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Financial Frictions and Corporate Investment in Bad Times. Who Cut Back Most?

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Financial Frictions and Corporate Investment in Bad Times. Who Cut Back Most?

Brunella Bruno[*], Alexandra D'Onofrio[**], Immacolata Marino[***]

Abstract
We first present detailed stylised facts on European corporates during the period of financial and sovereign crisis. We observe that investment in fixed assets declined over the crisis period in all countries. To understand the reasons of such a decline in corporate investment, we implement an econometric analysis to specifically explore the differential impact of leverage and debt maturity structure on investment. We find that in crisis years (i) leverage exerts a strong and negative effect on the level of investment, and (ii) firms with more long-term debt invest less. We also uncover heterogeneous reactions to the crisis due to the level of debt and its maturity by sorting firms by country-specific and firm-specific characteristics. We find that firms who cut back most investment in crisis years (conditional on the level of leverage and maturity) are (i) small and (ii) located in Eurozone periphery countries. Factors that help firms alleviate financial frictions and shield investment are (i) being able to rely on multiple bank relationships and (2) the ability to generate internal resources (cash flows). We find no evidence of a positive nexus between cash and investment, and only little evidence of a positive effect on investment of access to capital markets, to mitigate the negative impact of debt in crisis years.

Keywords: investment, leverage, long-term debt, crisis

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1. Introduction

As claimed by the European Commission, the financial and sovereign debt crisis has taken a heavy toll on Europe growth. Significant GDP losses occurred in many developed countries and became permanent. Compared with 2007, 6.5 million more people are now unemployed in the European Union. European economies are not only suffering from permanent and significant losses of GDP, but also a reduced potential real GDP growth rate. An investment gap has opened in Europe, which poses challenges in achieving competitiveness and sustainable growth (European Commission, 2016).

Several key determinants may have affected corporate investment in Europe over the last decade. Among these, a major role is played by leverage. Many commentators have argued that the lending boom of the early 2000s, which fuelled the run-up to the subprime crisis, caused firms and banks to increase their leverage substantially (Rodriguez-Palenzuela and Dees, 2016). When the boom turned into a bust and banks contracted credit, the global economic meltdown occurred (Kalemli-Ozcan et al., 2012). It is not only the level of debt, but also its composition, that may play a role, since some debt can be easily renegotiated while other forms cannot. For example, small businesses tend to hold more bank debt, regardless of the sector considered.[1] For some sectors, trade credit is more important as a source of external financing than bank credit. Real estate is the sector which is most dependent on bank credit (between 60% and 70% of total debt) regardless of firm size (Rodriguez- Palenzuela and Dees, 2016). These differences could have implications for corporate investment.

Against this background, we first present a detailed descriptive analysis of the performance of European firms over 2005-2014 – a boom and bust decade. Then, we focus on investment and its determinants. In particular, we want to explore the role of corporate leverage in influencing the impact of the crisis on investment. Theory predicts that financial structure affects output dynamics, and even more so when financial frictions increase. While financial deepening, through greater access to bank credit and securities, can help boost productivity levels and reduce macro volatility by diversifying firms' funding options, excess leverage can more than offset these benefits by raising corporate vulnerabilities and amplifying firms' sensitivity to income and interest shocks. This financial accelerator effect can in turn lead to larger and more persistent cyclical fluctuations in the economy (Bernanke and Gertler, 1989).

We also want to explore whether, together with leverage, the maturity structure of debt matters in explaining investment patterns in Europe through the cycle. The effect of debt maturity on corporate investment is still unclear and is mainly related to firms' characteristics.[2] A common prescription in the literature is that a firm should match the maturity of its liabilities to that of its assets to reduce the expected costs of financial distress (Stohs and Mauer, 1996). Long-term debt should, in principle, be better able to cover financial needs emerging from long-term investment such as capital expenditures. If

[1] Compared to US firms, European corporates tend to be more leveraged and, overall, more reliant on bank credit. This peculiarity is in part determined by the smaller average size of European firms, which amplifies information asymmetries and makes access to public debt markets costly, if not unfeasible.

[2] See Stohs and Mauer (1996) for a detailed review of the literature on the determinants of debt maturity structure.

debt has a longer maturity, then cash flows from assets cease, while debt payments remain due. Alternatively, if debt has a shorter maturity than assets, there may not be enough cash on hand to repay the principal when it is due. In addition, a greater reliance on shorter-term debt may increase rollover (liquidity) risk and hurt a firm's incentive to invest, especially in bad times and when a firm's value declines after the debt was issued (Diamond and He, 2014), or for lower quality borrowers (Diamond, 1991). It is also plausible, on the other hand, that a greater reliance on short-term debt makes it simpler to adjust a firm's financial structure. Leverage cannot be adjusted if there is long-term debt, but it is adjustable every period if short-term debt is issued (Moyan, 2007). This is especially true if growth opportunities are unanticipated, or if costs associated with the adjustment of debt maturity are high (Aivazian et al., 2005).

We analyse a large sample of firms from five major European countries (France, Germany, Italy, Spain and the United Kingdom). It is well known that these countries' reactions to the banking and the Eurozone sovereign crises have been heterogeneous. For example, GDP and bank credit have grown at different paces: according to IMF and World Bank data, average GDP growth rates since 2008 range from -1.05% (Italy) to 0.91% (United Kingdom); average bank credit growth rates over the same period range from -1.04% (Spain) to 4.93% (Germany). Overall, the impact of the two crises (particularly that of the Eurozone sovereign crisis) has been more severe in Eurozone 'periphery' economies compared with core or non-Eurozone countries (Acharya et al., 2015). Regardless of the country, it is not only firms but also sectors that have been hit by the crises with different intensity. Industry affiliation has thus become a key determinant of the level of corporate investment in Europe (Rodriguez-Palenzuela and Dees, 2016).[3]

We assess the differential impact of leverage and debt maturity structure on investment in firms in different countries and industries by employing a difference-in-difference approach. In our baseline specification, we compare firms' investment before and after the onset of the banking and the Eurozone sovereign crises as a function of leverage and debt composition, controlling for country-sector-year fixed effects, firm fixed effects, size, cash and cash flows, and an observable measure of investment opportunities (namely, sales growth). Unlike previous contributions (Barbiero et al., 2016; Kalemli-Ozcan et al., 2015), we look at firms' financial positions *prior* to the start of the crises and sort them into high-debt and low-debt groups.[4] This approach enables us to address endogeneity issues deriving from the use of a continuous difference-in-difference methodology, since variation in firms' financial positions as the crises unfold might be endogenous to unobserved variation in investment opportunities.[5]

[3] For example, one may expect firms to suffer less if they belong to less external finance-dependent sectors or to traded sectors, because these firms can, in principle, meet their financial needs with internal sources of funds or by accessing foreign capital markets when domestic credit is depressed (Duchin et al., 2010; Dell'Ariccia et al., 2008).

[4] Our approach resembles that employed by Duchin et al. (2010), but differs in that they look at the role played by cash holding on investment of large listed US firms during and after the onset of the subprime crisis.

[5] Note that leverage and maturity structure may be endogenous to investment. In theory, even if (long-term) debt creates potential incentives for underinvestment (suggestive of a negative nexus), the effect could be attenuated by the firm taking corrective action and lowering its leverage and maturity, in view of anticipated future investment opportunities.

It also allows us to estimate the differential impact of debt, as we are able to compare investment patterns of high-debt versus low-debt firms.

Our main result is that leverage exerts a strong, negative effect on the level of investment in crisis years. We also find that firms with more long-term debt invest less. These results are consistent across specifications and different sets of controls. In particular, we find heterogeneous reactions to the crisis due to different debt levels and maturity structures when sorting firms by country-specific and firm specific-characteristics.

When we split the sample by countries we find that, overall, highly leveraged firms invested less then lowly levered firms in all countries since the banking crisis, but the more so in France, Italy and Spain. The differential role played by leverage on investment is less pronounced in Germany and the United Kingdom. When we look at long-term debt, we find evidence of a negative impact on investment in France, Italy and the United Kingdom, but no effect on German and Spanish businesses. When present, the negative impact of either leverage or long-term debt is persistent over the period 2008-2014, but becomes more severe since the onset of the sovereign crisis in 2010. Interestingly, we uncover a positive role played by short-term debt in France and Italy, with firms with more short-term debt investing more (relative to firms with less short-term) in both countries. This effect is more evident in Italy, and is more pronounced during the banking crisis.

An important novel feature of our study is that we employ additional sources of identification by carrying out cross-sectional analyses based on firm-level measures of dependence on internal and external sources of financing. Because we cannot distinguish debt by type due to lack of data, we first look at size to capture bank-dependent borrowers. Considering the occurrence of large shocks to the banking system in Europe since the global financial crisis, we expect bank-dependent borrowers (namely, smaller firms) to have reduced investment by more due to greater financial constraints. We find that small firms (1) with more leverage and (2) with more long-term debt cut back investment by more than small companies with less leverage and with less long-term debt. The discrepancy between highly leveraged (with more long-term debt) and lowly leveraged (with less long-term debt) medium-to-large firms is less pronounced. We interpret this finding as evidence of a credit channel effect. To shed light on the effect of bank credit, we then split our sample into firms with a single bank relationship and those with multiple bank relationships. We find, in particular, that multi-banking in times of crisis may be beneficial in shielding investment in highly indebted firms. We argue that this result can be explained by the fact that firms with multiple bank relationships are better able to compensate credit constraints through substitution across banks (Detragiache et al., 2000).

When we account for firms' ability to tap capital markets, we find that accessibility to bond markets does not mitigate the negative role of leverage and long-term debt on investment in crisis years. It appears that

even if firms could in principle make up for a decline in bank lending by borrowing on the bond market (Adrian et al., 2011), these funds are not used to increase capital expenditures, or are only partially used to do so. Instead, we find no impact of indebtedness on investment in listed firms. The effect of long-term debt on firms' investment is even stronger if these firms are able to access capital markets.

Trade credit is an important source of borrowing, especially for small firms. In principle, during monetary policy shocks or business downturns when bank credit becomes constrained, trade credit can provide access to capital for firms that might be unable to find funding through more traditional channels (Petersen and Rajan, 1997; Carbò-Valverde et al., 2016). To account for this effect, we differentiate firms according to their level of trade debt over total debt. We find evidence of the opposite phenomenon, that is, a high level of trade credit seems to amplify the negative effect of leverage and long-term debt on investment.

Finally, following Duchin et al. (2010), we explore the role played by cash and cash flows by measuring firms' ability to alleviate financial constraints by using only internal funds. To understand whether greater (pre-crisis) internal funds mitigate the negative impact of debt on investment in crisis years, we differentiate firms by cash holdings and cash flow. Contrary to previous evidence (Duchin et al. 2010), we find that firms with high leverage and high cash holdings cut back on investment during a crisis by more than firms with high leverage and low cash holdings. This finding is not surprising, since in times of high uncertainty cash can serve not only as a financial buffer against liquidity shocks, but also as portfolio choice, replacing fixed investment (Rodriguez-Palenzuela and Dees, 2016). Finally, we find evidence of a positive impact of cash flows in relaxing financial constraints and mitigating the negative impact on investment of both high leverage and high long-term debt.

Our research provides new evidence on the relationship between financial leverage and investment. While most of the extant literature that links financial structure to investment is focused on large and listed US firms, our sample consists of European large and small and medium-sized enterprises (SMEs), both listed and unlisted.[6] This enables us to capture the differential role played by financial constraints on corporate investment and to exploit the heterogeneity across firms arising from a reliance on different sources of funding. It also contributes to the literature on the real effect of financial crises (Dell'Ariccia et al., 2008; Duchin et al., 2010; Buca and Vermeulen, 2015). In particular, we extend the recent literature on the effect of the debt overhang in Europe (Barbiero et al., 2016; Kalemli-Ozcan et al., 2015) along several important dimensions pertaining to the empirical methodology, including (i) the treatment of problems of endogeneity in the relationship between investment and leverage, and (ii) the introduction of various specifications to explore the role of different sources of financing, conditional on the firms' pre-crisis level of debt. We also complement the literature on multiple relationship banking, providing new

[6] Recently, Barbiero et al. (2016) and Kalemli-Ozcan et al. (2015) have looked at a pan-European firm dataset.

evidence of a positive effect of multi-banking in the context of reduced credit supply, when reliance on a single bank may increase a firm's financial constraints.

This study carries important policy implications. First, we find evidence of vicious feedback loops between investment and weak balance sheets, and we then document different investment patterns in firms with different access to alternative sources of funding. In highlighting the strain posed by leverage on investment, our findings point to the need for more effective institutional frameworks, especially in Eurozone periphery countries, to prevent the build-up of new imbalances. These include initiatives to enhance governance and transparency and tax policy measures to limit debt bias and other distortions in the corporate sector (Goretti and Souto, 2013). Overall, our research confirms the relevance of flexibility in the financial system (De Fiore and Uhlig, 2015) and calls for measures to promote firms' access to capital markets, especially measures targeted at SMEs. In this context, our results reinforce the evidence underpinning the plan for the Capital Markets Union recently released by the European Commission to mobilise capital in Europe (European Commission, 2016).

