The impact of financial position on investment: an analysis for non-financial corporations in the euro area*

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Abstract

This paper analyses the impact that firms' financial position has on investment decisions using panel data from a large sample of non-financial corporations (around 120,000 firms) in six euro area countries (Belgium, Germany, France, Italy, the Netherlands and Spain). The results support the existence of a channel of monetary transmission operating through firms' balance sheets, as financial pressure appears relevant in explaining investment dynamics when it is proxied by cash flow, indebtedness and debt burden. The results also show differences in the sensitivity of investment rates to changes in financial pressure across countries, which appears to be especially large in the Netherlands and Italy and relatively small in Germany.

JEL Classification: C33, E22, G32, J23

Key words: financial pressure; fixed investment; balance sheet channel: company panel data.

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Non-technical summary

Financial frictions can amplify the impact of changes in interest rates on economic activity. Accordingly, understanding the way in which financial conditions affect firms' demand of productive factors becomes relevant for an optimal design of monetary policy. In addition, in the context of the euro area, the knowledge of potential differences in the investment rate sensitivity to changes in firms' financial positions across countries or across different types of firms is crucial for a better understanding of the impact of a single monetary policy.

This paper investigates the sensitivity of investment rates to changes in firms' financial position, using a large sample of non-financial corporations in six major euro area countries (Belgium, Germany, France, Italy, the Netherlands and Spain). We proxy financial health using three financial ratios: profitability, net indebtedness and the interest rate burden. The expected relationship between the first financial ratio and investment activity is positive: financing constraints resulting from asymmetric information problems imply that firms tend to invest more when they have more internal resources available. As for the indebtedness ratio, although debt may have some desirable properties (it allows financing projects in the absence of internal resources), the commitment to repay the debt may have a negative influence on firms' spending decisions. The third ratio measures firms' capacity to meet interest payments with their earnings, and is also expected to present a negative relationship with investment rates.

The results show that the three financial ratios affect investment decisions of firms in the expected direction. Hence, we conclude that there is evidence of a channel of monetary transmission operating through firms' balance sheets. We find a certain degree of heterogeneity across countries: firms in the Netherlands are found to be the ones with the highest marginal impact of financial pressure on investment rates, while the lowest impact has been found for German firms.

In the paper we also give an insight on how, by altering the financial pressure experienced by firms in servicing their debt, monetary policy may operate through the corporate sector. A simple exercise quantifies how much investment rates change across countries, ceteris paribus, due to an increase in the cost of debt financing. Overall, taking into consideration our estimates on the sensitivity of investment to changes in the debt burden and the levels of this ratio in each country, the results show that Italian firms would be the most affected.

1 Introduction

The analysis of the financial position of non-financial corporations and their responses to financial pressure are important elements in any assessment of the macroeconomic outlook, as firms' financial situation can condition firms' real decisions. For example, excessive indebtedness or a high debt-service burden can have an adverse effect on investment spending, thereby contributing to deepen recessions or to delay or dampen upturns. Accordingly, understanding the way in which financial conditions affect firms' demand of productive factors becomes relevant for an optimal design of monetary policy. In addition, in the context of the euro area, the knowledge of potential differences in the investment rate sensitivity to changes in firms' financial positions across countries or across different types of firms is crucial for a better understanding of the impact of a single monetary policy.

A change in monetary policy does not only have an impact on real economy via the traditional interest rate channel. Several theories emphasize the role played by financial frictions in amplifying the effects of interest rate changes (see Bernanke and Gertler, 1995). Within the credit channel for the transmission of monetary shocks to real output, the bank lending channel is related to a loan supply decrease as a result of the reduction in their liquidity positions following a monetary policy contraction. The balance sheet channel emphasizes the negative impact that monetary policy has on firms' demand for loans. Higher interest rates increase debt servicing payments, erode cash flow and reduce collateral values. This affects firms' creditworthiness, something that increases the external finance premium and squeezes firm demand for loans (the financial accelerator mechanism). More recently, the so-called relationship channel has emphasized the role that long-term relationship between lenders and borrowers can have to reduce the asymmetric information problems and hence to mitigate the effects of the two previous channels.

Within the range of activities that can be affected by changes in monetary policy, investment, which represents around 20% of euro area GDP, is amongst the most prominent ones. This paper makes two contributions to the existing literature on how financial pressure affects investment rates. First, differently from most previous papers analysing the impact of financial constraints on investment, we do not just focus on investment sensitivity to cash flow ratios as a signal of financing constraints but also on the impact of changes in debt burden and indebtedness on investment rates. Second, our analysis is based on a large panel dataset with a high percentage of small and medium sized firms (over 85% in four out of the six countries considered -Belgium, France, Germany, Italy, the Netherlands and Spain, which broadly represent 90% of

euro area GDP-), which are in fact those thought to be more affected by credit constraints. In contrast, much of the existing empirical work has been based on datasets with a high proportion of large firms, which are likely to have a better access to capital markets.

Looking at the results, we conclude that there exists a channel of monetary transmission operating through firms' balance sheets. We find a certain degree of heterogeneity across countries which is partly in line with the idea of the balance sheet channel being more relevant in more market-oriented system than in more bank-based financial systems.

The rest of the paper is structured as follows. Section 2 describes the data used. Section 3 provides a descriptive analysis on the relationship between investment rates and firms' financial position. Section 4 presents the model and the estimation method. Section 5 presents the results obtained. The potential reasons behind the differences in the results across countries are presented in Section 6. Finally, Section 7 summarises the main results of the analysis and concludes.

2 Data and sample overview

The source of the company database used in this study is AMADEUS of the Bureau van Dijk, containing profit and loss account and balance sheet data on private and publicly owned firms across eleven euro area countries in the period 1990-2005. For the purpose of the analysis we considered euro area private listed and unlisted non-financial enterprises. We excluded the first three years because of the poor coverage across countries and lose some additional years for the construction of the variables for the econometric analysis. We exclude firms with investment rates larger than 1, as this is probably be a sign of merger or acquisition and those for which there are les than six consecutive years of information on the variables of interest. The size of our final sample is around 120,000 firms with about 900,000 observations. It predominantly consists of unquoted firms with only 2744 observations of quoted firms. The countries covered in our analysis are Belgium, Germany, France, Italy, the Netherlands and Spain. Whenever available, we use the consolidated annual accounts as these are considered to be most suitable for providing information about the financial situation of a company with subsidiaries. When consolidated data are not available, unconsolidated data are used. Moreover, since many small- and medium-sized (SMEs) non-financial firms provide only unconsolidated accounts, we are able to include in our sample a large number of SMEs, which would have been excluded otherwise[1].

[1] SMEs are firms that satisfy two out of the following three conditions: maximum number of 250 employees, maximum turnover of 50 mio. euro and maximum balance sheet total of 43 mio euro.

