroeconomic environment or also a determinant of weak GDP growth.

difficult in relation to non-financial corporations (NFCs, especially smaller ones where NPLs are unsecured), whereas NPLs for households are usually backed by real estate assets. ([19])

Graph I.6: **Composition of the stock of NPLs (%)**
(2015)



Source: ESRB Secretariat based on Consolidated Banking Data (ECB).

Aggregated data for the EU in Graph I.6 suggest that NPLs are considerably higher for loans to NFCs than for households. As far as NFCs are concerned, NPL ratios can also be expected to differ across productive sectors. Unfortunately, for most Member States, more disaggregated data on NPLs by sector are not publically available. An analysis for Spain and Portugal, for which such a breakdown of the data is available, is reported in Box I.1. The analysis suggests that (i) there is substantial heterogeneity in NPL ratios across productive sectors (identified by the statistical classification of economic activities by Eurostat, NACE 2) with construction and real estate services being the two most affected sectors in both countries; (ii) this cross-sector heterogeneity co-moves closely with the mean NPL ratio (i.e. it started to increase sharply in 2008); (iii) a clear link between NPLs and economic activity (measured by gross value added) is present also at the sector level.

([19]) The NPL ratio for HHs is skewed by the very high weight of mortgages in total HH lending. Defaults on mortgages are less likely, and also their drivers of default are likely to differ from the drivers of corporate default.

I.4. Developments in bank lending

As highlighted in sub-section I.2, one of the main channels through which high NPLs can have a negative feedback effect on the macroeconomic environment is through their impact on bank lending to the real economy. This possible impact of NPLs in terms of reduced credit supply is linked to several factors:

- **Lower available capital.** Because of their high risk weight, uncollateralised NPLs tie up substantial amounts of capital, which in turn reduce the room for expanding credit or raise the cost of doing so. ([20])

- **Lower profitability of banks.** The necessity of provisioning for NPLs reduces banks' net income and the reduced returns on NPLs also reduce profits. Reduced profits in turn result in fewer loans, other things being equal.

- **Higher funding costs.** Debt issued by banks with a high burden of distressed assets is perceived as riskier, and a premium is therefore required by bondholders. Uncertainty on the asset quality of individual banks may also limit their access to wholesale funding.

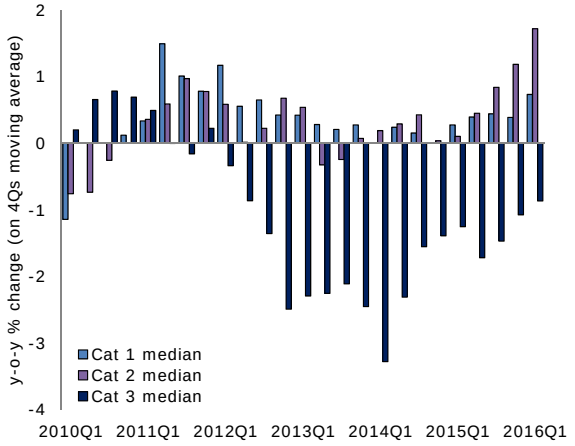
- **Monitoring and servicing costs**. The need to monitor distressed borrowers raises banks' operating costs.

Graphs I.7 and I.8 show how visible the contraction in bank lending has been to both NFCs and households respectively in Category 3 Member States, though it is not straightforward to disentangle the credit supply from the credit demand effects. ([21]) Some of this contraction might nonetheless also have been linked to a reduction of overcapacity in the banking sector from before the crisis, suggesting that the effect could be of a more enduring nature.

([20]) This holds particularly for banks using the standardised approach (SA) of credit risk measurement, whereas the bound capital for banks using the internal ratings-based (IRB) approach can be lower (if not addressed through higher requirements set by supervisors).

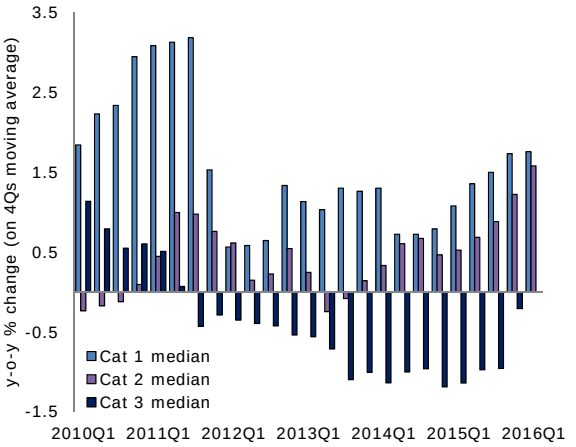
([21]) The Bank Lending Survey (BLS) by the ECB and the Survey on the Access to Finance of Enterprises (SAFE) by the Commission are generally used to distinguish between the two effects.