The structure of the paper is as follows. Section 2 presents some stylised aggregate facts on European firms' performance over 2005-2014. Section 3 briefly reviews the main related literature and develops our main hypotheses. In Section 4 we first describe the data and statistics to highlight the considerable cross-sectional and times series variation present in our firm-level data, and then illustrate our empirical strategy and present our results. Section 5 concludes.

2. Stylised facts on European firms

This section provides some stylised facts about European firms' performance over 2005-2014. We gathered together balance-sheet data to compare financial structure, profit margins and investment decisions of firms in five European countries. Overall, we are considering a period of time characterised by subdued growth, low investment, increasing financial constraints and declining profitability.

For each country, non-financial companies in the sample have been classified into four classes and four different sectors and, only for manufacturing and services, into major sub-sectors.[7]

[7] The four sectors are manufacturing, energy, construction (and real estate) and services (excluding agriculture, finance and insurance, public administration and some services activity). For some variables, only for manufacturing and services, we consider more detailed data, identifying 16 sub-sectors: ten for manufacturing and six for services. Business sectors and sub-sectors are based on Ateco 2007 codes. The four-dimensional classes are based on turnover in 2012, and are the following: 1) small: €2-10 million, 2) medium-small: €10-50 million, 3) medium-large: €50-250 million, 4) large: over €250 million. The sample includes only annual financial statements (no consolidated statements). Indicators are identified using the median value for each cluster for country, sector or subsector and size. For higher aggregation levels, indicators are calculated as weighted average of median values; weight is turnover in 2012. At level of countries/sectors/dimension weights are based on 2012 turnover estimation according to the Eurostat Structural Business Statistics; at the country/subsector/dimension levels, weights are based on turnover of the sample firms in 2012.

2.1 Profitability

The ability of a firm to generate profits is one of the main indicators of corporate performance. It captures the extent to which a firm can compete on both domestic and international markets. Profitable firms have more opportunities to invest, create employment and boost overall economic growth, and can cope better with economic downturns such as crisis periods. Data on profitability are particularly interesting since it is highly likely that profit-constrained firms have a lower propensity to invest. We analyse firm profitability using different indicators. We report data on average profitability as well as on the first and third quartile of the underlying distribution. Next, the pattern of firm profits for firms of different sectors and size classes are presented. By comparing data across countries, we emphasise the impact of the crisis and show the different recovery patterns across the countries under study.

Profitability, measured by return on sales (ROS), is falling in all countries except the United Kingdom. Data on ROS show a significant contraction, particularly in France, Italy and Spain (Figure 1). Differences across countries have widened during the financial crisis. After starting from similar levels, by the end of the period in 2013, the five countries exhibit a remarkable dispersion (ranging from 2.1% in France to 3.3% in the United Kingdom, compared with a difference of 0.5 percentage points between top and bottom before the crisis). A possible reason for this phenomenon is that firms were willing to accept lower prices than before to maintain their levels of business activity. The decline in ROS involved all sectors and size classes. Positive signs (i.e. increases in ROS) are registered in only seven cases out of 40 observations (Figure 2). At the beginning of the period, the worst quartile of European firms reported a very low ROS, close to 1% in every country (Figure 3). The crisis reduced this indicator to 0.5% on average, and to a negative value in Spain. The upper quartile declined from a range of 7-8% at the beginning of the period to a range of 5-7% in 2013 (with only the United Kingdom registering an improved performance). A more granular analysis reveals that the bottom decile was already below zero in 2007 (Figure 4). A partially different picture emerges from analysis across deciles, with the bottom decile, which was below zero at the beginning, decreasing at a faster pace (-1.3 %) than the top (-0.1 %) and median (-0.7 %) deciles, widening the gap in vulnerability of these firms.

In general, firm size is not correlated with profitability. Within countries, there are strong differences among sectors. The fall in the construction sector's profitability was highest in Spain and Italy, while in Germany and France manufacturing was the most penalised sector. The trend in ROS drives the trend of return on investment (ROI), another key measure of firm profitability. Rotation of invested capital (sales/total assets) was relatively constant over the whole period (Figure 5), but with strong structural differences across countries.

2.2 Investment

Long-term economic growth has been closely associated with a steady increase in stocks of capital. Over the last decade, aggregate data reveal that the crisis period caused a historically unprecedented collapse

in fixed capital investment in the European Union. Balance-sheet data from our sample confirm the overall decline in investment after the two crises. Indeed, investment in fixed assets declined over the period, in line with the trend observed in all countries at the aggregate level. This decline can be seen in the percentage of capital stock (Figure 6). The two most dramatic scenarios were recorded in Spain and Italy (almost -6% in both countries), in particular in the construction and service sectors (Figure 7), although the fall in investment in the other sectors reached at least -4%. Investment in Germany and United Kingdom was less affected by the crisis, but in these countries there are also differences between sectors and firms. Top investors – i.e. firms in the top 25% of the distribution of the investment to fixed asset ratio (I/K) – reduced investment at a faster pace (Figure 6): in 2013 the I/K value is closer to the median (24% versus 12%) than it was in 2007 (30% versus 15%). Industry (except energy) showed the most moderate fall (-3.4%), but its absolute level is still the lowest among the main sectors.

In detail, at the level of manufacturing sub-sectors (Figure 8), the sharp fall in investment in Spain involved almost all sectors, but it was more pronounced in the pharmaceutical sector (from a high level of investment at the beginning of the period), in the intermediate goods sector and in furniture. Automotive was the only exception, with a value of I/K at the end of the period slightly above the 2007-2008 average (peak years for the investment in this sector). In Italy, the fall in investment involved the metal supply chain, the electromechanical sector and the construction products sector; in contrast, the I/K value almost maintained its level in the pharmaceutical sector. In France and the United Kingdom, investment in manufacturing fell at a lower rate. In France, the decline in investment was due above all to the construction supply chain, the automotive sector – given the sharp drop of sectoral turnover and the low level of profitability – and the pharmaceutical sector (exclusively due to a 2013 value below the 10-year average). In Germany, the strong decrease in the I/K value also involved traditional sectors of German manufacturing such as the electromechanical sector and the metal value chain, pointing to productive overcapacity and weak demand expectations as the main barriers to investment. Investment remained constant in the sample of British firms, thanks to increasing investment in automotive, chemical products, food & beverage and furniture; investment fell in non-metal mineral products, fashion and pharmaceutical products.

Turning to services (Figure 9), Spanish firms showed the strongest reduction in the I/K value in all analysed sub-sectors, reaching very low levels in business services, wholesale, transport and household services in 2012-2013. In Italy, the decrease in investment has been widespread across all services sectors. In the five countries analysed, firms providing ICT services maintained a higher level of investment than those in the other tertiary sectors, despite a decrease from the beginning of the period. The only exception was the strengthening of investment between the two sub-periods in the retail trade in United Kingdom.

2.3 Financial structure and debt sustainability

The data show wide differences among countries in terms of financial structure and composition of liabilities. Across the five countries, aggregate data show that financial imbalances (as measured by the difference between financial liabilities and financial assets to total liabilities) are decreasing (Figure 10). Looking at the median, from a position of net borrower in 2007-2008, Italy has almost reached an equilibrium between financial liabilities and assets in 2013; Germany experienced the same trend, but starting from a position of net lender. French data show a substantial stability in its net lender position between 2007 and 2013, while Spain started as a net borrower at the beginning of the period and became recently a net lender. This dramatic fall in the indicator was largely driven by the construction sector, which experienced a shortage of bank loans. UK data are not consistent because of a strong bias in the *Other Financial Activities* item. The gap between the first and the third quartile does not change during the whole period in any of the countries, because of the reduction of imbalances for net borrower firms and an increasing position of net lender firms. This stylised fact might point to the existence of internal capital markets in Europe.

As far as debt composition is concerned, there are no relevant changes over the whole period. The idiosyncratic nature of the financial structure of European companies is confirmed (Figure 11). Germany is characterised by a high level of capital and of long-term financial debt. Italian and French firms rely more on trade credit and short-term debt. UK firms, who tend to finance their business through short-term debt, have gradually reduced their leverage (increased their net worth), especially at the expense of long-term borrowing. Spain's firms across the board appear to be more capitalised than their peers in other countries, with no relevant changes in their financial structure over the whole period.

The net financial position (NFP) – i.e. the total amount of debt net of cash holdings – over EBITDA[8] is a measure of debt overhang and can be interpreted as the number of years to repay debt with current cash flows. Differences across countries for the whole sample (median levels) are more important than changes over the period (Figure 12). In 2013 Germany and France show significantly lower levels (around 2.5) than Spain, Italy and the United Kingdom (4.5, 4.2 and 3.6, respectively). Looking at the third quartile (Figure 12), Germany shows the lowest (and a stable) value at below 6, which means that EBITDA is about 16 % of the NFP. France and Spain end up with values around 15 (more than twice their initial levels), revealing a wide area of financial vulnerability, while in Italy the worsening was moderate (from 6.4 to 9.4). Only in the United Kingdom are there much better conditions in 2013 than at the beginning of the period, because of better trends for turnover and EBITDA. As for the ability to serve debt (specifically, to cover interest expenses with operating income), Italian and Spanish firms are the most vulnerable, although the amount of interest expenses over EBIT has decreased significantly since 2007-2008 (Figure 13).

Summarising, the main stylised facts emerging from our analysis are the following:

[8] EBITDA: earnings before interest, tax, depreciation and amortisation.

1) Profitability of firms, as measured by ROS, shows a high variability across sectors and countries. ROS has fallen in all countries except the United Kingdom, and differences across countries have widened. The decline in ROS has involved all sectors and size classes, although firm size is not correlated with profitability. Within countries, there are strong differences among sectors: the fall in profitability was highest in the construction sector in Spain and Italy, while in Germany and France industry was the most penalised sector.
2) Investment in fixed assets declined over the period, in line with the trend observed in all countries at the aggregate level. The two most dramatic scenarios were recorded in Spain and Italy, in particular for the construction and service sectors. The United Kingdom shows a different trend, with constant investment in fixed assets. The fall in fixed asset investment has been heterogeneous across sectors, with industry (except energy) experiencing the most moderate fall.
3) Financial imbalances have decreased in all countries, suggesting the existence of internal capital markets in Europe.
4) The financial structure of European firms is idiosyncratic, with wide differences across countries in terms of composition of liabilities and no relevant changes over the period 2007-2013. Data on financial structure and debt sustainability suggest the existence of an area of vulnerability that depresses investment.
5) On average, SMEs are the segment of firms that has suffered most across all countries.

In following sections, we explore the relation between debt structure and investment to understand to what extent leverage (i.e. low net worth) and maturity of corporate debt are major factors weakening firms' balance- sheet.

3. Debt and investment: Main literature and hypothesis development

A central and highly debated issue in corporate finance is the nexus between debt and investment. [9] In a Modigliani-Miller setting, the market value of a firm should be independent of its capital structure and, as a result, the firm's investment decisions should be unaffected by the type of security used to finance it (Modigliani and Miller, 1958). However, in the presence of market frictions arising, for example, from asymmetric information between external investors and company managers, firms' capital structure would increasingly deviate from a well-defined leverage target at least in the short term, with firms favouring internal over external financing, and debt over equity (the 'pecking order theory'). [10]

[9] See Dang (2011) for a comprehensive literature review on leverage, debt maturity and investment.

[10] These agency models clearly show that the conflicts of interest among managers, shareholders and debt-holders over the exercise of investment will create potential underinvestment and overinvestment incentives, in which corporate financing and investment decisions become interrelated.

The theoretical motivation behind this view is that asymmetric information makes it costly for investors to monitor managers that in principle may use borrowed resources inefficiently. Lenders require a higher return as a compensation for the possibility that the managers are wasting resources. Internal funds are therefore cheaper at the margin than external funds. It follows, *ceteris paribus*, that firms with plenty of internal resources tend to invest more and hence, an overinvestment issue may arise. Moreover, it seems that highly levered firms are less likely to exploit valuable growth opportunities compared low leveraged firms due to the agency cost of outstanding debt (Myers 1977). The manager-shareholder coalition in control of a firm with high-growth opportunities might pass up positive net present value projects, and give rise to an underinvestment problem, because with risky debt, managers and shareholders do not receive the payoff of such projects in full, as payoff partially accrues to the debt-holders. Alternatively, Jensen (1986) and Stulz (1990) argue that in low-growth firms with large free cash flows, leverage is a disciplining device because it discourages managers from overinvesting in risky projects and/or avoids the empire building phenomenon (Stulz 1990).[11] Leverage is thus one mechanism for overcoming the overinvestment problem suggesting a negative relationship between debt and investment for firms with weak growth opportunities (Aivazian et al. 2005).

These underinvestment incentives can be alleviated, however, if the firm reduces leverage and/or shortens the debt maturity (Myers, 1977). The main hypothesis is that the impact of growth opportunities on leverage (or maturity) is conditional on debt maturity (or leverage). Maturity matters because, by using short-term debt that expires before an investment project, shareholders can take full advantage of the new project through renegotiation of the debt contracts. In this view, leverage and maturity are considered substitutes to mitigate the underinvestment problem. Hence, firms using short-term debt to control the underinvestment problem have less incentive to lower leverage, as well as firms that can sufficiently control underinvestment by decreasing leverage will have less incentive to use short-term debt.