Table 1 presents some basic features of the dataset across countries. Starting from the lower panel of the table, the sample could be easily divided into two different groups of countries. The first group (Belgium, France, Italy and Spain) is characterised by very high proportions of SMEs (above 95% in all countries except for Belgium -87%-) and very low proportions of listed companies (around or below 0.5%). The second group (Germany and the Netherlands) show lower percentages of SMEs (around 35%) and higher shares of listed companies (12% and 8%, respectively). The high share of SMEs in the samples used represents a clear difference with respect with most previous studies, which have used database containing mainly large companies and higher proportions of quoted firms. As for the sectoral composition, the majority of firms are in the manufacturing and trade sectors in Belgium, Italy, Spain and the Netherlands while fewer are in the services sector. The sample of French firms is more evenly distributed among trade, manufacturing and services sectors, while the German sample differs from the other countries since it contains a much higher percentage of firms in the services and in utilities, transport and communications sectors.

The upper panel of Table 1 reports the mean and median values of the variables used in the econometric analysis. As can be seen, the investment rate, the profitability ratio and, more significantly, the debt burden show a positively skewed distribution. The investment rate presents a median value around 11%-13% over the sample period except for Germany, where it is somewhat lower (9%). As can be seen, in Chart 1, it reached its highest level in 1999-2000 in most countries and thereafter declined until 2003, reflecting the slowdown in economic growth in the euro area. At the same time, firms grow faster (if sales increase is taken as a proxy for growth) on average in Spain and France, while Italian firms have hardly grown on average during the sample period. In all countries, the median sales growth rate recorded minimum values in 2002 and a recovery afterwards, except in Spain. Spanish firms showed the highest growth rates in the mid-nineties and in contrast recorded, together with Italian firms, the lowest increases at the end of the sample period. As for the dispersion in sales growth, measured by the coefficient of variation, the largest values are observed in the Netherlands and in Spain.

Three financial ratios have been chosen as a proxy for financial health: profitability, net indebtedness and the interest rate burden. Profitability (defined as cash flow to total assets) indicates that the typical Italian (proxied by the 50th percentile) is the one which faces higher financial pressure in comparison with the rest of the countries (see Chart 3). Its profitability ratio stands 50% below the figure observed for the Netherlands, where the largest values are recorded. The latter country recorded the largest drop in the early 2000s but has also shown the most significant recovery afterwards. It is also noticeable the downward trend observed from

end-nineties in the median profitability level in Spain.

The second financial ratio considered is net indebtedness, defined as the ratio of outstanding debt minus cash and its equivalent to total assets. It captures the importance of debt for firms once adjusted for liquidity at disposal. Debt includes trade credit, since for some countries there is no information on this variable for most of the companies in the sample. As can be seen in Chart 4, a downward trend has been observed in the median value of this ratio in all the countries analysed, but significant differences in indebtedness levels are observed across countries: France shows the lowest levels for this variable (around 40% at the end of the sample period), in line with the comparatively highest reliance of French firms on shares and other equity as a source of external finance. The highest values are recorded for Italian firms (around 65%),

The relative burden of debt is the firms' capacity to meet interest payments with the results it generates (see Chart 5). It is defined as the ratio of interest payments to earnings before interest, taxes, depreciation and amortization plus financial revenue. Therefore, it reflects the impact of changes in interest rates (related to general credit conditions at country level), company profitability and its indebtedness. As can be seen, this ratio showed a downward trend in the second half of the nineties, in line with decreasing interest rates, and increased slightly afterwards in the period 2000-2001, when a reduction in profitability was recorded in most countries. Over the sample period the typical French firm shows the lowest debt-burden ratio, while the typical Italian firm shows the highest ratio, in line with the higher indebtedness and lower profitability ratios observed in this country. Differences in the debt structure of firms are also playing a role in explaining debt burden dispersion across countries. For example, Italian firms have traditionally relied on expensive short-term debt financing, something that probably contributes to their higher debt burden ratios (although this has changed in the recent years, when they have importantly reduced the weight of short-term debt on their liabilities). Likewise, the comparatively high reliance on inter-company loans in Belgium - a source of funds cheaper than bank loans- probably contributes to explain the relatively low debt burden observed in this country. Non-financial corporations' in Germany are those more dependent on bank loans, while French companies are those that rely comparatively more on securities other than shares as a source of external financing[2].

To sum up, Italy is the country in which the position of the median firm seems comparatively weaker while the strongest position is observed for French firms, which are characterised

[2] See Task Force of Monetary Policy Committee of the ESCB (2007) for a description of the liability composition of non-financial corporations' balance sheets in euro area countries in the period 1995-2005.

by the lowest levels of indebtedness and interest burden and by relatively high growth rates of sales and high profitability and investment ratios.

3 The impact of financial variables on firms' investment decisions: descriptive evidence

The descriptive analysis of the previous section has shown that there exists a noticeable heterogeneity in the financial variables under consideration across countries not only in their development over time but also in their levels. A key question to analyse is whether these differences in financial pressure are going to have an impact on firms' spending decisions and, more specifically, on firms' investment rates.

A simple way to obtain some preliminary evidence about how financial pressure affects firms' investment is to plot how the investment rate varies in each country across firms facing different degree of financial pressure. For this purpose, Charts 6, 7 and 8 compare the median level of the investment rate in each country for three different corporate groupings, which are defined on the basis of their financial position. The latter is proxied by cash flow (Chart 6), indebtedness (Chart 7) and debt burden (Chart 8).

In particular, the different panels in Chart 6 present the median investment rate in each country for firms with high profitability (above the 90th percentile), medium profitability (firms for which this ratio stands between the 45th and the 55th percentile) and low profitability (lower decile). As can be seen, there is a clear relationship between profits generated and firms' capital demand, as firms with higher level of cash flow over their assets show higher investment rates.

Chart 7 depicts the median investment rates for firms facing different degrees of financial pressure when it is measured by the indebtedness level[3]. Although debt may have some desirable properties (it allows financing projects in the absence of internal resources), the commitment to repay the debt may have a negative influence on firms' spending decisions. The descriptive evidence shown in the chart points in this direction for Belgium, Germany and France, since investment rates present a negative relationship with indebtedness. In the two first of these countries, a non-linear relationship seems to exist between indebtedness and investment rates, since there are not marked differences in investment rates for firms with a moderate and low

[3] As in the analysis presented for profitability, firms in three different deciles (the 10% of firms with the lowest indebtedness, those for which this ratio stands between 45th and 55th percentiles of the distribution and, those in the higher decile) are considered.

level of indebtedness while for highly indebted firms their demand for capital is substantially lower. In Italy, the Netherlands and Spain the relationship derived from this descriptive analysis seems to be less clear-cut.