Graph I.7: **MFI lending to non-financial corporations, EU**
(2010Q1 – 2016Q1)



Source: ECB, DG ECFIN calculations.

Graph I.8: **MFI lending to households, EU**
(2010Q1 – 2016Q1)



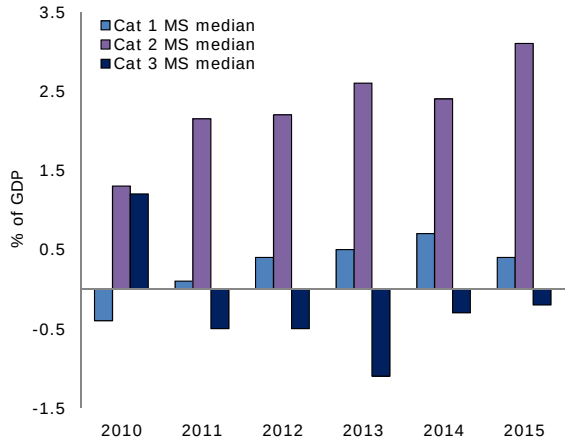
Source: ECB, DG ECFIN calculations.

The decrease in lending activities (still for Member States in Category 3) has been stronger for NFCs than for housholds. ([22]) It is noteworthy that this decrease in lending, especially to NFCs, seems to have taken place after the spike in NPL ratios (in 2013). The contraction seems to have taken place at the time when banks had to build up their provisioning in reaction to an increase in non-performing exposure in their loan book. In Category 2 Member States, lending to NFCs started to pick up again (since the first quarter of 2015) in line with a closing of the output gap and decreasing NPL ratios, thus highlighting remarkable differences in behaviour across categories of countries.

I.5. Developments in investment

The next step in our comparative analysis is to look at possible differences in terms of investment activity across the three groups of countries. The propensity to invest (i.e. the ratio of gross fixed capital formation to GDP) ([23]) is the result of the interaction of supply of savings and demand for investment, and hence is likely to also reflect information on credit supply and demand.

Graph I.9: **Deviation of investment ratio from EU average**
(2010 – 2015)



Source: Eurostat, DG ECFIN calculations.

As Graph I.9 suggests, Category 3 Member States show a below-average investment ratio, with the largest negative gap relative to EU average recorded in 2013, i.e. at the time of the peak in the NPL ratio for this group of countries. Category 2 Member States, on the contrary, show a strong recovery in their investment ratios after the initial impact of the crisis up to above EU average levels. These relatively higher levels of investment might be due to structural factors related to compositional effects (e.g. generally higher investment needs in Central and Eastern European

([22]) This might also reflect the average shorter residual maturities of corporate loan books, which translate into greater volatility of loan stocks and greater deleveraging opportunities compared to household mortgage lending.

([23]) Gross fixed capital formation is the most appropriate measure of investment activity as it measures the value added of an economy that is derived from the production, improvement or maintenance of fixed assets. It therefore excludes the purchase of financial assets and the purchases of land. Applied to the current context, it might understate the investment activity in Category 1 Member States, where a high share of the investment activity is generated in the residential real estate sector, including the buying and selling of land.

Member States, included in Category 2), but they might also be associated with a faster balance sheet repair of NFCs.

One crucial albeit complex question to address in this context is whether the presence of a high NPL ratio in the banking sector might have an influence on the demand side of investment, beyond the effects via lower bank lending. The common assumption is that the NPLs effects are already reflected in the availability and cost of bank lending (see Graph I.10 clearly indicating divergence of lending rates for NFCs in the EA countries affected by the financial crisis). However, problems associated with a high ratio of NPLs in the banking sector might also have a bearing on the investment planning of corporates before a concrete credit request is made. Specifically, there are several theoretical considerations that could result in an impact of high NPL ratios on NFCs' investment planning:

- **Profit sharing**: NFCs with existing arrears might have fewer incentives to invest in new projects when some of their debt is already in default as any upside from new projects would necessarily need to be shared.