The liquidity risk hypothesis (Diamond 1991; Sharpe 1991) has important implications for the nexus among leverage, debt maturity and growth. An excess of short-term debt creates significant liquidity risk as firms may not be able to roll over the (short-term) outstanding debt. Likewise, when the cost of the liquidity risk associated with short-term debt is higher than the reduced cost of underinvestment, firms will have less incentive to shorten their debt maturity. Overall, transaction costs and liquidity risk may constrain firms in fully adjusting their leverage and debt maturity, resulting in underinvestment ex post.

Furthermore, when growth opportunities are not anticipated sufficiently early and completely, there is even less scope for alleviating underinvestment incentives (Aivazian et al. 2005). Because a quick renegotiation with the debt-holders is costly, these increased transaction costs will prevent firms from adjusting leverage and debt maturity. Hence, firms with a high leverage ratio and/or a long-term debt maturity ex ante will be likely to forgo valuable growth opportunities, pointing to a negative impact of leverage and debt maturity

[11] Debt serves as a protection mechanism against overinvestment, because free cash flow that can be used for personal benefits of the managers should be paid to bondholders in the form of interest. Unlike dividends the interest payments are mandatory and not paying them leads to default and eventually bankruptcy

on ex post investment levels.

In sum, motivated by the main related literature, we highlight the following key points:

(1) Higher debt gives rise to an underinvestment problem that can be mitigated if growth opportunities are fully recognised and if leverage can be restructured ex-ante.

(2) Longer term maturity gives rise to an underinvestment problem that can be mitigated if the debt maturity can be easily lowered in view of future investment opportunities. On the other hand, it reduces the liquidity (rollover risk) associated with shorter-term debt.

(3) Overall, renegotiation and transaction costs as well as liquidity risk may constrain firms from fully adjusting their leverage and debt maturity structure, resulting in underinvestment ex post.

All of the above points lead to our main hypothesis. We expect uncertainty and lenders' constraints to increase in the run-up to crisis years (Banerjee et al. 2015). The scenario of uncertainty makes it difficult to anticipate investment opportunity and restructuring debt (i.e. lowering the debt overhang and shortening the debt maturity), which gives rise to underinvestment problems associated to either high leverage or high long-term debt.

4. Debt and investment in crisis and post-crisis years: An econometric analysis

4.1 Data sources

To investigate the nexus between corporate debt and investment in Europe, we combine data from three databases lining up yearly information on balance-sheet items for firms in our selected countries. Firms' balance-sheet information and income statements, as well as information about each company's shareholders, come from the ORBIS dataset provided by Bureau van Dijk (BvD). ORBIS is a commercial dataset that contains administrative data covering around 130 million firms worldwide. We use financial and balance-sheet information collected by local Chambers of Commerce and in turn, relate them to ORBIS through about 40 different information providers, including official business registers. The main feature of this dataset is that about 99% of the companies are private (fewer than 2% of the firms are publicly listed). We complement balance-sheet indicators with individual bond issuance drawn from Thomson Reuters. Finally, we use the "Banker" variable in ORBIS to determine each firm's bank relationship, and we use Bankscope to explore heterogeneity in the balance-sheet strength of each firm's bank. This variable allows us to capture firm-bank linkages, but unfortunately only at one specific date, namely, the last available account date. Our hypothesis is that firm-bank relationships are long-term connections and did not change after the crisis hit.

We start with the ORBIS database, taking companies with financial data over the period 2005–2014 and working with unconsolidated accounts. Our sample comprises 3,108,918 firm-year observations, corresponding to a total of 514,287 firms from France (27.87%), Germany (17.67%), Italy (28.33%),

Spain (17.29%) and the United Kingdom (8.84%). The sample is mainly composed of SMEs with sales turnover greater than 2 million euros, operating in the following industries: construction (16.4%), energy (2%), manufacturing (24.75%) and services (56.79%).

We use the following variables: total assets, tangible fixed assets, total debt, long-term debt, short-term debt, trade payable, cash, EBITDA, sales and interest expenses. We check their consistency and drop inconsistent firm-year observations. Our consistency checks ensure that balance-sheet identities hold within a small margin and entries are meaningful from an accounting point of view. We use real variables expressed in 2010 prices (millions of euros) and deflated using a GDP deflator. All variables are winsorised at the 1% level.

We also collect data from Thomson on all firms' bond issuances over 1996-2014 to determine whether a firm has access to the bond market. This dataset provides information on bonds issued by 1,498 firms over this period (corresponding to 3% of the ORBIS dataset). We aggregate bond-level information at the firm level by computing the number of bond issuances by each firm, and the number of bonds issued by each firm before 2008. The average firm in Thomson issued four bonds before the onset of the financial crisis. Then, we merge this information with our master ORBIS database using the full name of the firms as the key variable. We assign to our firms in ORBIS a dummy variable indicating whether the firm and/or any of its parents issued bonds at least once before 2008. Merging using the full name allows us to perfectly match 129,276 firm-year observations (4% of the ORBIS database). This match rate is very high for this type of analysis if we consider that (i) no fuzzy procedures are used to keep the match, and (ii) the entire sample of Thomson Reuters is only 3% of the ORBIS dataset.

Main variables and descriptive statistics

Table 1 provides the definition and descriptive statistics of all variables, including our dependent variable, i.e. the investment-to-capital ratio (Investment/Capital). We measure investment in real capital expenditures on a net basis as the percentage of lagged capital stock. In the empirical literature, investment is measured on either a gross or net basis. Using net investment carries a few advantages. First, this is a pure measure, not influenced by the depreciation of capital equipment (the gross investment rate is computed as net investment *plus* the depreciation rate). An additional advantage is that we do not lose observations that otherwise would be lost due to missing data on depreciation. While the sample mean of Investment/Capital is 19.97% over 2005-2014, it varies significantly across firms, with a 25th percentile of 16.66% and a 75th percentile of 12.52%. Figure 14 shows that it declines over the crisis years from 25% to 12% in 2013.

Our leverage indicator is the debt-to-assets ratio (Debt/Assets), where the numerator is the sum of long-term debt,[12] loans, credit and other current liabilities. On average, firms' leverage ratio is 70%, with a top

[12] This is a proxy of long-term (over one-year maturity) financial liabilities held by the firm. Note that this measure does not include provisions.

75th percentile close to 90% (Table 1). Debt composition also varies markedly across firms, with 25% of firms in our sample showing no long-term debt among their total debt. Short-term debt includes current liabilities (e.g. bank loans) and is net of trade debt and non-financial short-term liabilities.[13] Trade debt is the component of the short-term debt attributable to trade payables. Trade credit is an important source of borrowing, especially for small firms, and one that in principle can provide access to alternative sources when bank credit is constrained (Petersen and Rajan, 1997; Carbò-Valverde et al., 2016).[14] Unfortunately, the ORBIS dataset does not break down debt by type of lender, so we cannot account for the amount of bank debt held by firms.

In our analysis, we include variables that are standard in the literature on investment. We look at size in terms of Log (Assets) and variable sales growth (the annual percentage change in sales) as an indicator of firms' growth opportunities. We consider size because we expect firms to react differently to a crisis according to the scale of their business. For example, small firms, which are often dependent mainly on bank debt, are expected to suffer more during a banking crisis, consistent with the hypothesis that a banking channel is in operation (Dell'Ariccia et al., 2008; Duchin et al., 2010; Acharya et al., 2016). To account for firms' ability to generate internal source of funds, we look at cash (the ratio of cash holdings to total assets) and cash flows (EBITDA over total assets). The literature on the role of corporate demand for cash shows the precautionary benefits of cash holdings when credit is tighter and firms are financially constrained and run the risk of underinvestment in future states of the world (Almeida et al., 2004; Acharya et al., 2007). Several contributions (e.g., Fazzari et al., 1988) also emphasise the fact that investment is highly correlated with cash flows. A possible explanation for this nexus is that a shock to current earnings affects future net worth and thus the term of credit available to the firms; or simply, investment is directly tied to available internal funds in the case of credit rationing (Gilchrist and Himmelberg, 1995).[15]

We then use a set of additional control variables (together with sales growth, firm size and cash flows) to explore the idea that factors increasing firms' ability to obtain external funding may also increase investment when access to credit is imperfect. We introduce a measure of debt overhang (i.e. the ratio of net debt to EBITDA (Kalemli-Ozcan et al., 2015)), the ratio of EBITDA to interest coverage to account for a company's ability to meet its interest expenses, and a measure of asset tangibility (the ratio of tangible assets to total assets). In particular, tangible assets may serve as support for financially constrained firms. Hence, their differential effect on investment at the onset of the crisis might be

[13] Precisely, ORBIS defines "current" liabilities as the following items: creditors (trade debt), loans (including bank loans), and other current liabilities (taxes payables and accrued expenses). Hence, our indicator of short-term debt corresponds to the "loans" category according to the ORBIS definition. Our indicator of trade debt corresponds to the item "creditors" in ORBIS.

[14] Beck et al. (2008) find that in most countries, trade credit represents the second-most important source of external finance after bank credit.

[15] Because cash flows can be used for several purposes (Lewellen and Lewellen, 2014), a different relationship is also possible. For example, it is plausible that in times of high uncertainty, instead of investing in physical assets, firms may want to use cash flow for purposes (Rodriguez-Palenzuela and Dees, 2016).

appreciable (Almeida and Campello, 2007).[16]

The annual change in net fixed tangible assets over capital has been negative, on average, for most of the firms in the sample (the median value is -4.5%), confirming the stylised fact that investment in fixed assets declined over the period almost everywhere (with the exception of the United Kingdom). We capture profitability by computing sales growth and the ratio of EBITDA to interest expenses. EBITDA over interest expenses (i.e. the ratio of EBITDA to interest coverage) is commonly computed to assess a firm's financial strength by examining whether it is profitable enough to pay off its funding costs – a ratio lower than one means that a company cannot meet its interest payments. Alternatively, financial strength can be measured in terms of the number of years that a firm can sustain that interest expense. In our sample, the mean value is high at around 35 years, while the median is about 7 years. The median value of sales' growth rate is less than one, in line with the decline of firms' profitability over the same period.[17]

Looking at some sample characteristics, firms appear to be similar in size, since total assets (in Log) do not vary significantly within the sample. As for the financial structure of firms, funding in the average firm is composed of almost 18% long-term debt (above one-year maturity) and 12% short-term debt (below one-year maturity). On average, the most prevalent source of financing in European firms is trade debt (around 36% of total debt). As far as internal sources of funds are concerned, cash holdings and cash flows (proxied by EBITDA) as a percentage of total assets average nearly 13% and 9%, respectively. There is, however, remarkable variance within the sample, as shown by the large gap between the top and the bottom 25% of firms for both variables.

4.2 Baseline specification

To analyse the impact of debt during financial and sovereign crisis on corporate investment, we employ a difference-in-differences approach. Specifically, we compare investment before and after the onset of the financial crisis as a function of firms' leverage level and debt composition, and dependence on external and internal finance. We control for firm fixed effects, country-industry-year fixed effects, and observable measures of size and investment opportunities (sales growth and cash flow). Following much of the investment literature, our analysis measures investment in real capital expenditures as the annual percentage change in fixed tangible assets. We are mostly interested in studying the role of firms' debt positions in either mitigating or worsening the impact and the persistence of the crisis on investment. The main challenge in addressing this research question is dealing with the endogeneity issue. Inferences may be confounded by the potential endogeneity of a firm's leverage position. Because unobservable changes in the investment rate as the crisis unfolds may lead to higher indebtedness, we clean our specifications of

[16] Asset tangibility is important for the real decisions of financially constrained firms in several respects. Tangibility increases the value that can be captured by creditors in default states, reduces firms' incentives to default strategically, can be used as a screening device in environments with asymmetric information, and so on.

[17] Unreported data show that over 2006-2013, turnover decreased across sectors (with the exception of the energy industry), especially for SMEs. Return on sales dropped in all countries except the United Kingdom, regardless of the sector and firm size.

this variation by measuring firms' leverage position in the pre-crisis period, specifically over 2006-2007. Thus, our empirical approach is similar to an instrumental variables approach in which the identifying assumption is that firms' debt position before the financial crisis is not correlated with unobserved within-firm changes in the investment rate following the onset of the crisis (Duchin et al., 2010).[18] We estimate the following regression model:

$$IK_{jcit} = \beta_0 TotDebt_{jci} \times Post_t + \beta_1 LongTermDebt_{jci} \times Post_t + \beta_2 ShortTermDebt_{jci} \times Post_t + \boldsymbol{X}'_{cit-1}\varphi + \mu_{cit} + \varepsilon_{jcit} \quad (1)$$

where α_j are firm fixed effects and μ_{cit} are country-industry-year fixed effects. The dependent variable *IK* denotes investment as a percentage of capital (change in tangible assets as a percentage of lagged tangible assets). $\boldsymbol{X}_{jcit}$ is a vector of control variables including, in different combinations, the lagged dependent variable, sales growth (annual percentage change in sales revenues), firm size (measured as Log of assets), cash flows (measured as ratio of EBITDA to assets), the ratio of total debt to assets, the ratio of long-term debt to total debt, and the ratio of short-term debt to total debt. $TotDebt_{jci}$ is a time-invariant dummy variable equal to 1 if the firm is high leveraged in the pre-crisis period and zero otherwise. Specifically, we consider a firm to be high leveraged if it is in the top 50% of the total debt-to-asset ratio distribution before 2008. $LongTermDebt$ and $ShortTermDebt$ are time-invariant dummies equal to 1 if the firm is has a high level of long-term (short-term) debt in the pre-crisis period and zero otherwise. Specifically, we consider a firm to be a have a high level of long-term (short-term) debt if it is in the top 50% of the distribution for the ratio of long-term (short-term) debt to total debt before 2008. We compute the median for each of these treatment variables within country and industry.