Chart 8 compares the investment rates using the relative burden of debt as a proxy for financial pressure. Firms with a higher debt burden in relation to their capacity to generate funds have substantially lower investment rates in all countries. This simple descriptive analysis also indicates that in some countries (especially Belgium, the Netherlands and Spain, and somewhat less clearly, Italy) the relationship between financial pressure and investment might be non-linear, as no marked differences in investment rates are observed between those firms with the lowest financial pressure and those with average financial pressure, while firms facing a high degree of financial pressure show substantially lower investment rates. This hypothesis has already been tested in Hernando and Martinez-Carrascal (2003) for a different sample of Spanish firms, where evidence supporting a non-linear relationship between investment and financial position was found.

Overall, this descriptive evidence suggests that financial pressure can negatively affect firms' capital demand. The negative relationship between financial position and firms' investment rates becomes especially clear when financial pressure is proxied by means of profitability and debt burden. The relationship becomes somewhat more blurred when the relationship between indebtedness and investment rates is analysed. The absence of a clear relationship in this case might be the result of two opposite effects: on the one hand, highly indebted firms may experience problems in gaining access to additional external funds to finance their projects; on the other hand, companies with higher investment levels might be those that have been more successful in attracting external funds to finance their growth opportunities.

4 Model specification and estimation method

The estimation analysis in this section consists in examining the responsiveness of fixed investment to changes in the financial pressure faced by a company, which is proxied by means of the three financial variables presented in the previous section: profitability, indebtedness and debt burden. The model estimated is an error-correction model which specifies a target level of the capital stock and allows for a flexible specification of the short-run investment dynamics, in which we add different financial indicators as potential explanatory variables. The depreciation rate is subsumed into the unobserved firm-specific effects and it is assumed that variation in

the user cost of capital can be controlled for by including time-specific, sectoral-specific and firm-specific effects[4]. The equation to be estimated is:

$$\frac{I_{it}}{K_{it-1}} = \beta_1 \frac{I_{it-1}}{K_{it-2}} + \beta_2 \Delta \ln Y_{it} + \beta_3 \Delta \ln Y_{it-1} + \beta_4 (\ln K_{it-2} - \ln Y_{it-2}) + \gamma X_{it-1} + \alpha_i + \theta_t + S_i + \varepsilon_{it}$$

where i indexes companies i=1,2..N and t indexes year t=1,2...T. Δ denotes a first difference, I/K is the investment rate, Y are real sales, K is real fixed capital stock, and X_{it} represents a vector of financial variables (profitability, indebtedness and debt burden) already described in the previous section[5] . α_i are company-specific fixed effects, θ_t are time effects that control for macroeconomic influences on fixed investment common across companies and $S_i$control for sectoral effects constant over time. ε_{it} is a serially-uncorrelated, but possibly heteroskedastic error. The coefficients β_2 and β_3 indicate the short-run responsiveness of fixed investment to sales growth, whilst the coefficient β_4 indicates the speed of adjustment of the capital stock towards its desired level. γ captures the impact of the financial ratio introduced in the equation. A positive coefficient is expected for profitability, and negative ones for debt burden and indebtedness ratios. This equation is estimated separately for each one of the six countries considered with the data contained in the AMADEUS database.

The estimation method consists of the GMM-System estimator proposed by Arellano and Bover (1995) and examined in detail in Blundell and Bond (1998). These models control for fixed effects with the estimator being an extension of the GMM estimator of Arellano and Bond (1991) and estimates equations not only in first differences but also in levels. The use of GMM-System estimator is especially justified in the case of autoregressive models with high persistence in the data such that the lagged levels of a variable are not highly correlated with the first difference, something that results in finite sample biases associated with weak instruments in the first-difference estimator (see Blundell and Bond, 1998). Blundell and Bond (1998) show that in

[4]See Bond *et al* (1999) or Bond *et al* (2003) for details on the derivation of the investment model. More structural models, such as Q models, would be more appropriate from a theoretical point of view because they control for expectations about future profitability and hence it can be argued that financial variables would not enter the specification as proxies for future investment opportunities (see for example, Fazzari *et al*, 1988). However this type of models can be significantly affected by measurement errors and has often failed to produce significant and correctly signed key parameters. For this reason, we estimate an error correction model, which is standard in the investment literature and which, as emphasized in Bond et al (1999), tends to display more reasonable parameters than structural models. In any case, the estimation of a Q model is not possible here since most of the firms in the sample are not quoted and hence the usual Q variable cannot be constructed.

[5]See Data Appendix for detail on the definition of the variables used.

these circumstances also including the levels equations in the system estimator offers significant gains, countering the bias. They also show that in autoregressive-distributed lag models, first-differences of the variables can be used as instruments in the levels equations provided that they are mean stationary. The high levels of serial correlation displayed by several variables included in the models and the fact that they can be regarded as mean stationary favour the use of a GMM-System estimator rather than the first-difference estimator.

The estimation method requires the absence of second order serial correlation in the first differenced residuals for which the test of Arellano and Bond (1991) is presented (labelled M_2). If the underlying models residuals are indeed white noise then first-order serial correlation should be expected in the first-differenced residuals for which we also present the test of Arellano and Bond (1991), labelled M_1. We also report the results of the Sargan test of overidentifying restrictions as test for instrument validity in the GMM-System equations. Lagged levels of the explanatory variables are used as instruments.

The estimation was initially carried out using the same set of instruments for all the countries, but in some countries second order autocorrelation tests and Sargan tests rejected the validity of the instruments. To avoid this problem, alternative sets of instruments were used for the different countries, checking afterwards if there were significant changes in the results obtained. The significance of the variables of interest remains when using a common set of instruments[6].

5 Results

Table 2 shows the results obtained for the baseline specification (that is, before including financial variables). As can be seen, the results are in line with those found in similar studies: the error-correction term $(k-y)_{it-2}$ is correctly signed and statistically significant and the sales growth has a positive short-run impact on investment, which is statistically significant in all countries. We find the expected first-order serial correlation in our first-differenced residuals while there is no evidence of second order serial correlation, the key requirement for validity of our instrumentation strategy. The Sargan test statistics are insignificant at conventional (5%) levels.

Table 3 presents the same regression but including the profitability indicator. For all

[6] Just in one case (see footnote 11) the significance seems to depend more on the set of instruments used. See Tables A1, A2 and A3 in Appendix 1 for results using common instruments for all countries.

countries profitability turns out to be significant: Italy shows the highest estimated coefficient (for each percentage point increase in profitability, investment rate increases by 0.6 percentage points), while in contrast Germany shows a relatively lower level in comparison with the rest of the countries, somewhat less than half the one estimated for Italy. The country-ranking according to the magnitude of the estimated cash flow coefficient is the same as that reported in Chatelain et al (2001) where cash flow sensitivities of investment have been tested for Germany, France, Italy and Spain. As it has been extensively discussed in the literature on investment and financial constraints, a significant cash flow coefficient might not be enough to prove the existence of financing constraints, since cash flow effects could just be a proxy for investment opportunities. However, to the extent that a similar relationship between current cash flow and future profitability across countries exists, differences in the estimated coefficients on the cash flow variables are more likely to reflect differences in the effects of financing constraints. The results of a simple forecasting model for profitability seem to point in this direction, as there are no significant differences in the forecasting power of lagged or current cash flow for future profitability across countries[7].