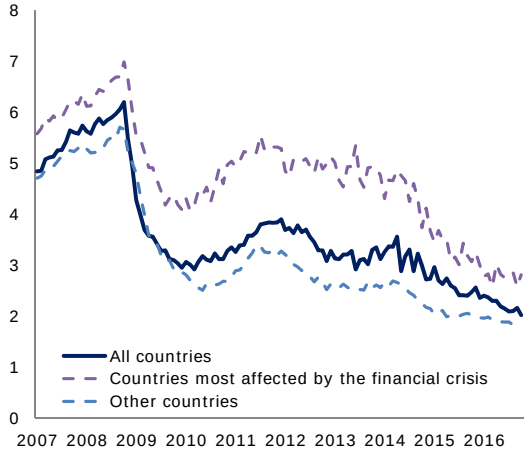
- **Adverse selection**: Higher bank lending costs discourage NFCs with strong balance sheets to turn to external sources of financing, while weaker NFCs with limited internal funds continue to seek external financing. This lowers the average quality of credit demand, affecting the signal banks get from NFCs seeking bank lending ('lemons problem'), hence increasing bank lending rates. NFCs without sufficient internal financing capacity might thus have an incentive to avoid large investment projects, which would oblige them to request bank lending.

- **Real financing costs**: Despite low nominal interest rates, real rates might be higher and weighing on credit demand (especially in Member States with very low inflation or deflation). ([24]) This adds to the effect of high perceived NFC credit risk and raises the requirements in terms of profitability of individual projects to be undertaken, thus making some investment projects non-viable from a financial perspective.

- **Risk aversion**: NFCs without existing arrears but heightened debt burden might be discouraged from investment by less leeway for banks to show flexibility in case of difficulties. Hence, NFCs might refrain from exposing themselves to the risk of becoming dependent on such flexibility by not engaging in possibly profitable but risky projects. This would amplify the already cyclical effect of the prudential treatment of risks.

Graph I.10: **Cost of borrowing for NFCs, EA (1)**

(Jan 2007-Oct 2016, in %)



(1)Countries most affected by the financial crisis include CY, GR, IE, IT, PT, SI and SK.
Source: ECB.

The above listed effects are admittedly unlikely to be the main driving force in determining the investment decision of NFCs, in particular in Member States where firms first have to restore their impaired balance sheets and therefore refrain from investing. Still, these effects might tacitly influence corporates' investment decisions. However, identifying this type of effects in aggregated macroeconomic data is difficult.

I.6. Possible spillover effects

One important element that should be considered when assessing the linkages between the quality of bank balance sheets (in general, and NPLs in particular) and the macroeconomic environment is the issue of cross-border spillovers. While there are strong benefits from financial integration in the EU in terms of risk diversification, in such a deeply integrated area, economic and financial difficulties

([24]) See: European Commission (2015), 'Revisiting the real interest rate mechanism', Quarterly Report on the Euro Area, Vol. 14, No 4, pp. 33-48.

in one Member State can also have a bearing on other Member States even outside of an acute crisis situation. In order to track potential cross-border spillover effects, empirical studies look at price measures, such as banking stock prices and credit default swap or even sovereign bond yields (as these are mostly held by the banking sector). ([25]) The existing evidence suggests the importance of co-movement between these measures, reflecting both the achieved degree of financial integration but also potential for unwelcomed cross-border spillovers. Another option that is pursued here is to use the quantity-based measure, namely cross-border bank exposures.

Spillovers across national borders can take place through different channels:

- **Macroeconomic effects:** These are the effects that emanate from the overall deterioration of the macroeconomic environment, reinforced by a possible negative feedback effect of NPLs on GDP growth. Subdued economic growth in one Member State eventually translates into less import demand (through the trade channel) and a deteriorating value of cross-border holdings of equity and debt of NFCs in the same country (through the financial channel), thus hitting other Member States too. Lower growth will also have an effect on public finances with a likely weakening of the sovereign debt risk profile, generating additional cross-border effects in the financial system. Cross-border effects can also be related to consumer confidence shocks, as these types of shocks affect domestic consumption and also have the potential to spill over across countries. ([26])

- **Cross-border lending effects:** Spillover effects can take place either via *domestic* bank lending or the lending of *foreign* banks. Spillovers via *domestic* banks occur when the increase in the NPL ratio in a foreign banking sector is affecting the loans handed out by domestic banks operating in that foreign market and these banks are subject to the same structural deficiencies that prevent a timely resolution of NPLs in the foreign country. In this case, the NPL exposure in the foreign market can tie up risk capital, which is not available for lending activities in the banks' home market. Spillovers via *foreign* banks, on the contrary, occur when banks in one Member State feel compelled to cut back their cross-border lending activities, due to the constraints they face because of high NPLs in their domestic loan book, and thereby reduce credit supply in other Member States. Unless the impact on lending in the home countries of the affected banks is compensated by an increase in lending from competitors, both channels lead to a situation in which problems associated with high NPLs in one Member States can have an impact on credit supply in other Member States.

While it is impossible to verify and quantify empirically the aforementioned channels of cross-border spillovers, ([27]) it is nevertheless possible to assess at least which Member States could be more vulnerable to such spillover effects due to a relative larger cross-border exposure of bank assets (Tables I.2 and I.3). However, the analysis is considerably weakened by the limited availability of suitable data to measure spillovers of lending. Consequently, the cross-border exposures should be understood as a *necessary* condition rather than a *sufficient* one for the NPL spillovers to take place.