Table 2 presents estimates from our base specification (1). Column 1, which does not include any control for firm time-variant characteristics, establishes the basic pattern in the data. It shows that the decline in annual investment as a fraction of lagged capital stock is substantially greater for firms that were highly leveraged over the two years before the onset of the crisis. The coefficient estimates imply a 9% greater decline in investment for a firm with high leverage relative to firms with low leverage (measured as an indicator variable prior to the onset of the crisis). Column 1 also shows that firms with high levels of long-term debt make less investment relative to firms with less long-term debt, while the opposite is true for short-term debt. In Column 2 we add as a control the lagged dependent variable – the size of the main coefficients is reduced, but remains economically and statistically significant. The economic magnitude of the effect from leverage is sizable, ranging from 52% to 40% if we compare columns 1 and 2.

[18] According to Aivazian et al. (2005a), leverage can be optimally reduced by management ex ante in view of projected valuable ex post growth opportunities, so that its impact on growth is attenuated. Thus, a negative empirical relationship between leverage and growth may arise even in regressions that control for growth opportunities because managers reduce leverage in anticipation of future investment opportunities. Leverage simply signals management's information about investment opportunities. The authors refer to the possibility that leverage might proxy for growth opportunities as the endogeneity problem.

Columns 3 and 4 of Table 2 show that the results on leverage and long-term debt are stable if we control for additional firm-level observable factors. Column 3 includes standard controls for growth opportunities, firm size and gross profitability (cash flows). In Column 4 we further control for continuous, one-year lagged leverage and debt composition. The estimated coefficients on the interactions between our 'treatment' variables and Post are unchanged and statistically significant. The estimates in column 4 imply that investment declines by around 7 percentage points more in high leveraged firms relative to low leveraged firms after 2008, and this effect is statistically and economically significant (46% of the average dependent variable). Additionally, high long-term debt implies that investment decreases by 12 percentage points more in treated firms relative to control group firms.

The definition of our treatment dummies in the pre-crisis period helps to deal with the endogeneity issue, and it is developed on the hypothesis that the distribution of the ratio of total debt to assets (as well as the ratios of long-term and short-term debt to total debt) is stable over time, and after the crisis shock. In order to properly interpret the effect of our treatment variables in the short-run versus long-run periods, we split the post-financial crisis years into three different periods, and we split the time dummy *Post* into three time dummies: *BankingCrisis* is equal to one in 2008 and 2009 and zero otherwise, *SovereignCrisis* is equal to one in the period 2010-2012 and zero otherwise, and the *Post2012* dummy indicates the period after 2012. As in the main specification, we interact each of these time dummies with our treatment dummy variables. This approach allows us to capture the precise impact of total indebtedness (and long-term *vis-à-vis* short-term debt component) on investment opportunities during the financial crisis, and the persistence of this impact during and after the sovereign crisis.

Table 3 shows that the negative impact of both leverage or long-term debt is persistent over 2008-2014, but becomes more severe after the onset of the sovereign crisis.

To better investigate whether these results are driven by country-specifics, we replicate the main strategy by country and include industry-year fixed effects. The results in Table 4 show that, overall, highly leveraged firms invested less than less-leveraged firms in all countries since the banking crisis, but more so in France, Italy, and Spain. The influence of leverage on investment is less pronounced in Germany and the United Kingdom. When we look at long-term debt, we find evidence of a negative impact on investment in France, Italy and the United Kingdom, but no effect on German and Spanish businesses. Interestingly, we uncover a positive role played by short-term debt in France and Italy, with firms with more short-term debt investing more (relative to firms with less short-term) in both countries. The effect is more evident in Italy, and is accentuated during the banking crisis.

An important contribution of our paper is that we address the endogeneity issue by looking at leverage and debt composition prior to 2008. One concern is that taking constant the leverage position before the crisis, we do not take into account changes that may have occurred during the crisis years in a firm's debt structure. At the same time, we are interested in investigating how the leverage position at the onset of the crisis may affect the way in which a firm's investment reacts to the crisis periods, and only

considering the leverage position before 2008 can help answering our research question. Table 5 shows that our results are unclear if we use a rolling window strategy (as in Kalemli-Ozcan et al., 2015). In this case, the specification becomes:

$$\begin{aligned} IK_j = {} & \vartheta_0 TotDebt_{jcit-1} + \beta_0 TotDebt_{jcit-1} \times Post_t \\ & + \vartheta_1 LongTermDebt_{jcit-1} + \beta_1 LongTermDebt_{jcit-1} \times Post_t \\ & + \vartheta_2 ShortTermDebt_{jcit-1} + \beta_2 ShortTermDebt_{jcit-1} \times Post_t \\ & {}_j + \boldsymbol{X}'_{cit-1}\varphi + \alpha_i + \mu_{cit} + \varepsilon_{jcit} \end{aligned} \quad (2)$$

In Table 6 we report estimates from the main specification (1), using for robustness different definitions of leverage and long-term debt. We define *FinLeverage* as the part of *TotDebt* that includes only financial leverage: the sum of long-term debt (we do not include provisions and other long-term debt) and loans (short- term debt) as a percentage of assets. *LongTermDebt1* is the ratio of long-term debt to financial debt. As in the main analysis, *FinLeverage* and *LongTermDebt1* are two indicator variables equal to one if a firm is in the top 50% of the *FinLeverage* or *LongTermDebt1* distribution before 2008, respectively. Our basic results are confirmed: firms that entered the crisis period with high debt relative to assets (and with high long-term debt relative to total debt) reduced investment more than less-leveraged firms during and after the financial and sovereign debt crises. This result is confirmed controlling for time-variant firm characteristics and lagged investment.

Our difference-in-differences specification relies on the common trend assumption that we test in the data. We test whether highly leveraged and less-leveraged firms share the same trend in investment before the financial crisis. This assumption is graphically supported by Figure 15 and is formally tested by checking the statistical significance of the interaction term *TotDebt*Year* in a model where firm investment is regressed in the pre- crisis period on a linear trend, the high-leverage dummy (*TotDebt*) and the interaction term. Column 1 of Table 7 shows that the estimated coefficient of the interaction term is small and not statistically different from zero. Therefore, the parallel-trend assumption is not rejected.

4.3 The role of external and internal finance

An important and novel feature of our paper is that we employ additional sources of identification by carrying out cross-sectional analyses based on firm-level measures of dependence on internal and external sources of financing. Specifically, we consider how the effects of leverage and debt composition vary across the cross-section of firms by access to external sources of finance and reliance on internal funding. In Table 8 we consider several measures of access to external finance, all computed before 2008. Columns 1 and 2 show that highly leveraged small firms (as well as those with more long-term debt) cut back investment more in crisis years that less-leveraged small firms (as well as those with less long-term debt). We identify small and medium-to-large firms based on a threshold of €10 million turnover before

2008. The discrepancy between highly leveraged (with more long-term debt) and less-leveraged (with less long-term debt) medium-to-large firms is less pronounced. We interpret this finding as evidence of a credit channel effect. It is well known that smaller firms are commonly bank-debt dependent, especially in Europe where the corporate bond and commercial papers markets are less developed than in the United States (European Commission, 2013). Considering the occurrence of large shocks to the banking system in Europe since the global financial crisis, we expect bank-dependent borrowers to have reduced investment by more due to greater financial constraints. Our finding is suggestive indirectly of how shocks to the banking sector are propagated in the real economy (Buca and Vermeleun, 2015). To shed light on the effect of bank credit, Columns 7 and 8 in Table 8 present results for firms with a single or multiple bank relationships. There are several reasons why a firm may want to seek multiple lenders, and at the same time there may be several effects on lending and firm performance induced by single versus multiple bank relationships (Petersen and Rajan, 1994; Farinha and Santos, 2002). We find, in particular, that multi-banking in crisis times may be beneficial in shielding investment in highly indebted firms. We explain this result by the fact that firms with relationships with multiple banks are better able to compensate credit constraints through substitution across banks. This evidence is in line with Detragiache et al. (2000), who provide a rationale for a firm seeking multiple lenders by considering the cost it incurs when it is denied credit by its bank for reasons that have to do with the bank itself.

Columns 3 and 4 in Table 8 show that access to bond markets does not mitigate the negative role of leverage and long-term debt in investment in crisis years. There is no differential impact of the leverage and long-term debt components in the group of firms that issued bonds (either directly, or indirectly though their parent company) before 2008. Hence, it appears that even if firms could make up for a decline in bank lending through borrowing on the bond market (Adrian et al., 2013, these funds are not used to increase capital expenditures. Instead, in Columns 5 and 6 we find no impact of indebtedness on investment in listed firms. The effect of long-term debt on firms' investment is even stronger if these firms are, in principle, able to access the capital markets.

Next, we look at trade credit as an important source of borrowing, especially for small firms. In Columns 9 and 10, we differentiate firms according to their level of trade debt over total debt before 2008. Contrary to the previous literature (Carbò-Valverde et al., 2016), we find evidence that higher level of trade credit seems to amplify the negative effect of leverage and long-term debt on investment.

In Table 9 we present results for the effect of leverage and long-term debt on investment in firms with different internal funding opportunities. Following Duchin et al. (2010), we explore the role played by cash and cash flows to measure firms' ability to alleviate financial constraints by using internal funds. Columns 1 and 2 show that companies with high leverage and high cash holdings cut back on investment by more in crisis than firms with high leverage and low cash holding. This finding suggests that in times of high uncertainty, cash may serve not only as a financial buffer against liquidity shocks but also as a portfolio choice, replacing fixed investment (Rodriguez-Palenzuela and Dees, 2016). As expected,

results in Columns 3 and 4 show that higher cash flows have a beneficial impact, increasing firms' ability to mitigate the negative impact on investment of both high leverage and high long-term debt.

5. Conclusions

We analyse a comprehensive dataset of firms, both small and large, in five major European countries to explore the role of leverage on corporate investment over 2005-2014. This period was a boom and bust decade characterised by the lending boom of the early 2000s and two dramatic crisis episodes (the global banking crisis and the Eurozone sovereign debt crisis) from 2008 onwards. During the boom period firms increased leverage substantially, while during the crisis period they reduced investment substantially. We seek to shed light on the nexus between high debt (in the pre-crisis years) and low investment (in crisis years) by accounting for firm- and country-specific factors. In particular, we want to understand whether firms, conditional on their level of debt and its maturity structure prior to the crisis, might have taken different investment decisions in crisis years as a consequence of their differing ability to access alternative source of funds.

Our main result is that leverage exerted a strong, negative effect on the level of investment ex post, possibly due to an agency cost of debt that cannot be completely alleviated. We also find that firms with more long- term debt carried out less investment ex post. These results are consistent across specifications and different sets of controls. When we split the sample by country, we find that, overall, highly leveraged firms invested less than less-leveraged firms in all countries since the banking crisis, but more so in the 'periphery' countries (Italy and Spain) and France. Looking at long-term debt, we find evidence of a negative impact on investment in France, Italy and the United Kingdom. The negative impact of both leverage and long-term debt persisted over 2008-2014, but become more severe from the onset of the sovereign crisis.

We also uncover that firms' dependence on either internal or external sources of financing matters in explaining investment patterns of highly indebted firms. We find that leverage and long-term debt had a more severe impact on investment in small firms. This is consistent with the hypothesis that a lending channel is in operation.

Hence, more bank-dependent borrowers (such as small firms) suffered more during the crises, when bank credit shrank. We also find that multi-banking in crisis times was beneficial in shielding investment in highly indebted firms. We explain this result by fact that firms with multiple bank relationships are better able to compensate credit constraints through substitution across banks (Detragiache et al., 2000).

We also find some evidence that firms that are capable of tapping public (bond and equity) capital markets can mitigate the negative role of leverage and long-term debt on investment in crisis years. This evidence deserves further analysis and robustness checks, however, because while we find no impact of

indebtedness on investment in listed firms, the nexus between our proxy for companies' ability to issue bonds is significantly and negatively related to investment. Hence, it appears that even if firms could make up for a decline in bank lending through borrowing on the bond market (Adrian et al., 2013), these funds were not used to increase capital expenditures. Interestingly, we find a similar negative impact on investment in firms with a high level of trade debt. Finally, we uncover that high cash flows helped firms to alleviate the constraints posed by high debt. In contrast, it appears that cash holdings were not used as a financial buffer to shield investment, but as a portfolio choice replacing investment in fixed capital assets.

Overall, our analysis confirms the role played by high debt in holding back European corporate investment during the crisis years (Kalemli-Ozcan et al., 2015). It also places new emphasis on the importance of the structure of debt maturity (together with the level of debt) in influencing investment in crisis times. As hypothesised, the uncertainty of crisis times made it difficult to anticipate investment opportunities and/or to restructure debt (by either lowering the debt overhang or shortening the debt maturity). Hence, the firms that entered the crisis years with an inflexible financial structure, consisting of either high leverage or high long-term debt, were those that cut investment most.