In addition to the relationship between investment rates and profitability, it is also relevant to know how companies may adjust in the light of balance sheet pressures linked to their level of indebtedness. Table 4 shows the results obtained when the indebtedness ratio is included in the baseline investment equation. In line with the descriptive evidence shown above, a negative (and significant) coefficient is obtained in Belgium and France. Also for Italy and Spain evidence in favour of a contractive impact of indebtedness on investment rates is found, which was not so clear-cut according to the descriptive analysis. In the Netherlands the p-value associated to the significance of this variable is relatively low (18%), while in Germany this variable turns out to be insignificant. In the Dutch case, the rather limited significance of this ratio seems to be linked to the fact that the coefficients are estimated quite imprecisely, rather than to a lower magnitude. The small number of companies available for the estimation in this country might be a reason behind its comparatively lower statistical significance. Hence, these results suggest that a high level of debt can lead to balance sheet adjustments in the form of companies deferring or foregoing investment projects (see Vermeulen, 2002 for an industry-level study). The comparison of coefficients across countries shows that the largest sensitivity of investment to indebtedness changes is observed in the Netherlands and, to a minor extent, in Italy„ while German firms present the lowest sensitivity.

Finally, Table 5 shows the reports obtained when financial pressure is proxied by debt

[7] Results available upon request.

burden. Significant (negative) coefficients are indications that monetary policy has an impact on firms' investment rates through the induced changes in the costs of debt servicing. Only in Germany the significance of this indicator is somewhat more limited (p-value=14%)[8]. The highest response to changes in debt burden is estimated for the Netherlands and Italy[9]. Belgium, France and Spain show lower (and similar) investment rate sensitivities, which are above the estimates for Germany.

Overall, these econometric results support the hypothesis that financial pressure faced by firms is important to explain corporate decisions on fixed investment, as indebtedness, debt burden and profitability indicators are found to be significant when included in investment equations.

These results can be used to quantify the impact of monetary policy on investment through the induced changes in the costs of debt servicing. Similarly to Nickell and Nicolitsas (1999), we analyse which is the impact of an increase in interest rates of 100 basis points, from 4%, which was the level of the average cost of debt financing in the euro area at the end of 2005, to 5%. Under the assumption of no fixed rate debt, this implies an increase in debt burden close to 25%. This can be used, together with the information on the average levels of debt burden across countries in 2005, to compute the impact on investment rate of this increase in interest rates at the end of the sample period. The results show that the largest contractive impact would be observed in Italy: the average company in this country would reduce its investment rate by 1 percentage point (which amounts 7.3% of the mean value in 2005) while in the Netherlands it would be 0.6pp (4.1% of the mean value). The lowest impact would be observed for Belgium, Germany and France (around 0.3pp) while the impact for Spain would also be relatively moderate (0.4pp). The impact in Italy is not only higher, but also more unevenly distributed, given the larger dispersion that the distribution in debt burden presents in this country.

Hence, even if the marginal impact of changes in the debt burden on investment is estimated to be lower for Italy than for the Netherlands, the impact of the increase in financing costs would be higher for the average Italian company, as it faces a higher degree of finan-

[8] The significance of the debt burden indicator in Germany is also more dependent on the set of instruments used than in the rest of the countries. In fact, when using common instruments for all countries, the significance of this variable decreases further.

[9] The p-value associated to the Sargan test in the Italian case is very low (1.4%), but the M2 statistic indicates that the key condition for instrument validity holds. On the basis of Monte Carlo analysis, Blundell et al (2000) report that the Sargan test tends to over-reject in the context of this estimator. In line with this, Nickell and Nicolitsas (1999) report significant Sargan test statistics for all their regression results.

cial pressure. Likewise, in spite of the fact that the coefficient estimated for France is higher than for Germany, the average firm in France is the one less affected by the increase given its comparatively sounder financial position. Overall, this simple exercise illustrates that both the heterogeneity in the magnitude of the marginal impact of debt burden on investment rates and in the financial position are important to make a proper assessment of the impact of changes in monetary policy on investment rates.

6 What drives differences in investment rate sensitivity to financial pressure changes accross countries?

The results presented in Section 5 point to significant differences across countries in the sensitivity shown by investment rates to changes in firms' financial pressure. This sensitivity seems relatively low in Germany, while it is definitely higher in the Netherlands and in Italy. Differences in the size and sector compositions of the samples used, as well as differences in country financial structures, might be important elements to explain those differences in sensitivities.

A first factor that can be potentially contributing to explaining the differences in the results across countries is the different composition of the sample in each of the countries considered. As presented in Section 2, Belgium, France, Italy and Spain show a much higher percentage of SMEs. SMEs are usually thought to be more affected by the asymmetric information problems that are the basis for the existence of the balance sheet channel, as they are expected to be more opaque towards external investors. In particular, they do not usually enter into publicly visible contracts and do not usually issue traded securities that are continuously priced in public markets. The evidence available in this respect in the empirical literature is, however, inconclusive, as there are conflicting results regarding the correlation between size and financing constraints[10]. As for our econometric results, this factor could explain why investment rate sensitivity to financial position changes is relatively low in Germany, but not why it is found to be especially large in the Netherlands. In any case, when we allow for a different marginal impact of indebtedness, debt burden and profitability for SMEs and large firms, our regression results do not conclusively point to SMEs investment rates being differently and, in particular, more negatively affected by changes in their financial position than large firms (see Table 6). In fact, the point estimates of the difference in the sensitivity of investment to financial factors be-

[10] See Task Force of the Monetary Policy Committee of the ESCB (2007) for a review of the academic literature on the relationship between financing constraints and size.

tween SMEs and large firms are not only non-significant in general but also non –systematically positive or negative. Only for Belgium we find some evidence in favour of a higher contractive impact for SMEs of increases in financial pressure on investment rates, in line with the results presented in Butzen et al (2001) for this country. Overall, our results might be indicating that size is not a good indicator of informational asymmetries that are the basis for the balance sheet channel effects.