Table I.2 provides an indication of *the vulnerability* of individual Member States *to spillovers via cross-border exposures of domestic banks*. On the basis of BIS data (on an ultimate risk basis) ([28]) the numbers describe the cross-border bank exposures from foreign banks (in percentage of GDP of their home Member State). Looking, for example, at Category 3 Member States, one finds that

([25]) See for example: Alter, A., and A. Beyer (2014), 'The dynamics of spillover effects during the European sovereign debt turmoil'. Journal of Banking & Finance, No. 42, pp. 134-153. Betz, F., N. Hautsch, T.A. Peltonen and M. Schienle, M. (2016), 'Systemic risk spillovers in the European banking and sovereign network', Journal of Financial Stability, Vol. 25, pp. 206-224. Claeys, P. and B. Vašíček, (2015), 'Systemic risk and the sovereign-bank default nexus: a network vector autoregression approach', Journal of Network Theory in Finance, Vol. 1, No. 4, pp. 27-72.

([26]) See: European Commission (2016), 'Confidence spillovers in the euro area', Quarterly Report on the Euro Area, Vol. 15, No 2, pp. 33-38.

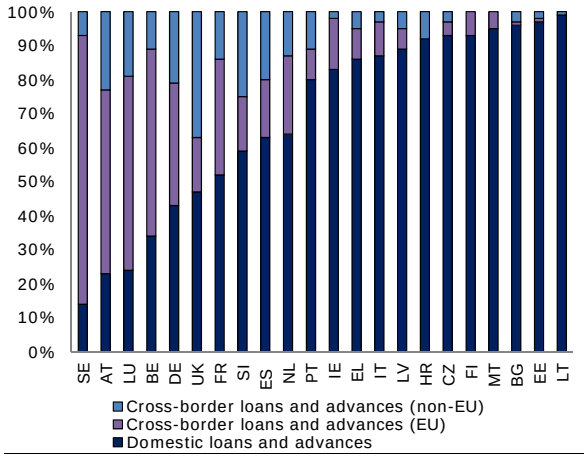
([27]) The existing data from the BIS (consolidated banking statistics), the ECB (CBC) and EBA (results of the stress tests / transparency exercise) do not allow a direct identification of cross-border NPLs on a bilateral basis. See also: EBA (2016): Report on the dynamics and drivers of non-performing exposures in the EU banking sector. This EBA report contains a cross-border exposure matrix, but the data is only related to a subsample of 166 banks.

([28]) On an ultimate risk basis, the exposure is only showing the cross-border net risk transfer (i.e. adjusted for guarantees and other forms for third-party risk transfer). This usually differs from the gross exposure (e.g. from an immediate borrower basis) and represents the most appropriate metric for cross-border risk exposure.

Romanian banks seem to exhibit an elevated exposure to Greece (measured in Romanian GDP); British banks seem to be exposed to Ireland; and German banks to Italy. While these exposures, being largely exposures vis-à-vis foreign affiliates, represent a welcome sign of banking integration across the EU, they could also have an unwelcome side-effect in the form of spillovers via domestic bank lending.

Table I.3 provides raw indications of the vulnerability to spillovers via *foreign* banks. ([29]) For example, a number of countries (especially Croatia, Austria, Hungary) appear to be particularly exposed to a change in lending policy by Italian banks. The analysis also shows that a high number of Member States could be exposed to spillover effects via banks from Member States, which do not have high NPL ratios. For example, the numbers show that Croatia, the Czech Republic and Slovakia could become particularly affected by a change in lending policy of Austrian banks. And Latvia, Lithuania, Estonia, Denmark and Finland could become considerably affected if Swedish banks were to cut back their cross-border activity.

Graph I.11: **NPLs by origin of loan provider, European union**
(March 2016)



(1) Data for CY, RO, PL, HU, SK and DK are not available. The banking data are partially consolidated. For details see EBA (2015): Decision of the European Banking Authority on reporting by competent authorities to the EBA.
Source: EBA.

The indications above seem to be consistent with recent EBA findings using a subset of 166 large banks (see Graph I.11). The EBA dataset provides a breakdown of NPLs in individual Member States between domestic and cross-border loans and advances (the latter allows one to distinguish between exposures vis-à-vis the rest of the EU and non-EU countries but not vis-à-vis individual countries). According to this dataset, the exposure to NPLs through banks' cross-border exposure is particularly pronounced for banks in Austria and Sweden (this can be either direct cross-border lending or indirectly via foreign subsidiaries). On the contrary, the bulk of NPLs for banks in smaller Member States, like Latvia, Estonia, Bulgaria and Malta, is related to domestic loans and advances.