Our findings have important policy implications. The financial constraints of highly leveraged firms can be only partially relaxed by using internal source of funds or by accessing external funds other than bank debt. This is because under uncertainty, internal funds may be retained for precautionary motives. Also, small firms are precluded from accessing capital markets, especially the equity segment. In light of this evidence, our paper points to the importance of more effective institutional frameworks, especially in periphery countries, to strengthen balance sheets by preventing the build-up of excessive leverage as well to ease deleveraging and restructuring processes (Goretti and Souto, 2013). Our findings also suggest that increasing the flexibility in financial systems (De Fiore and Uhlig, 2015) would be beneficial in that it may encourage substitution across funding sources and different segments of financial markets should particular sources dry up or turn out to be unavailable.

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Figure 1: Return on sales (measured as Ebit/turnover) by country (2006-2013)

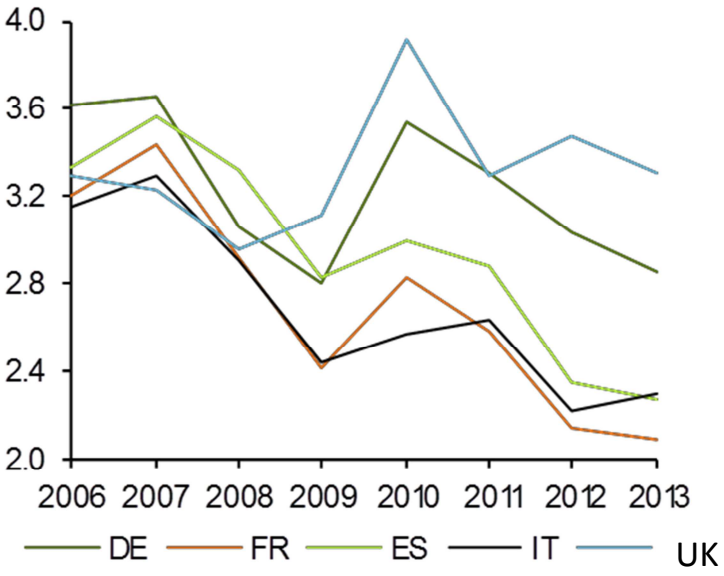
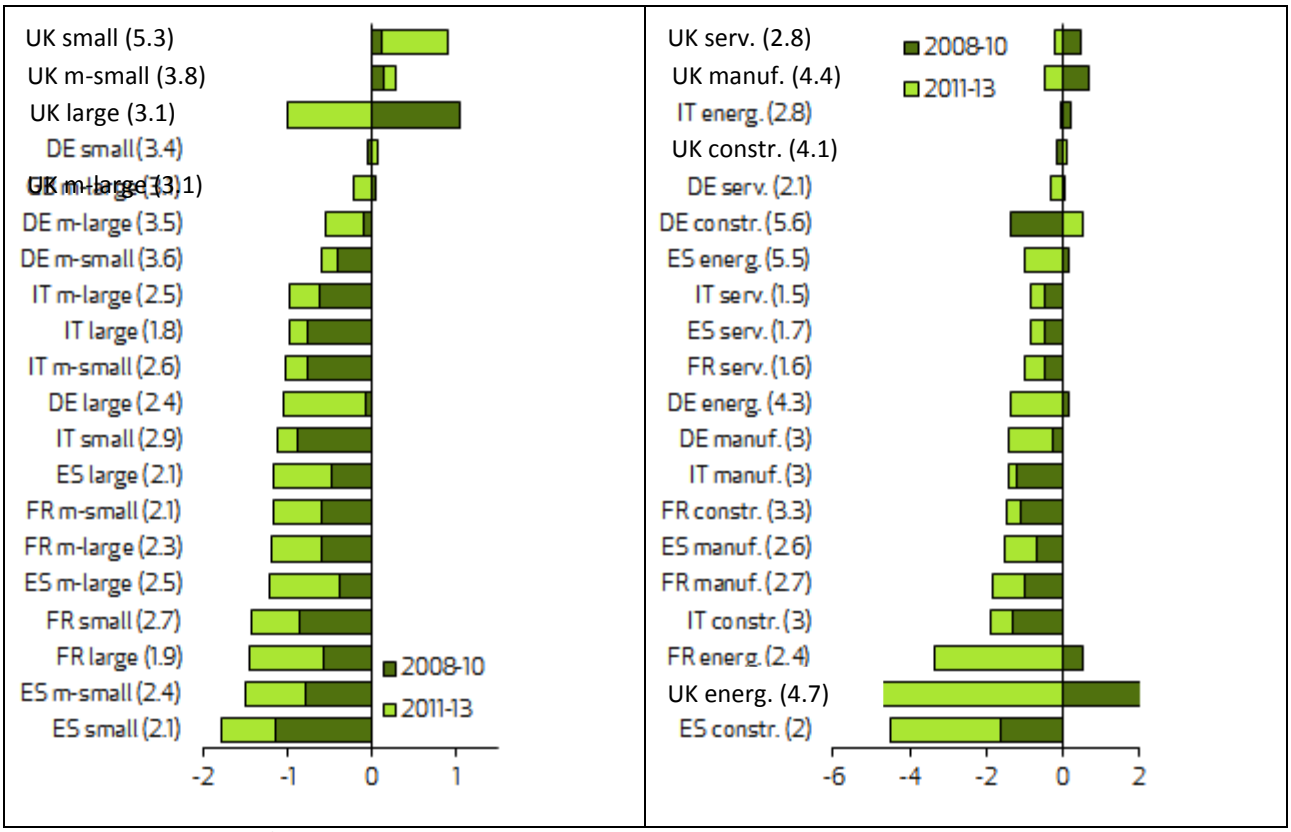


Figure 2: The variation of ROS (measured as Ebit/turnover) relative to 2007 by country, firm size, sector



Notes: value in parentheses refer to 2013.

Figure 3: 1st and 3rd quartiles of ROS by country in 2007 and 2013

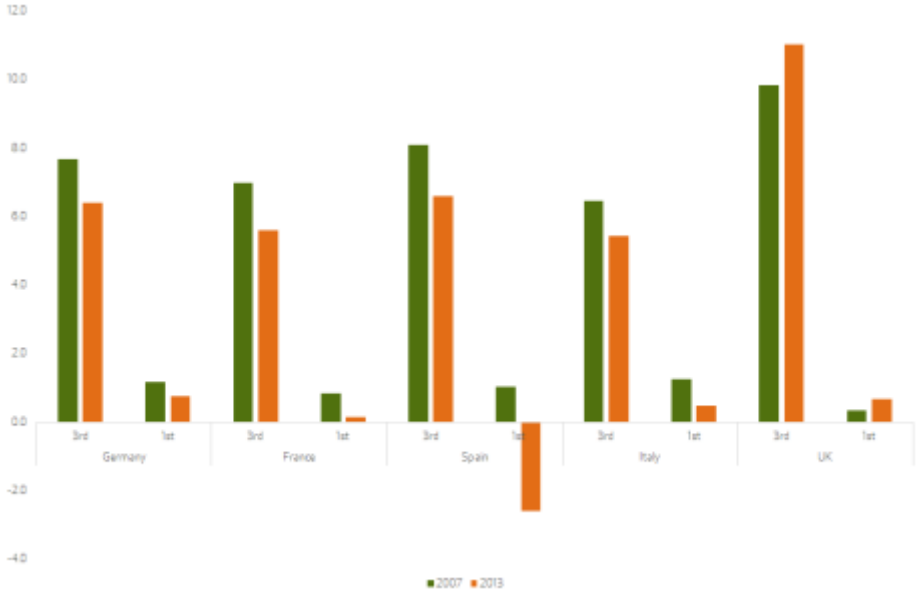


Figure 4: 10th and 90th deciles of ROS

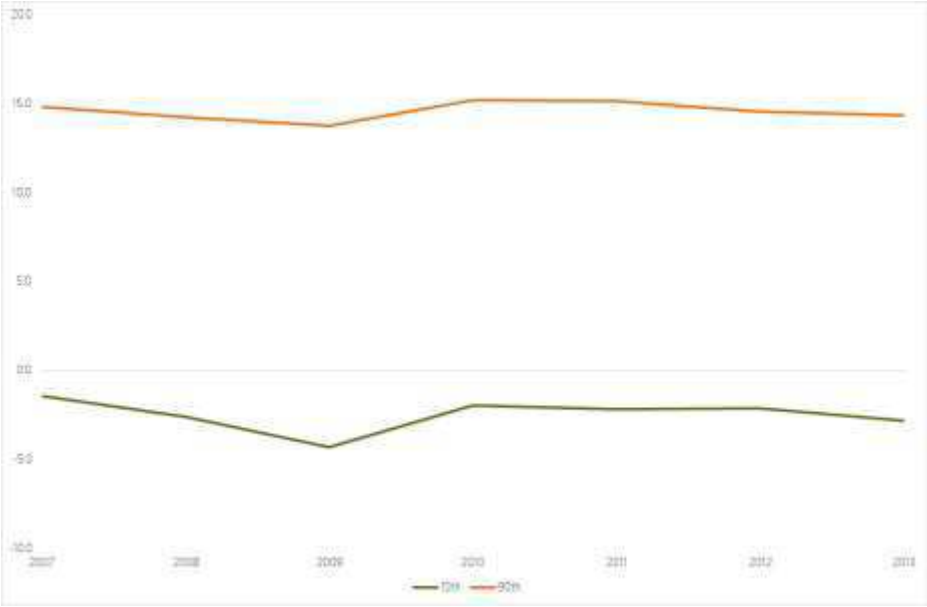


Figure 5: Capital rotation by countries

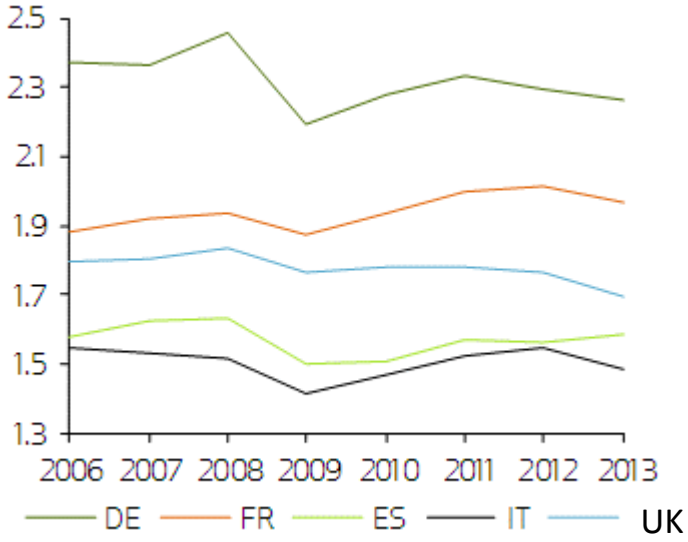
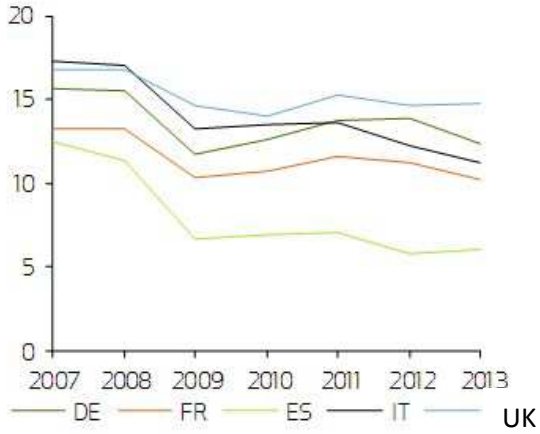


Figure 6: Fixed investment in percentage of net fixed assets by countries

Median



3rd quartile

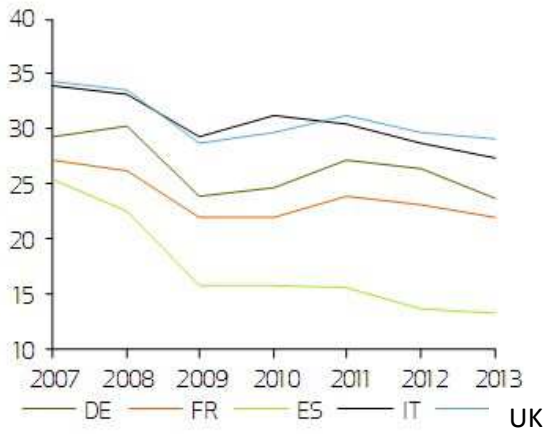


Figure 7: Fixed investment in percentage of net fixed assets by sector and country: variation between 2007-2008 and 2012-2013 on the median values