Differences in the sectoral composition of the sample could also be driving the differences in investment rates' sensitivities across countries. There can be differences in the degree of financing constraints faced by firms in the various sectors due, for example, to differences in the available collateral. As seen in Table 1, close to 30% of the companies in the German sample are in the electricity, gas and water supply sector, transport, storage and communications, while in Italy and France this percentage is hardly above 5%. The Spanish sample also shows a low rate of companies in this sector (below 7%), while for the Netherlands the observed percentage is quite higher (12%). As firms in these sectors keep a high percentage of fixed assets in their balance sheets, they might be able to obtain more easily external finance than firms in other sectors such as construction and wholesale and retail trade, for which short-term assets (usually less suitable to be used as collateral) are more important. However, we do not find a clear-cut evidence supporting systematic sectoral differences in the impact of financial position on investment across countries (see Table 7).

Another reason why the broad credit channel might be more powerful in some countries than in others is that financial systems deal differently with asymmetric information problems. In this sense, it is commonly argued that financing constraints might be more severe in more market-oriented financial systems because borrowers and lenders operate at arms-length relationship compared to bank-based systems, where banks invest in long-term relationships with their clients, thereby reducing asymmetric information problems. The results in Bond et al (2003), for example, point in this direction: they find higher sensitivity of investment rates to changes in cash flow in the United Kingdom than in more bank-based systems such as Belgium, France and Germany. Also Valderrama (2001), for example, finds that Austrian companies with tighter relationships with the main bank react less to cash flow than firms with less intense relationships.[11]. The results found here are partly in line with the relationship channel hypothesis,

[11] Leaving aside the advantages of close relationships with lenders for a given indebtedness level, firms more dependent on bank financing will be more affected by changes in the supply of loans than firms that have easy access to other sources of external financing. In line with this, Haan and Sterken (2006) conclude that small private firms use less debt after a monetary tightening, but somewhat less in bank-based economies.

as Germany shows the lowest sensitivity of investment rates to changes in financial variables while the Netherlands stands in the opposite extreme. The "house banks" system prevailing in Germany, in which firms establish financial relationships with only one bank, implies a much closer linkage to a single bank than in many other countries, something that can help to mitigate the effects of the balance sheet channel. In any case, this hypothesis has not been tested directly in the paper and our estimated results can also be consistent with alternative explanations. In fact, while the sensitivity seems to be the highest in the Netherlands, a more market-oriented system[12], in the case of Belgium and France, where equity financing plays an important role, investment sensitivity is not found to be high in comparison with the rest of the countries. In the case of Belgium, this could be partly explained by the existence of pyramidal ownership structures, with holding companies playing a significant role in the financing and in the management of their affiliated firms hence lowering the external finance premium.

The relationship channel cannot explain why Italy shows a comparatively high investment sensitivity to changes in financial position. It could be partly related, though, to the fact that a high percentage of loans is backed by collateral, which might result in a more accentuated impact of the balance sheet channel (since the negative impact on asset prices -and hence on collateral values- of monetary policy contractions might have a more significant impact on credit availability)[13]. An additional factor that can contribute to the high sensitivity estimated for Italy is the comparatively weaker financial position observed for firms in this country, if a non-linear impact of financial position on investment exists. Descriptive evidence shown in Section 3 might point in this direction, especially for the debt burden indicator[14].

7 Concluding remarks

We have analysed the sensitivity of investment to changes in financial pressure faced by firms with a large sample of firms in six euro area countries (Belgium, Germany, France, Italy, the Netherlands and Spain), which broadly represent 90% of GDP in the euro area. Financial pressure has been proxied by firm indebtedness, debt burden and profitability. One positive characteristic of the database used for the analysis is that the percentage of smaller firms in these samples, that are those expected to be more affected by financial constraints, is much

[12] However, Dutch firms show intermediate investment sensitivities to cash flow.

[13] See Ehrmann et al. (2001) for an analysis of the structure of the banking and the financial markets across euro area countries and its impact on the role of banks in the monetary policy transmission.

[14] Also, as mentioned above, Hernando and Martinez-Carrascal (2008) test this hypothesis and find evidence of non-linearities in the impact of financial position on investment for Spanish non-financial corporations

higher than in previous studies.

All in all, our results support the existence of a channel of monetary transmission operating through firms' balance sheets, as financial pressure enters significantly the investment equation when it is proxied by cash flow, indebtedness and debt burden. The results show differences in the investment sensitivities across countries. For instance, firms in Germany are found to be the ones with the lowest marginal impact of financial pressure on investment rates, while the highest impact has been found for Dutch and Italian firms.

We have also investigated if the differences in sensitivity found across countries can be due to differences in the sample composition and more specifically to sectoral or size composition differences. The results do not point in this direction, as no significant differences have been found in investment rates responsiveness to changes in financial pressure for different size groups. Neither systematic sectoral differences in the sensitivity of investment rates to changes in financial pressure have been found.

The analysis has also given an insight on how, by altering the financial pressure experienced by firms in servicing their debt, monetary policy may operate through the corporate sector. It has been illustrated how the heterogeneity both in the magnitude of the marginal impact of debt burden on investment rates and in the level of indebtedness is important to evaluate potential asymmetries on the impact of changes in monetary policy on investment rates.

Table 1. Summary statistics

			Belgium	France	Germany	Italy	the Netherlands	Spain
I/K	investment rate	mean	0.150	0.170	0.123	0.176	0.156	0.172
		median	0.113	0.116	0.093	0.132	0.129	0.118
Δy	sales growth	mean	0.015	0.023	0.017	0.000	0.019	0.030
		median	0.020	0.023	0.018	0.008	0.018	0.029
(D-L)/A	net indebtedness	mean	0.517	0.433	0.563	0.623	0.512	0.475
		median	0.529	0.449	0.551	0.661	0.528	0.499
db	interest debt burden	mean	0.198	0.183	0.291	0.318	0.186	0.267
		median	0.115	0.093	0.176	0.222	0.120	0.176
CF/A	profitability	mean	0.073	0.089	0.069	0.054	0.097	0.083
		median	0.065	0.078	0.067	0.042	0.090	0.071
Number of firms			3425	43880	532	27607	658	45880
Number of observations			26504	332082	3637	205406	4974	336001
Quoted firms in % of total firms			0.6	0.3	11.8	0.1	7.9	0.1
SMEs in % of total firms			86.6	96.2	35.7	96.8	35.1	98.2
Sectors (% firms)								
Construction			8.4	11.1	6.2	6.1	5.6	12.2
Manufacturing			34.3	24.2	22.0	46.4	35.0	31.5
Services			15.4	24.9	30.5	9.0	10.8	17.8
Trade			33.2	34.1	11.8	33.5	36.8	31.8
Electricity, gas, water supply, transport, storage and communications			8.7	5.8	29.5	5.0	11.9	6.8

Table 2. Baseline specification

	Belgium		Germany		France		Italy		Netherlands		Spain	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
$(I/K)_{it-1}$	0.168	0.186	-0.116	0.324	0.357	0.028	-0.065	0.700	0.041	0.750	0.203	0.169
$(\Delta y)_{it}$	0.072	0.266	0.095	0.112	0.311	0.036	0.430	0.001	0.078	0.374	0.100	0.245
$(\Delta y)_{it-1}$	0.078	0.028	0.091	0.008	0.146	0.441	-0.107	0.417	0.178	0.003	0.192	0.116
$(k-y)_{it-2}$	-0.069	0.020	-0.060	0.022	-0.078	0.121	-0.099	0.072	-0.148	0.007	-0.072	0.029
M_1	0.00		0.00		0.00		0.00		0.00		0.00	
M_2	0.17		0.30		0.05		0.23		0.17		0.16	
Sargan	0.15		0.74		0.10		0.07		0.64		0.80	

Note : All equations include time and sectoral dummies. The equation is estimated using the GMM-SYSTEM estimator using the robust one-step method (Blundelll and Bond, 1998; Arellano and Bond, 1998). Sargan is a Sargan test of over-identifying restrictions (p-value reported for the null hypothesis of instrument validity).M_j is a test of j th -order serial correlation in the fisrt differenced residuals (p-values reported).