I.7. Conclusions

This section has specifically put the focus on the macroeconomic importance of high NPL ratios in a number of EU Member States, which deserves particular attention in the current context of a slow economic recovery, with persistent, substantial slack in the economy. High levels of NPLs on bank balance sheets negatively impact credit supply and credit demand, reducing lending to the real economy at a time where, on the contrary, support to the still modest economic recovery would be needed. Monetary policy transmission in the euro area might also be negatively affected by elevated NPL ratios, in particular given the dominance of bank lending in the financing of European corporates.

Feedback effects from elevated NPLs on the macroeconomic environment can give rise to a vicious circle, whereby low asset quality results in low bank profitability, low capital buffers and constrained lending to the real economy, which in turn negatively affects GDP growth, worsening the initial problems with NPLs. This clearly highlights the importance of pro-active policy actions to break such vicious circles.

Though showing causality is fraught with difficulties, the comparative analysis across EU countries grouped according to the intensity of their NPL problems shows that, over the last five years, Member States with high NPL ratios have also experienced below average economic growth. These economies have displayed the most visible contraction in bank lending to both non-financial corporations and households. At the same time, the group of Member States experiencing the most severe problems with NPLs have also seen their investment ratios fall below the EU average. This indicative evidence points in the direction of an important nexus between NPLs and the

([29]) The analysis is considerably weakened by limited data availability.

contraction in bank lending and investment activities.

It is important to stress that the recent financial turmoil affected both credit demand (via the depth of the recession) and credit supply (via the adjustment in the banking sector), and it is very difficult to provide evidence on causality. Instead, it seems fair to say that both banking developments (NPLs, credit) and real developments (investment) are endogenous. Even acknowledging the difficulties in showing causality, as already stressed, it seems plausible that persistently high NPLs in a number of Member States can be a factor contributing to the currently sluggish nature of the recovery. Therefore, taking decisive policy action to reduce NPLs would be beneficial for growth.

Finally, it is important to recognize that in a deeply economically integrated area like the EU, and particularly the euro area, financial systems are also highly interconnected across borders. This means that problems with NPLs are likely to constrain credit supply and economic growth not just in the affected Member States but also in the euro area as a whole. The potential broader economic and spillover effects would therefore require not only undertaking important structural measures at Member States level but also, importantly, a coordinated European approach to the NPL issue. Obviously, any such common approach would have to comply with the current EU legal framework. Any short-term solutions would need to be complemented by more long-term reforms to enhance the performance of secondary markets for NPLs and the institutional environment for their resolution. This could go a long way in addressing the concerns explained in this analysis.

Table I.2: **Cross-border bank exposures (loans and advances) of domestic banks (1)**

(2015Q2)

Cross-border bank exposure (in % of GDP of home MS)