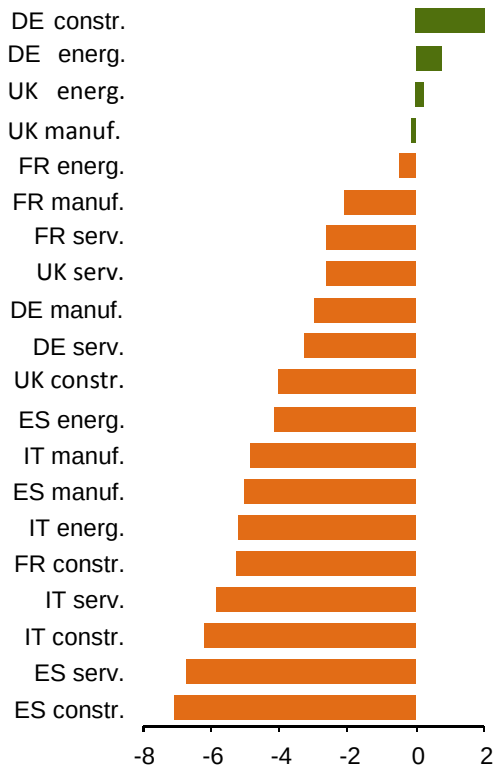
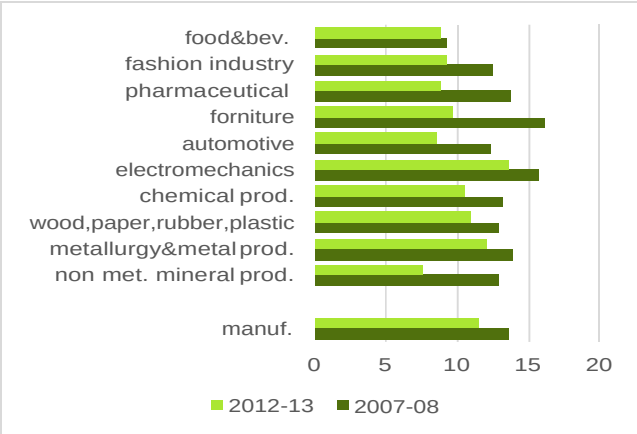


Figure 8: Fixed investment in percentage of net fixed assets by manufacturing sub-sectors and country (median)

Germany

France



Spain

Italy

UK

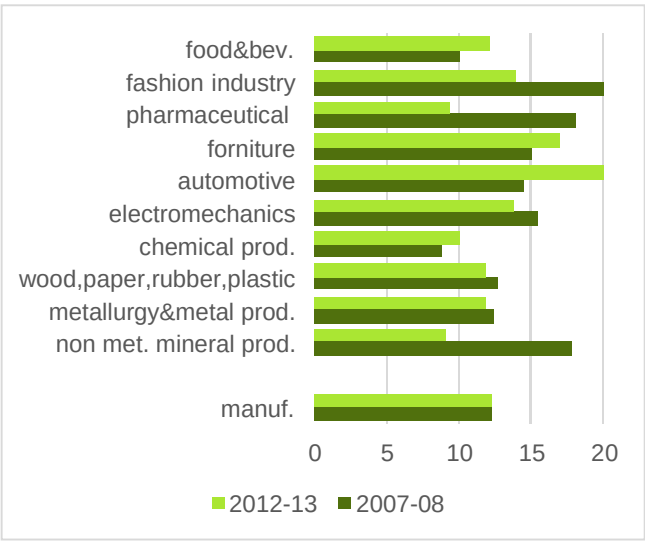
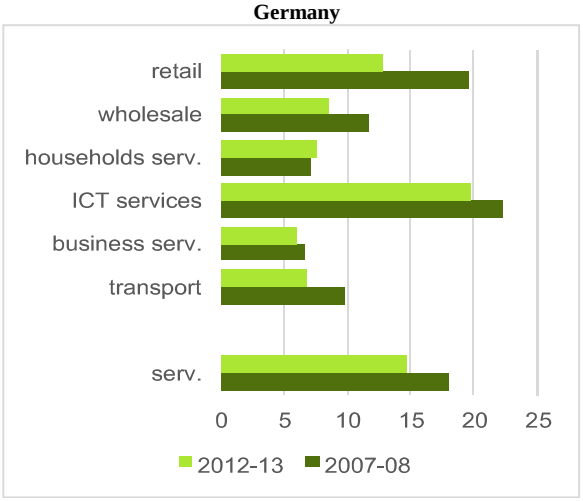
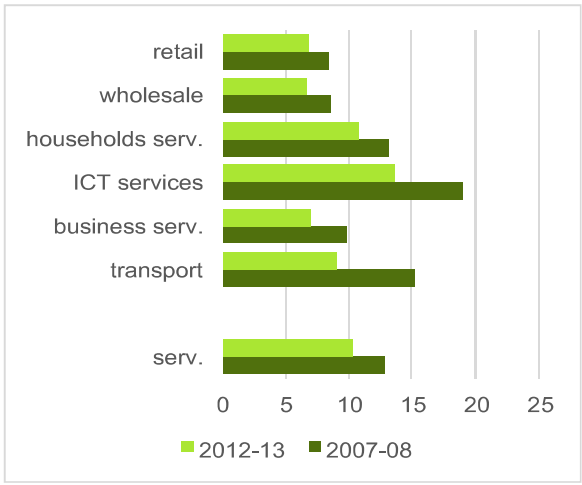


Figure 9: Fixed investment in percentage of net fixed assets by services sub-sectors and country

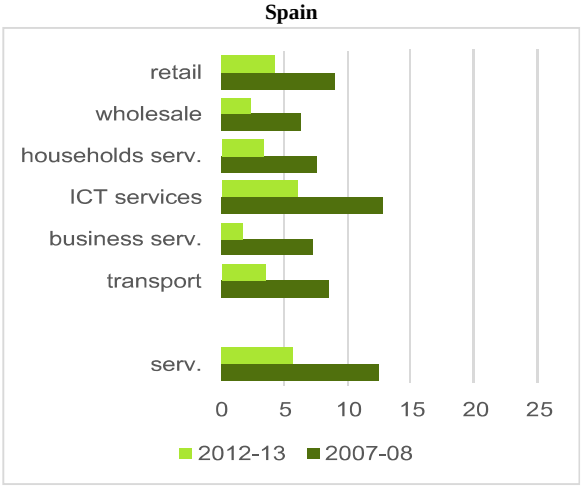
Germany



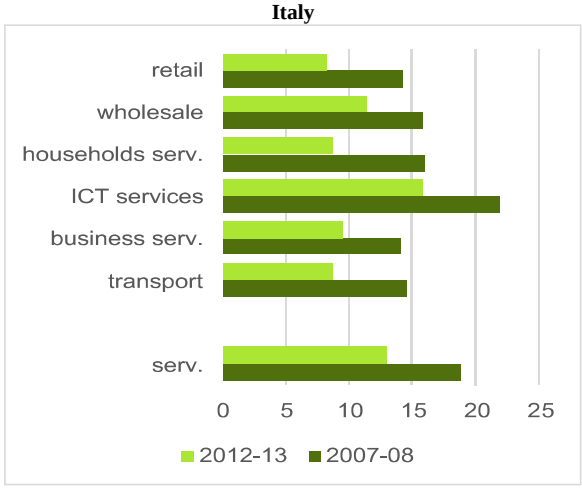
France



Spain



Italy



UK

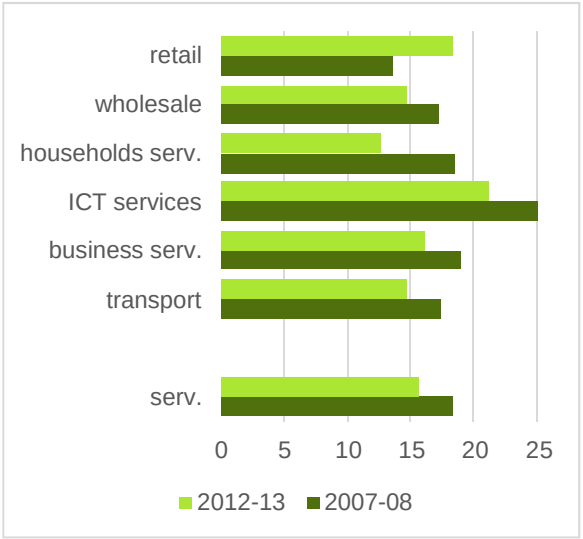


Figure 10: (Financial liabilities – Financial assets)/Total Liabilities*100 by countries

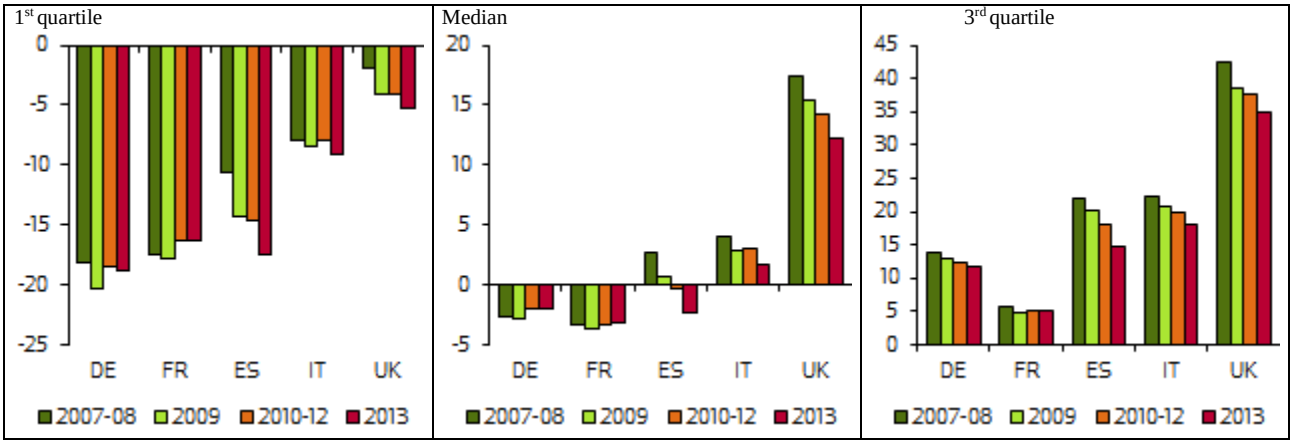


Figure 11: Percentage composition of liabilities by country

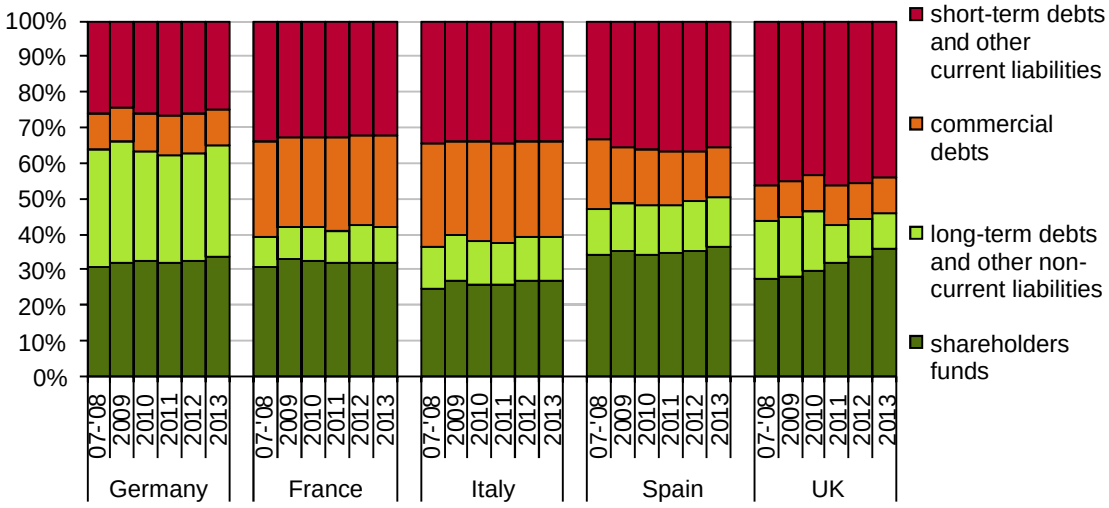
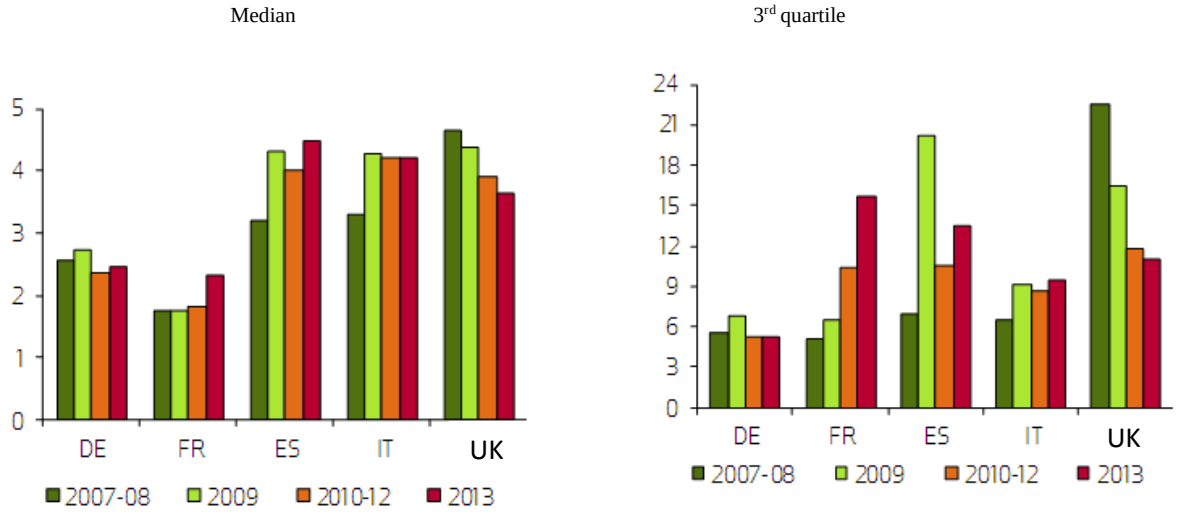


Figure 12: Debt sustainability by country



Notes: Debt sustainability=NFP/Ebitda, where EBITDA approximates the current cash flow

Figure 13: Gross debt interests in percentage of EBIT by country

Figure 14
Evolution of investment (as percentage of lagged capital).
The figure shows the evolution of weighted average investment (variation in tangible fixed assets as percentage of lagged capital stock) over 2006-2013. Each diamond represents average values across all firms in our sample.
Source. Authors' calculation based on ORBIS data.