Table 3. Baseline specification plus cash flow ratio (CF/A)

	Belgium		Germany		France		Italy		Netherlands		Spain	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
$(I/K)_{it-1}$	0.180	0.156	-0.141	0.167	0.142	0.317	-0.105	0.540	0.112	0.259	0.265	0.058
$(\Delta y)_{it}$	0.005	0.924	0.046	0.431	0.357	0.000	0.470	0.000	0.100	0.193	0.120	0.177
$(\Delta y)_{it-1}$	0.037	0.169	0.063	0.044	0.162	0.153	-0.143	0.252	0.105	0.009	0.237	0.011
$(k-y)_{it-2}$	-0.044	0.040	-0.043	0.037	-0.112	0.020	-0.061	0.115	-0.090	0.004	-0.041	0.073
$(CF/A)_{it-1}$	0.487	0.005	0.275	0.085	0.541	0.002	0.599	0.076	0.373	0.074	0.327	0.040
M_1	0.00		0.00		0.00		0.00		0.00		0.00	
M_2	0.23		0.15		0.12		0.37		0.09		0.14	
Sargan	0.12		0.77		0.16		0.18		0.32		0.65	

Note : see note in Table 2

Table 4. Baseline specification plus indebtedness ratio ((D-L)/A)

	Belgium		Germany		France		Italy		Netherlands		Spain	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
$(I/K)_{it-1}$	0.172	0.069	-0.139	0.200	0.159	0.196	0.049	0.687	0.030	0.737	0.203	0.147
$(\Delta y)_{it}$	0.087	0.094	0.100	0.053	0.489	0.000	0.536	0.000	0.158	0.040	0.114	0.157
$(\Delta y)_{it-1}$	0.081	0.001	0.096	0.004	0.337	0.025	-0.184	0.152	0.143	0.000	0.179	0.104
$(k-y)_{it-2}$	-0.070	0.001	-0.060	0.023	-0.049	0.003	-0.059	0.000	-0.096	0.001	-0.074	0.011
$((D-L)/A))_{it-1}$	-0.055	0.072	-0.022	0.846	-0.058	0.006	-0.075	0.035	-0.109	0.178	-0.055	0.030
M_1	0.00		0.00		0.00		0.00		0.00		0.00	
M_2	0.07		0.20		0.73		0.05		0.35		0.13	
Sargan	0.06		0.87		0.12		0.30		0.39		0.89	

Note: see Note in Table 2

Table 5. Baseline specification plus debt burden ratio (db)

	Belgium		Germany		France		Italy		Netherlands		Spain	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
$(I/K)_{it-1}$	0.155	0.144	-0.108	0.327	0.176	0.069	-0.198	0.103	-0.055	0.325	0.261	0.036
$(\Delta y)_{it}$	0.073	0.188	0.078	0.142	0.398	0.002	0.299	0.000	0.094	0.234	0.093	0.120
$(\Delta y)_{it-1}$	0.081	0.013	0.057	0.045	0.237	0.027	-0.088	0.286	0.165	0.000	0.093	0.140
$(k-y)_{it-2}$	-0.076	0.008	-0.030	0.084	-0.077	0.035	-0.123	0.000	-0.115	0.005	-0.030	0.183
$(db)_{it-1}$	-0.067	0.073	-0.061	0.135	-0.068	0.072	-0.121	0.059	-0.165	0.036	-0.069	0.053
M_1	0.00		0.00		0.00		0.00		0.00		0.00	
M_2	0.11		0.20		0.15		0.63		0.73		0.04	
Sargan	0.36		0.47		0.20		0.01		0.42		0.71	

Note: see Note in Table 2

Table 6. Impact of financial variables on investment. Differential impact for small and medium-size enterprises.

	BE		DE		FR		IT,		NL		ES	
	Coefficient	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**
Profitability	0.210	0.325	0.516	0.016	0.791	0.001	0.306	0.372	0.698	0.002	0.128	0.284
Diff. SMEs	0.332	0.098	-0.461	0.109	-0.298	0.232	0.172	0.595	-0.475	0.055	0.169	0.153
Indebtedness	-0.021	0.597	-0.069	0.584	-0.042	0.246	-0.065	0.039	-0.124	0.147	-0.059	0.338
Diff. SMEs	-0.050	0.181	0.071	0.278	0.021	0.621	0.000	0.999	-0.043	0.585	0.022	0.701
Debt burden	-0.003	0.943	-0.054	0.145	-0.056	0.271	-0.009	0.921	-0.118	0.149	-0.072	0.213
Diff. SMEs	-0.094	0.070	-0.013	0.828	-0.025	0.629	-0.119	0.162	0.039	0.696	0.009	0.871

Note : see Note in Table 2. Diff. SMEs captures, for each financial ratio, the differential impact of that ratio on investment rates for SMEs

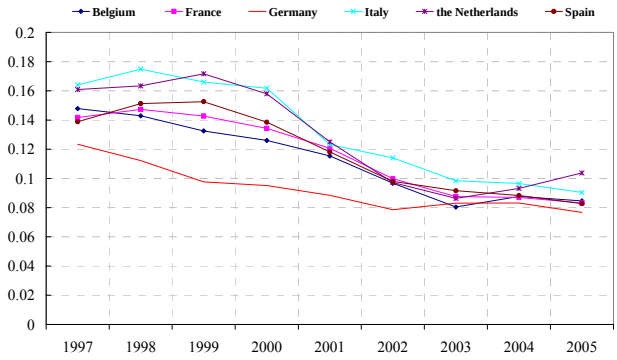
Table 7. Impact of financial variables on investment, allowing different impact for different sectors.