Member State to which exposure is held

	BG	HR	CY	GR	IE	IT	RO	SI	MT	PT	CZ	PL	HU	SK	ES	LV	LT	EE	AT	BE	DK	FI	DE	LU	NL	FR	SE	UK
BG		-	-	3.9	-		-	-	-	0.0	-	-	-	-	0.0	-	-	-	0.8	0.2	-	-	0.0	-	-	-	0.0	0.0
HR	-		-	0.0	-	1.2	-	-	-	0.0	-	-	-	-	0.0	-	-	-	5.0	0.0	-	-	-	-	-	-	0.0	0.0
CY	-	-		4.4	-	0.0	-	-	-	0.0	-	-	-	-	0.0	-	-	-	0.3	0.0	-	-	0.1	-	0.1	-	0.3	0.0
EL	-	-	-		-	0.0	-	-	-	0.1	-	-	-	-	0.1	-	-	-	0.0	0.0	-	-	0.2	-	0.2	0.0	-	0.1
IE	-	-	-	0.1		0.3	-	-	-	0.7	-	-	-	-	0.4	-	-	-	0.2	3.0	-	-	0.9	-	1.4	1.3	0.1	3.1
IT	-	-	-	0.1	0.6		-	-	-	2.8	-	-	-	-	3.3	-	-	-	1.5	1.7	-	-	2.6	-	3.4	10.1	0.1	1.1
RO	-	-	-	5.8	-	0.5		-	-	0.0	-	-	-	-	0.0	-	-	-	5.8	0.0	-	-	0.0	-	0.7	-	0.0	0.0
SI	-	-	-	-	-	-	-		-	0.0	-	-	-	-	0.0	-	-	-	1.3	0.0	-	-	0.0	-	-	-	0.0	0.0
MT	-	-	-	0.3	-	0.0	-	-		0.1	-	-	-	-	0.0	-	-	-	0.1	0.0	-	-	0.1	-	0.1	-	0.0	0.2
PT	-	-	-	0.0	-	0.1	-	-	-		-	-	-	-	4.5	-	-	-	0.1	0.1	-	-	0.4	-	0.4	0.5	0.0	0.3
CZ	-	-	-	0.0	-	0.8	-	-	-	0.0		-	-	-	0.0	-	-	-	11.9	6.7	-	-	0.2	-	-	1.2	0.0	0.2
PL	-	-	-	0.1	-	2.1	-	-	-	7.6	-		-	-	2.5	-	-	-	5.1	0.3	-	-	1.2	-	3.2	1.5	1.1	0.3
HU	-	-	-	0.0	-	0.7	-	-	-	0.1	-	-		-	0.0	-	-	-	3.9	1.6	-	-	0.2	-	-	-	0.0	0.1
SK	-	-	-	-	-		-	-	-	0.0	-	-	-		0.0	-	-	-	1.3	0.0	-	-	0.0	-	-	-	0.0	0.0
ES	-	-	-	0.0	1.0	2.0	-	-	-	5.7	-	-	-	-		-	-	-	0.6	1.5	-	0.0	2.3	-	4.6	3.9	0.2	1.0
LV	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0		-	-	0.0	0.0	-	-	0.0	-	-	-	1.9	0.0
LT	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-		-	0.0	0.0	-	-	0.0	-	-	-	2.5	0.0
EE	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	0.0	-	-		0.0	0.0	-	-	0.0	-	-	-	3.1	0.0
AT	-	-	-	0.1	-	4.1	-	-	-	0.0	-	-	-	-	0.3	-	-	-		0.3	-	0.2	1.3	-	1.2	0.5	0.2	0.2
BE	-	-	-	0.2	0.3	0.4	-	-	-	0.2	-	-	-	-	0.3	-	-	-	0.4		-	0.4	0.7	-		6.4	0.8	0.5
DK	-	-	-	0.0	-	0.1	-	-	-	0.1	-	-	-	-	0.3	-	-	-	0.3	0.1		0.2	0.4	-	0.6	0.3	33.6	0.3
FI	-	-	-	0.1	-	0.1	-	-	-	0.0	-	-	-	-	0.2	-	-	-	0.5	0.3	-		0.5	-	1.1	0.3	20.2	0.4
DE	-	-	-	0.9	0.4	9.3	-	-	-	0.9	-	-	-	-	3.4	-	-	-	9.0	1.9	-	1.4		-	19.0	5.9	11.5	4.8
LU	-	-	-	0.7	-	1.0	-	-	-	1.9	-	-	-	-	0.5	-	-	-	1.0	1.1	-	0.2	1.9		2.0	3.0	1.3	0.8
NL	-	-	-	0.1	0.9	0.9	-	-	-	3.8	-	-	-	-	1.1	-	-	-	1.3	4.4	-	0.9	2.2	-		3.5	1.9	3.2
FR	-	-	-	0.5	1.9	2.1	-	-	-	2.0	-	-	-	-	3.2	-	-	-	2.2	4.6	-	1.0	4.3	-	10.0		1.9	6.1
SE	-	-	-	0.0	0.3	0.1	-	-	-	0.0	-	-	-	-	0.3	-	-	-	0.3	0.1	-	1.6	0.7	-	0.7	0.6		0.5
UK	-	-	-	4.7	32.4	2.1	-	-	-	1.3	-	-	-	-	29.9	-	-	-	2.9	3.4	-	0.6	10.7	-	10.5	8.1	10.5	

(1) The colours differentiate different level of exposures where green describes low vulnerability (0-0.99% GDP), yellow medium vulnerability (1-4.99% GDP) and red high vulnerability (above 5% GDP).

Source: BIS consolidated banking statistics (ultimate risk basis), IMF, ECFIN calculations.

Table I.3: **Cross-border bank exposures (loans and advances) of foreign banks (1)**

(2015Q2)

Recipient MS of cross-border bank exposure (in % of GDP of recipient MS)