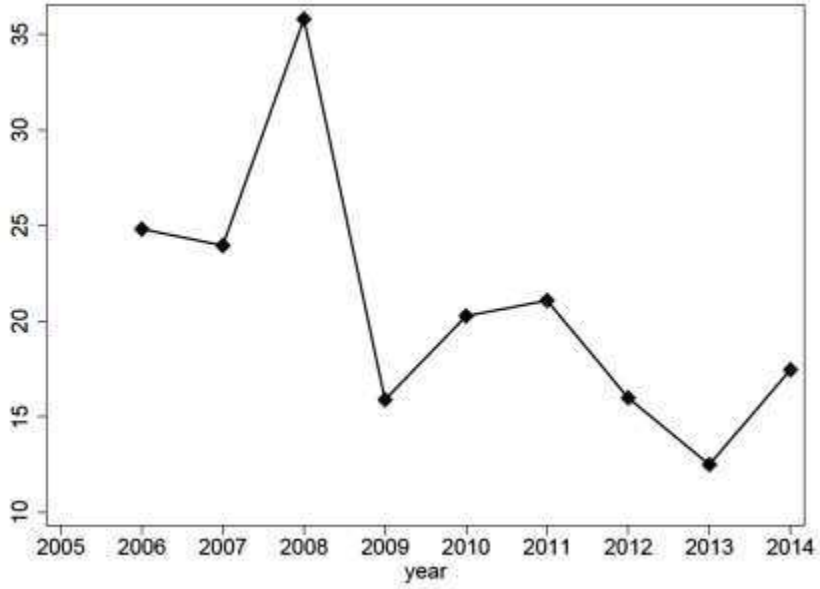


Figure 15
Evolution of investment (as percentage of lagged capital) by firm leverage position.
The figure shows the evolution of weighted average investment (variation in tangible fixed assets as percentage of lagged capital stock) over 2006-2013, by firm leverage position. Diamonds represent average values across all firms in our sample.
Source. Authors' calculation based on ORBIS data.

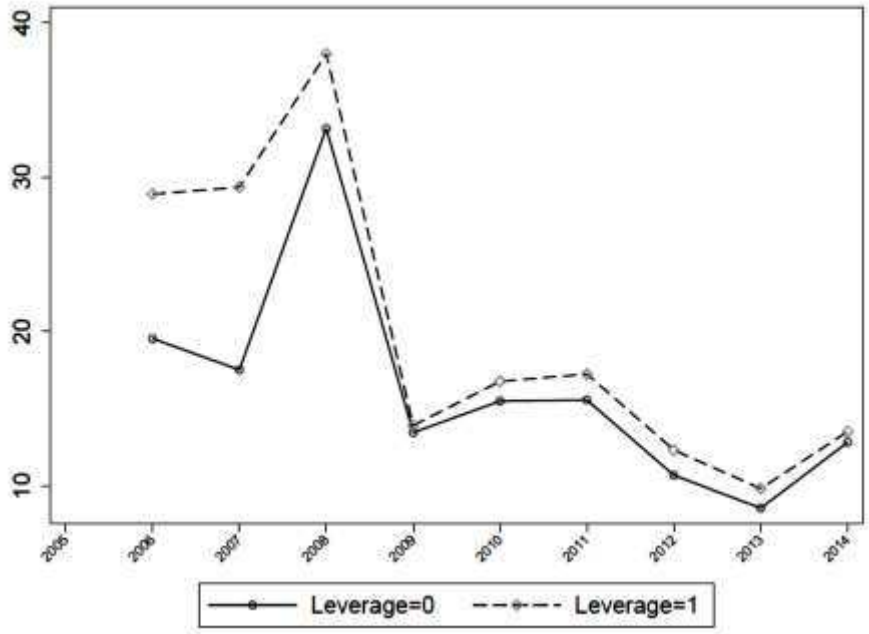


Table 1
Summary statistics.
The table reports summary statistics for the main sample of firm-year observations from 2005 to 2014. Investment/Capital is the annual change **in net fixed tangible assets** as a ratio to lagged capital stock, at constant 2010 euros. Cash measured as Cash holding/Assets. Cash Flow measured as Ebitda/Assets. Debtoverhang measured as the ratio of total debt to earnings.

Variable	Definition	Mean (1)	P25 (2)	Median (3)	P75 (4)	St.dev. (5)	N.obs (6)
IK	Investment/Capital	19.88	-16.66	-4.52	12.50	109.06	2,444,663
Lev	Total Debt/Assets	69.87	52.38	71.86	88.08	26.70	3,169,035
FinDebt	Fin.Debt/Assets	19.04	0.39	11.31	30.65	21.75	2,764,949
LongDebt	Long-Term Debt/TotDebt	17.75	0.00	4.78	26.08	25.81	2,946,960
LongTermDebt1	Long-Term Debt/Fin.Debt	49.53	3.31	52.55	90.31	39.10	2,201,933
ShortDebt	Short-Term Debt/TotDebt	11.74	0.00	2.77	17.21	17.66	2,984,638
Sales Growth	Annual % Growth of Sales Revenues	9.21	-7.84	0.73	12.96	47.14	2,554,283
Log(Assets)	Log(Assets)	15.11	14.10	14.87	15.91	1.47	3,169,051
Cash	Cash/Assets	12.88	1.32	6.33	18.75	15.86	3,082,294
Cash Flow	Ebitda/Assets	9.84	3.71	7.95	14.47	11.74	2,767,955
Ability	Ebitda/Interest Expenses	35.40	2.33	6.53	22.50	100.56	2,430,937
Tangibility	Tangible Assets/Assets	18.57	2.93	10.25	27.22	20.98	3,065,765
Debtoverhang	Net Debt/Ebitda	7.90	1.41	5.13	11.48	27.87	2,694,348

Table 2
Debt structure and investment before and after the crisis.
The table reports estimates from panel regressions explaining firm-level investment for years 2005-2014. Dependent variable is the annual change **in net fixed tangible assets** as a ratio to lagged capital stock, at constant 2010 euros. $TotDebt$ is a time-invariant dummy variable equal to 1 if the firm is in the top 50% of the total debt to asset ratio distribution before 2008. $LongTermDebt$ and $ShortTermDebt$ are time-invariant dummies equal to 1 if the firm is in the top 50% of the long-term debt to total debt ratio distribution before 2008. The median for each of these treatment variables is computed within country and industry. *Post* is a dummy equal to one for years 2008-2014. All control variables are lagged one period. Standard errors clustered at firm-level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level.

	(1)	(2)	(3)	(4)
Post*TotDebt	-9.88***	-6.36***	-6.41***	-6.78***
	(0.458)	(2.254)	(2.237)	(2.236)
Post*LongTermDebt	-7.14***	-11.47***	-10.89***	-12.25***
	(0.485)	(2.600)	(2.608)	(2.637)
Post*ShortTermDebt	1.90***	4.97*	4.76*	3.72
	(0.489)	(2.626)	(2.636)	(2.632)
Controls				
Dep. Var.		-0.16***	-0.15***	-0.14***
		(0.001)	(0.001)	(0.001)
Sales Growth			0.25***	0.25***
			(0.005)	(0.005)
Log(Assets)			-39.27***	-38.31***
			(0.618)	(0.635)
Cash Flow			0.64***	0.63***
			(0.017)	(0.018)
Lev				0.15***
				(0.015)
LongDebt				-0.64***
				(0.012)
ShortDebt				-0.33***
				(0.012)
Country-industry-year FE	YES		YES	YES
Firm FE	YES		YES	YES
N.Obs	1,853,774	1,505,893	1,479,610	1,424,351
N.Firms	300,164	292,903	285,554	283,336
Mean	17.48	15.62	15.62	14.77
St.dev	102.6	98.35	98.24	96.11

Table 3

Debt structure and investment in crisis and post crisis years.

The table reports estimates from panel regressions explaining firm-level investment for years 2005-2014. Dependent variable is the annual change **in net fixed tangible assets** as a ratio to lagged capital stock, at constant 2010 euros. $TotDebt$ is a time-invariant dummy variable equal to 1 if the firm is in the top 50% of the total debt to asset ratio distribution before 2008. $LongTermDebt$ and $ShortTermDebt$ are time-invariant dummies equal to 1 if the firm is in the top 50% of the long-term debt to total debt ratio distribution before 2008. The median for each of these treatment variables is computed within country and industry. *BankingCrisis*, *SovereignCrisis*, and *Post* are dummies equal to one respectively for years 2008-2009, 2010-2012, 2013-2014. All control variables are lagged one period. Standard errors clustered at firm-level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level.

	(1)	(2)	(3)
BankingCrisis*TotDebt	-8.99***	-6.92***	-8.27***
	(0.529)	(0.531)	(0.530)
SovereignCrisis* TotDebt	-10.23***	-8.86***	-8.65***
	(0.487)	(0.488)	(0.490)
Post2012* TotDebt	-11.17***	-9.57***	-9.51***
	(0.557)	(0.558)	(0.561)
BankingCrisis*LongTermDebt	-8.62***	-7.57***	-9.28***
	(0.557)	(0.560)	(0.563)
SovereignCrisis*LongTermDebt	-7.23***	-7.27***	-10.94***
	(0.514)	(0.515)	(0.527)
Post2012*LongTermDebt	-4.74***	-5.51***	-10.18***
	(0.585)	(0.586)	(0.600)
BankingCrisis*ShortTermDebt	-1.04*	-1.71***	0.14
	(0.561)	(0.565)	(0.571)
SovereignCrisis*ShortTermDebt	3.03***	-0.08	-0.07
	(0.518)	(0.520)	(0.528)
Post2012*ShortTermDebt	4.44***	-0.17	-0.06
	(0.588)	(0.591)	(0.601)
Controls			
Sales Growth		0.26***	0.26***
		(0.005)	(0.005)
Log(Assets)		-43.59***	-41.52***
		(0.513)	(0.519)
Cash Flow		0.67***	0.59***
		(0.015)	(0.016)
Lev			0.01
			(0.012)
LongDebt			-0.69***
			(0.010)
ShortDebt			-0.32***
			(0.010)
Country-industry-year FE	YES	YES	YES
Firm FE	YES	YES	YES
N.Obs	1,820,823	1,773,011	1,712,941
N.Firms	299,433	291,217	290,682
Mean	17.62	17.54	16.81
St.dev.	103.1	102.8	101

Table 4

Debt structure and investment in crisis and post-crisis years by country

The table reports estimates by country from panel regressions explaining firm-level investment for years 2005-2014. Dependent variable is the annual change **in net fixed tangible assets** as a ratio to lagged capital stock, at constant 2010 euros. $TotDebt$ is a time-invariant dummy variable equal to 1 if the firm is in the top 50% of the total debt to asset ratio distribution before 2008. $LongTermDebt$ and $ShortTermDebt$ are time-invariant dummies equal to 1 if the firm is in the top 50% of the long-term debt to total debt ratio distribution before 2008. The median for each of these treatment variables is computed within country and industry. *BankingCrisis*, *SovereignCrisis*, and *Post* are dummies equal to one respectively for years 2008-2009, 2010-2012, 2013-2014. All control variables are lagged one period. Standard errors clustered at firm-level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level.