	BE		DE		FR		IT,		NL		ES	
	Coefficient	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
Profitability	0.453	0.004	0.190	0.197	0.696	0.000	0.800	0.000	0.473	0.008	0.452	0.000
Diff. sector 2	-0.072	0.360	0.075	0.283	0.225	0.000	0.017	0.843	0.008	0.953	0.130	0.004
Diff. sector 3	-0.008	0.936	0.113	0.766	0.252	0.000	0.223	0.072	0.021	0.926	0.119	0.003
Diff. sector 4	0.089	0.073	0.032	0.476	0.080	0.073	0.032	0.640	0.131	0.313	0.033	0.265
Diff. sector 5	-0.089	0.116	0.039	0.834	0.042	0.350	0.034	0.485	-0.165	0.112	0.008	0.742
Indebtedness	0.180	0.440	-0.330	0.145	-0.769	0.206	-0.039	0.135	-0.085	0.484	-0.015	0.611
Diff. sector 2	-1.513	0.054	0.294	0.191	1.557	0.371	-0.012	0.882	-0.007	0.965	0.096	0.110
Diff. sector 3	0.004	0.994	0.368	0.361	1.974	0.099	0.192	0.101	0.067	0.799	0.033	0.569
Diff. sector 4	0.057	0.842	0.334	0.154	1.086	0.105	-0.047	0.380	0.199	0.231	-0.006	0.892
Diff. sector 5	-0.527	0.126	0.206	0.436	0.823	0.333	-0.026	0.454	-0.164	0.243	-0.041	0.180
Debt burden	-0.064	0.172	0.027	0.609	-0.111	0.002	-0.140	0.029	-0.109	0.036	-0.082	0.001
Diff. sector 2	-0.164	0.188	0.021	0.750	0.290	0.000	-0.176	0.129	-0.044	0.732	0.131	0.003
Diff. sector 3	-0.063	0.637	0.112	0.763	0.210	0.000	-0.284	0.065	0.002	0.992	0.085	0.020
Diff. sector 4	-0.200	0.393	-0.005	0.915	0.089	0.014	0.092	0.171	0.135	0.272	0.022	0.423
Diff. sector 5	-0.165	0.039	-0.005	0.977	0.013	0.718	-0.010	0.888	-0.178	0.086	-0.015	0.504

Note : see Note in Table 2. Diff. sector j captures, for each financial ratio, the differential impact of that ratio on investment rates for sector j. Manufacturing sector is the reference sector (sector 1). Sector 2 includes firms in the electricity gas, water supply, transport, storage and communication sectors. Sector 3, 4 and 5 includes companies in the construction, services and trade sectors, respectively.

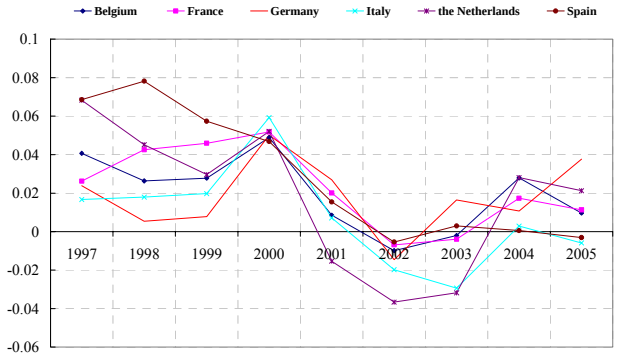
Charts 1-5: Selected variables over time

Chart 1: Investment rate



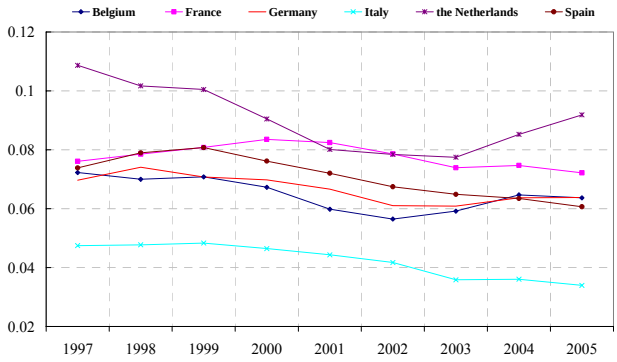
Source: Amadeus, Bureau van Dijk and own calculations

Chart 2: Real sales (annual rate of growth)



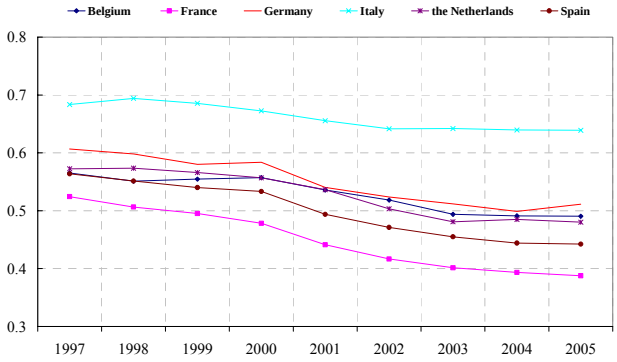
Source: Amadeus, Bureau van Dijk and own calculations

Chart 3: Profitability



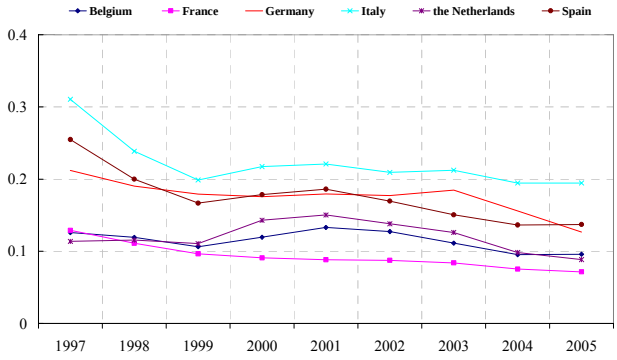
Source: Amadeus, Bureau van Dijk and own calculations

Chart 4: Net indebtedness Interest debt burden



Source: Amadeus, Bureau van Dijk and own calculations

Chart 5: Interest debt burden

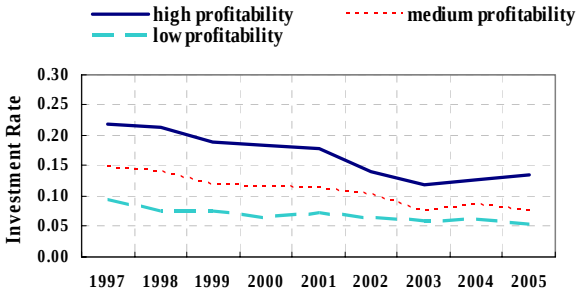


Source: Amadeus, Bureau van Dijk and own calculations

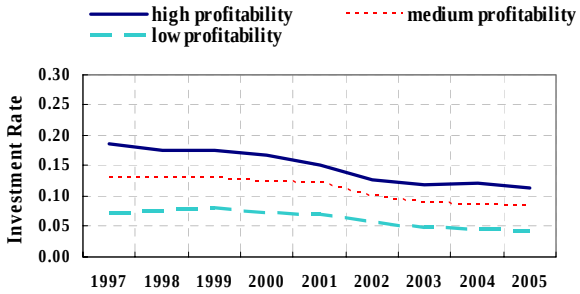
Charts 6-8: Financial positions and level of investment