Home Member State of Banks	BG	HR	CY	GR	IE	IT	RO	SI	MT	PT	CZ	PL	HU	SK	ES	LV	LT	EE	AT	BE	DK	FI	DE	LU	NL	FR	SE	UK
BG	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
EL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
IE	-	-	-	-		0.1	-	-	-	-	-	-	-	-	0.2	-	-	-	-	0.2	-	-	0.0	NA	0.3	0.2	0.1	3.0
IT	-	44.7	3.6	0.3	3.0		6.0	-	6.3	1.4	8.3	8.7	11.6	-	3.1	-	-	0.4	20.4	1.6	0.5	0.5	5.3	NA	2.2	1.6	0.4	1.7
RO	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SI	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MT	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PT	0.0	0.0	0.0	0.1	0.6	0.3	0.0	0.1	1.7		0.0	3.3	0.1	0.0	0.9	0.0	0.0	-	0.0	0.1	0.1	0.0	0.1	NA	1.0	0.2	0.0	0.1
CZ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SK	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ES	0.1	0.1	0.6	0.3	2.2	2.2	0.4	0.1	2.8	28.0	0.1	6.6	0.2	0.0		0.0	0.0	0.0	1.0	0.8	1.2	1.0	1.3	NA	1.8	1.6	0.7	15.7
LV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
EE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AT	6.7	37.6	4.8	0.1	0.4	0.3	13.2	11.8	3.4	0.2	24.9	4.3	12.7	32.1	0.2	0.2	0.2	0.2		0.4	0.3	0.7	1.1	NA	0.7	0.3	0.2	0.5
BE	2.4	0.1	0.1	0.0	6.8	0.4	0.1	0.3	0.3	0.2	17.3	0.3	6.3	9.6	0.6	0.4	0.2	0.4	0.4		0.1	0.6	0.3	NA	2.7	0.9	0.1	0.7
DK	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA
FI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	0.1	0.2	0.2		0.1	NA	-	0.1	0.8	0.1
DE	0.1	-	15.7	2.6	14.1	4.7	0.5	3.8	26.5	7.3	2.9	9.0	4.8	2.1	6.4	1.2	1.1	0.8	11.9	5.0	4.5	6.5		NA	10.0	5.9	4.6	15.4
LU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA
NL	-	-	3.9	0.6	5.2	1.4	3.3	-	7.6	1.5	-	5.3	-	-	2.9	-	-	-	2.5	-	1.4	3.6	4.5	NA		3.1	1.1	3.5
FR	-	-	-	0.5	15.6	13.4	-	-	-	6.1	15.9	8.0	-	-	8.0	-	-	-	3.6	34.6	2.8	3.3	4.4	NA	11.6		3.0	8.5
SE	0.0	0.0	7.6	-	0.3	0.0	0.0	0.0	0.8	0.0	0.1	1.2	0.1	0.1	0.1	35.0	30.7	69.0	0.2	0.8	57.0	42.7	1.8	NA	1.2	0.4		2.2
UK	0.0	0.3	5.7	1.3	38.2	1.5	0.0	0.8	51.3	4.6	2.6	1.5	1.2	0.2	2.1	0.2	0.1	0.0	1.4	2.9	2.3	3.9	3.8	NA	11.1	6.4	2.3	

(1) The colours differentiate different level of exposures where green describes low vulnerability (0-0.99% GDP), yellow medium vulnerability (1-4.99% GDP) and red high vulnerability (above 5% GDP).

Source: BIS consolidated banking statistics (ultimate risk basis), IMF, ECFIN calculations.

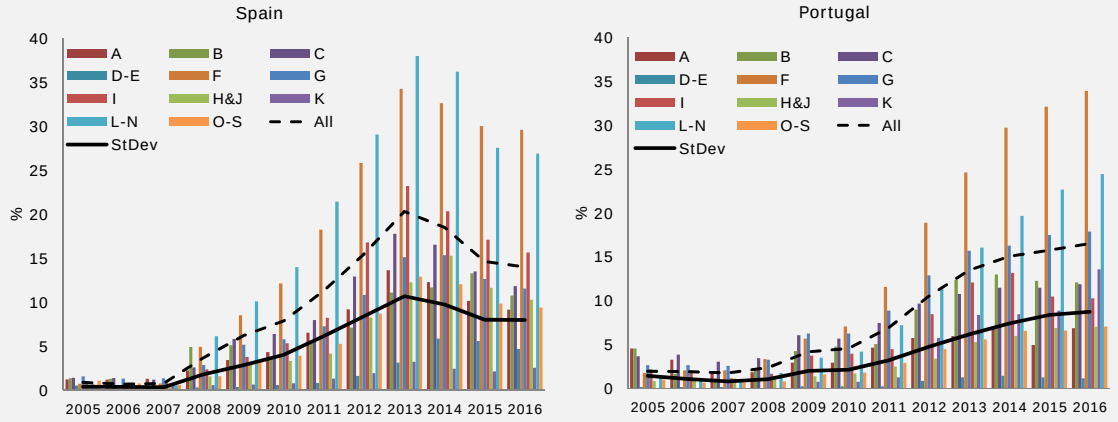
Box 1.1: NPL ratios by productive sector

In this Box we briefly present developments of NPL ratios by productive sector (NACE 2) for Spain and Portugal, two countries for which data are publicly available at this disaggregated level.