	France	Germany	Italy	Spain	UK
	(1)	(2)	(3)	(4)	(5)
BankingCrisis*TotDebt	-8.56***	-0.77	-10.99***	-0.25	-4.28**
	(0.879)	(1.769)	(0.954)	(1.282)	(1.825)
SovCrisis*TotDebt	-9.13***	-4.28***	-7.77***	-14.27***	-3.94**
	(0.853)	(1.645)	(0.859)	(1.098)	(1.816)
Post2012*TotDebt	-8.18***	-4.79**	-9.59***	-17.04***	-3.92*
	(0.999)	(1.883)	(0.962)	(1.227)	(2.156)
BankingCrisis*LongTermDebt	-17.01***	-3.35*	-5.48***	1.13	-7.01***
	(1.008)	(1.858)	(1.006)	(1.330)	(1.855)
SovCrisis*LongTermDebt	-15.26***	-0.87	-6.06***	-0.02	-7.13***
	(0.980)	(1.725)	(0.905)	(1.137)	(1.843)
Post2012*LongTermDebt	-12.84***	-0.94	-4.49***	-0.12	-6.19***
	(1.144)	(1.972)	(0.998)	(1.262)	(2.195)
BankingCrisis*ShortTermDebt	-0.51	-2.40	4.44***	-7.49***	-4.05**
	(1.024)	(1.947)	(1.035)	(1.263)	(1.845)
SovCrisis*ShortTermDebt	2.55***	1.39	2.00**	-3.54***	-4.27**
	(0.991)	(1.796)	(0.937)	(1.072)	(1.824)
Post2012*ShortTermDebt	2.81**	0.65	2.54**	-6.01***	-2.67
	(1.149)	(2.056)	(1.036)	(1.208)	(2.146)
Controls					
Sales Growth	0.41***	0.31***	0.22***	0.15***	0.26***
	(0.011)	(0.021)	(0.007)	(0.008)	(0.018)
Log(Assets)	-39.02***	-38.40***	-53.66***	-37.20***	-23.47***
	(0.875)	(2.233)	(0.892)	(1.198)	(1.568)
Cash Flow	0.81***	0.41***	0.71***	0.55***	0.48***
	(0.024)	(0.052)	(0.033)	(0.036)	(0.043)
Ind-Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
N.obs	624,942	110,310	627,699	306,006	104,054
N.firms	105,078	21,126	98,736	48,153	18,124
Mean	18.35	12.84	21.06	14.36	5.772
St.Dev.	106	81.41	108.1	96.57	85.47

Table 5

Robustness: Debt structure and investment using continuous treatment variables.

The table reports estimates by country from panel regressions explaining firm-level investment for years 2005-2014. Dependent variable is the annual change **in net fixed tangible assets** as a ratio to lagged capital stock, at constant 2010 euros. Standard errors clustered at firm-level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level.

	(1)	(2)	(3)
PostxLev		-0.05	-0.11*
		(0.055)	(0.057)
Lev	0.09***	0.14**	0.19***
	(0.015)	(0.057)	(0.058)
PostxLongDebt		-0.11*	-0.08
		(0.064)	(0.064)
LongDebt	-0.66***	-0.56***	-0.58***
	(0.012)	(0.065)	(0.064)
PostxShortDebt		0.04	0.06
		(0.079)	(0.078)
ShortDebt	-0.32***	-0.35***	-0.38***
	(0.012)	(0.079)	(0.079)
PostxGrowthSales			0.03
			(0.037)
GrowthSales	0.05***	0.05***	0.02
	(0.003)	(0.003)	(0.037)
PostxSize1			-4.76***
			(0.937)
Size1	-54.93***	-54.93***	-50.22***
	(0.645)	(0.645)	(1.128)
PostxCashFlow			-0.19
			(0.133)
CashFlow	0.43***	0.43***	0.62***
	(0.018)	(0.018)	(0.133)
Observations	1,574,181	1,574,181	1,574,181
N. firms	354,138	354,138	354,138
Country-Ind-Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Mean	16.22	16.22	16.22
St. Dev.	100.6	100.6	100.6

Table 6
Robustness: Debt structure and investment using financial leverage.
The table reports estimates by country from panel regressions explaining firm-level investment for years 2005-2014. Dependent variable is the annual change **in net fixed tangible assets** as a ratio to lagged capital stock, at constant 2010 euros. $FinLeverage$ is a time-invariant dummy variable equal to 1 if the firm is in the top 50% of the total financial debt to asset ratio distribution before 2008. Standard errors clustered at firm-level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level.

	(1)	(2)	(3)	(4)
Post*FinLeverage	-4.83***	-7.46***	-7.73***	-11.85***
	(0.503)	(2.452)	(2.452)	(2.408)
Post*LongTermDebt1	-7.50***	-11.54***	-10.61***	-12.09***
	(0.489)	(2.478)	(2.469)	(2.534)
Controls				
Dep. Var.		-0.15***	-0.15***	-0.13***
		(0.001)	(0.001)	(0.001)
Sales Growth			0.23***	0.21***
			(0.005)	(0.006)
Log(Assets)			-38.73***	-39.04***
			(0.654)	(0.713)
Cash Flow			0.64***	0.55***
			(0.018)	(0.019)
FinLeverage				-0.42***
				(0.014)
LongTermDebt1				-0.13***
				(0.005)
Country-Ind-Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
N.obs	1,601,928	1,303,595	1,285,696	1,114,573
N.firms	257,678	251,845	246,944	240,682
Mean	16.07	14.36	14.38	12.60
St.dev	98.08	94.11	94.08	88.66

Table 7
Check on common trend and no-anticipation assumptions.
The table reports estimates of the effect of being high-levereged on investment. In each of the rows, *TotDebt* is an indicator variable for firms above the median of the total debt to asset ratio before 2008. In column 1 the sample is before 2008 and the regression includes a linear trend as control. In column 2 *p-value Leads* is the *p-value* for the joint statistical significance of the leads effect of the leverage. Standard errors clustered at firm-level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level.

	Common Trend Assumption (1)	Leads & Lags (2)
TotDebt*Year	-3.774	
	(0.000)	
TotDebt*2006		10.430***
		(2.438)
TotDebt*2007		10.753***
		(1.163)
TotDebt*2008		3.145***
		(1.189)
TotDebt*2009		-0.489
		(1.143)
TotDebt*2010		-0.094
		(1.147)
TotDebt*2011		0.079
		(1.148)
TotDebt*2012		-0.187
		(1.138)
TotDebt*2013		-1.051
		(1.133)
Observations	289,063	2,002,009
N. firms	277,708	327,548
P-value Leads		0.884
Sample	Pre-2008	All
Firm FE	YES	YES
Country-Ind-Year FE	YES	YES

Table 8

Debt structure, external finance dependence and investment in crisis and post-crisis years.

The table reports estimates by from panel regressions explaining firm-level investment for years 2005-2014. Dependent variable is the annual change **in net fixed tangible assets** as a ratio to lagged capital stock, at constant 2010 euros. Standard errors clustered at firm-level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level.

	Small	Medium-Large	NoBond	Bond	NoTicker	Ticker	NoMultibank	Multibank	Low trade credit	High trade credit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post* TotDebt	-6.00***	-2.55***	-5.19***	-5.45**	-5.30***	4.57	-6.47***	1.26	-5.91***	-6.72***
	(0.813)	(0.752)	(0.479)	(2.222)	(0.469)	(13.398)	(0.790)	(1.045)	(0.709)	(0.690)
Post*LongTermDebt	-11.47***	-5.88***	-6.41***	-9.45***	-6.44***	-31.36***	-11.60***	-0.94	-6.73***	-9.01***
	(0.890)	(0.807)	(0.514)	(2.305)	(0.502)	(11.534)	(0.893)	(1.072)	(0.816)	(0.726)
Post*ShortTermDebt.	-3.33***	2.15**	-0.81	1.29	-0.68	17.62	-2.07**	-6.78***	1.35	1.43*
	(0.962)	(0.858)	(0.515)	(2.376)	(0.504)	(13.404)	(0.889)	(1.064)	(0.857)	(0.765)
Controls										
Sales Growth	0.28***	0.34***	0.25***	0.46***	0.26***	0.49***	0.35***	0.17***	0.27***	0.31***
	(0.006)	(0.010)	(0.005)	(0.029)	(0.005)	(0.135)	(0.011)	(0.009)	(0.007)	(0.007)
Log(Assets)	-45.20***	-40.35***	-42.34***	-39.16***	-42.26***	-25.78**	-36.47***	-45.23***	-40.82***	-39.83***
	(0.791)	(0.969)	(0.523)	(2.364)	(0.511)	(12.812)	(0.927)	(1.217)	(0.833)	(0.725)
Cash Flow	0.38***	0.46***	0.39***	0.52***	0.40***	0.82**	0.47***	0.36***	0.39***	0.44***
	(0.025)	(0.030)	(0.016)	(0.066)	(0.016)	(0.372)	(0.025)	(0.035)	(0.025)	(0.023)
Ability	0.04***	0.01***	0.02***	0.00	0.02***	-0.00	0.02***	0.01**	0.02***	0.02***
	(0.003)	(0.002)	(0.001)	(0.004)	(0.001)	(0.025)	(0.002)	(0.003)	(0.002)	(0.002)
Tangibility	-4.24***	-3.72***	-4.08***	-3.45***	-4.05***	-4.49***	-3.94***	-3.48***	-3.46***	-4.96***
	(0.029)	(0.037)	(0.020)	(0.106)	(0.020)	(0.739)	(0.043)	(0.039)	(0.030)	(0.031)
Debtoverhang	-0.00	0.00	0.00	-0.01	0.00	-0.16**	0.01	0.01	0.00	0.01
	(0.007)	(0.006)	(0.004)	(0.018)	(0.004)	(0.078)	(0.007)	(0.009)	(0.006)	(0.006)
Observations	687,242	468,263	1,516,374	62,921	1,571,133	2,269	449,501	283,017	605,765	767,009
N. firms	127,212	83,067	270,524	12,026	281,107	420	84,108	49,129	108,286	137,675
Country-industry-year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Mean	21.25	13.41	16.34	12.45	16.19	11.11	12.03	13.18	13.70	17.39
St. Dev.	110.2	86.20	98.37	94.92	98.20	93.69	88.28	89.24	93.18	99.80

Table 9
Debt structure, internal finance and investment in crisis and post-crisis years.
The table reports estimates by from panel regressions explaining firm-level investment for years 2005-2014. Dependent variable is the annual change **in net fixed tangible assets** as a ratio to lagged capital stock, at constant 2010 euros. Standard errors clustered at firm-level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level.

	Low Cash	High Cash	Low Cash Flow	High Cash Flow
	(1)	(2)	(3)	(4)
Post*TotDebt	-3.35***	-6.29***	-4.24***	-4.65***
	(0.675)	(0.658)	(0.779)	(0.596)
Post*LongTermDebt	-4.89***	-7.62***	-8.26***	-5.60***
	(0.727)	(0.688)	(0.818)	(0.635)
Post*ShortTermDebt	0.01	-1.35**	1.35	-1.80***
	(0.786)	(0.674)	(0.838)	(0.628)
Controls				
Sales Growth	0.26***	0.26***	0.25***	0.28***
	(0.007)	(0.006)	(0.007)	(0.006)
Log(Assets)	-42.62***	-41.76***	-44.87***	-40.70***
	(0.788)	(0.672)	(0.847)	(0.640)
Cash Flow	0.43***	0.38***	0.39***	0.45***
	(0.025)	(0.021)	(0.030)	(0.019)
Ability	0.01***	0.02***	0.02***	0.02***
	(0.002)	(0.002)	(0.003)	(0.002)
Tagibility	-3.61***	-4.43***	-4.19***	-3.98***
	(0.029)	(0.026)	(0.036)	(0.023)
Debtoverhang	0.01	-0.00	0.00	-0.00
	(0.005)	(0.006)	(0.005)	(0.006)
Observations	687,032	885,370	638,929	938,000
N. firms	120,131	159,961	115,119	166,641
Country-industry-year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Mean	13.95	17.93	16.11	16.20
St. Dev.	93.71	101.5	102.6	95.03

Table 10
Debt structure and investment: focus on firm-bank relationship.
The table reports estimates by from panel regressions explaining firm-level investment for years 2005-2014. Dependent variable is the annual change **in net fixed tangible assets** as a ratio to lagged capital stock, at constant 2010 euros. Standard errors clustered at firm-level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level.

	(1) Small Bank	(2) Large Bank	(5) Low GvBond Bank	(6) High GvBond Bank	(9) Low NPL Bank	(10) High NPL Bank
Post*TotDebt	0.27	-0.50	1.40	-1.96	0.39	2.17
	(1.335)	(1.215)	(1.440)	(1.352)	(1.440)	(1.558)
Post*LongTermDebt	-5.04***	-2.57**	-0.98	-5.64***	-2.05	-2.46
	(1.388)	(1.251)	(1.482)	(1.402)	(1.467)	(1.623)
Post*ShortTermDebt	-7.76***	-4.57***	-9.67***	-1.04	-5.31***	-5.43***
	(1.431)	(1.247)	(1.454)	(1.469)	(1.468)	(1.649)
Controls						
Sales Growth	0.21***	0.26***	0.20***	0.31***	0.25***	0.25***
	(0.014)	(0.013)	(0.014)	(0.018)	(0.015)	(0.018)
Log(Assets)	-42.52***	-41.27***	-44.34***	-37.60***	-42.76***	-39.02***
	(1.516)	(1.424)	(1.635)	(1.658)	(1.558)	(2.041)
Cash Flow	0.32***	0.41***	0.38***	0.43***	0.41***	0.40***
	(0.044)	(0.041)	(0.047)	(0.046)	(0.048)	(0.054)
Ability	0.01***	0.01***	0.01	0.01***	0.01***	0.01*
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)
Tangibility	-3.44***	-3.74***	-3.61***	-3.72***	-3.76***	-3.54***
	(0.053)	(0.053)	(0.056)	(0.067)	(0.059)	(0.071)
Debtoverhang	0.00	0.00	-0.00	0.01	0.00	0.02
	(0.012)	(0.010)	(0.011)	(0.012)	(0.011)	(0.015)
Observations	159,085	209,001	147,501	155,334	159,163	109,376
N. firms	28,479	37,582	26,083	28,687	27,807	19,973
Country-industry-year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Mean	12.30	13	13.55	11.78	13.07	12.55
St. Dev.	86.04	89.87	90.18	84.88	91.11	85.28