By looking at the data reported in Chart 1, a few observations stand out:

- Heterogeneity of NPL ratios across sectors appears to be substantial.
- In both Spain and Portugal, heterogeneity (measured by the standard deviation) started to increase alongside the mean NPL ratio in 2008, with the start of the financial crisis.
- In Spain the overall mean NPL ratio and the cross-sector heterogeneity peaked in 2013 and started decreasing afterwards (comprehensive bottom-up stress tests were performed in 2012, and consequently SAREB, the Spanish government-owned company responsible for managing distressed assets, was established), while in Portugal both the mean NPL ratio and heterogeneity are still on a mildly increasing path.
- For Spain, the highest NPL ratios by far were recorded in construction (code F) and in real estate, professional and support service activities (code L-N); in Portugal construction (code F) presents by far the highest NPL ratio too, followed at significant distance by real estate, professional and support service activities (code L-N). Hotels and restaurants (code I) in Spain and whole sale and retail trade (code G) in Portugal also present high NPL ratios, though generally significantly lower than the aforementioned sectors.

Chart 1: **NPL ratios by sector of economic activity, (Spain and Portugal) (1)**
(2005 – 2015)

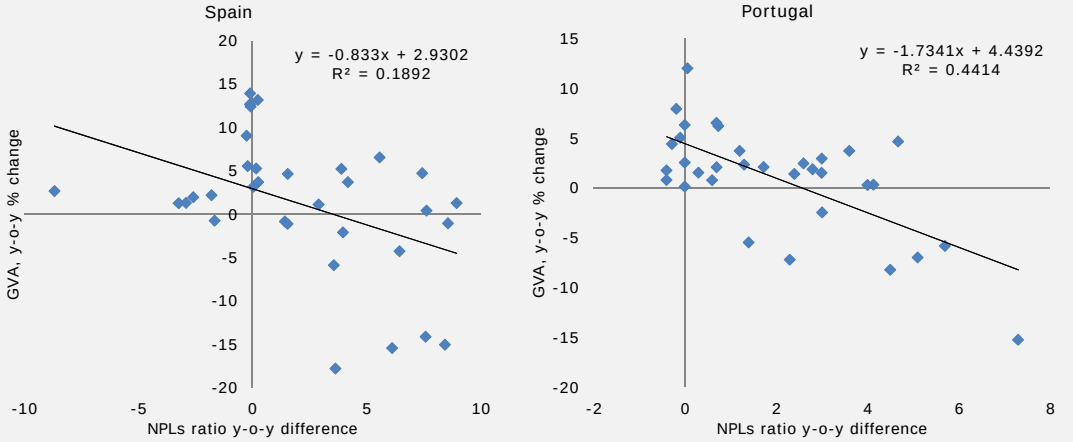


(1) The sectors of economic activity presented in the graph (by NACE Rev. 2) for both Spain and Portugal are: Agriculture, Forestry and Fishing (A), Mining and Quarrying (B), Manufacturing (C), Electricity, Gas, Steam and Air Conditioning (D), Construction (F), Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles (G), Transportation and Storage (H), Accomodation and Food Service Activities (I), Information and Communication (J), Financial and Insurance Activities (K), Real Estate Activities (L), Professional, Scientific and Technical Activities (M), Administrative and Support Service Activities (N), Public Administration and Defence; Compulsory Social Security (O), Education (P), Human Health and Social Work Activities (Q), Arts, Entertainment and Recreation (R), Other Service Activities (S)
Source: *Banco de España and Banco de Portugal.*

Chart 2 below reports the change in NPL ratios (X-axis) against the annual percentage change in gross value added (Y-axis) for the three industries with the highest NPL ratios (on average for the past decade) in each of the two countries. From the chart it is evident that the negative relation between NPL ratios and economic activity found at aggregate level can be found also at sectorial level. Despite the large dispersion, arguably driven by the heterogeneity between the industries (the relation is much stronger if the scatter plot is drawn for some of these industries separately, especially for the ones with the highest NPL ratios), the negative association is very clear: the higher the NPL ratio, the lower the increase in gross value added.

Box (continued)

Chart 2: **Annual changes in NPL ratios and annual % changes in GVA for the sectors of economic activity with the highest NPL ratios, (Spain and Portugal) (1)**
(2005 – 2015)



(1) The sectors of economic activity presented in the graph (by NACE Rev. 2) for Spain are L-N (merged), F and I, while for Portugal they are F, L-N (merged) and G. (See also Chart 1 of this box for an analytical description of economic sectors of activity by NACE Rev.2).
Source: *Eurostat, Banco de España and Banco de Portugal.*