Chart 6: Profitability and level of investment

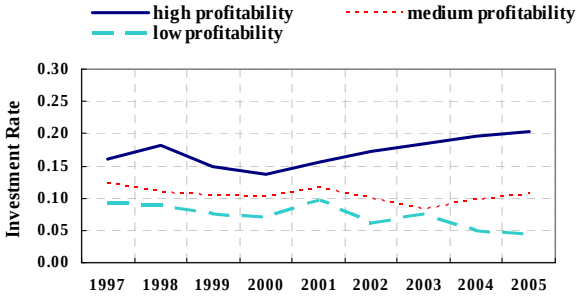
Belgium



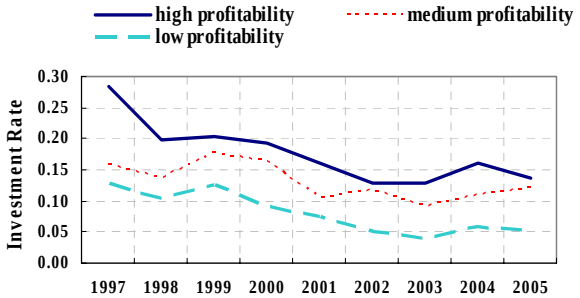
France



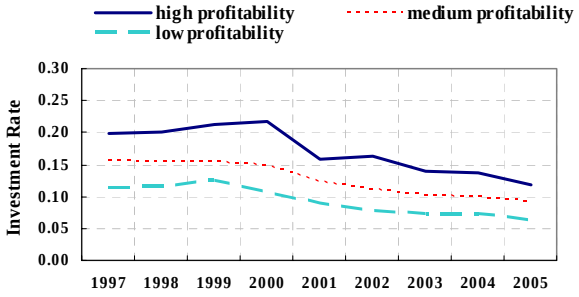
Germany



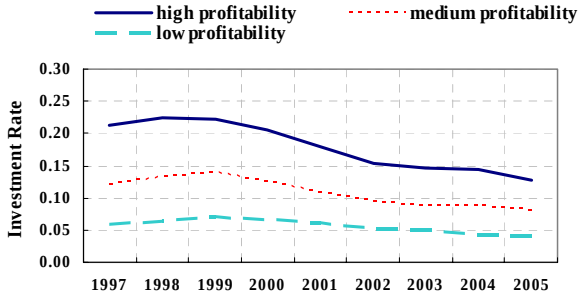
Netherlands



Italy



Spain

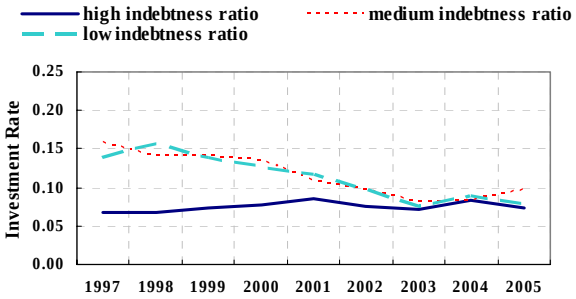


Source: Amadeus, Bureau van Dijk and own calculations

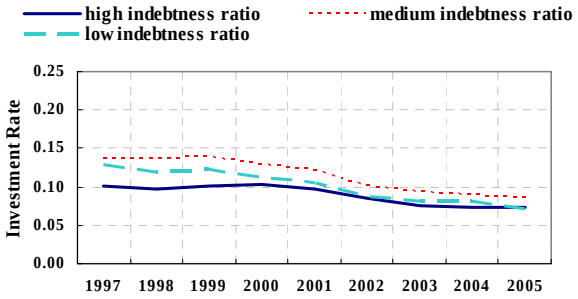
Note: The different panels present the median investment rate in each country for firms with high profitability (above the 90th percentile), medium profitability (firms for which this ratio stands between the 45th and the 55th percentile) and low profitability (lower decile). The investment rate is defined as the ratio of gross fixed capital formation over capital stock, while profitability is the ratio of cash flow over total assets

Chart 7: Indebtedness and level of investment

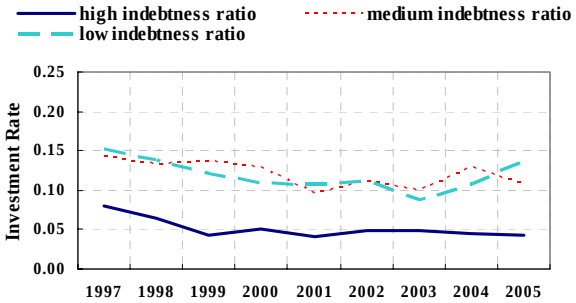
Belgium



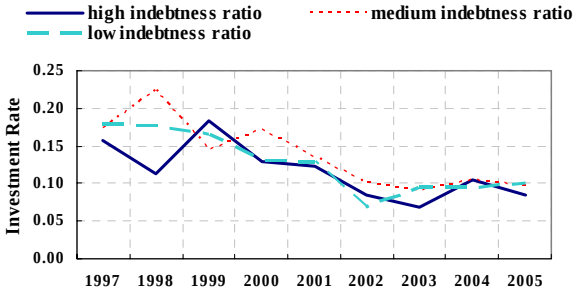
France



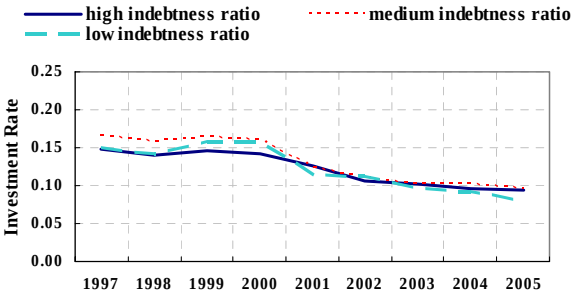
Germany



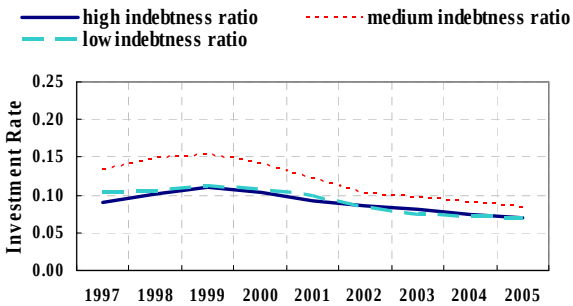
Netherlands



Italy



Spain

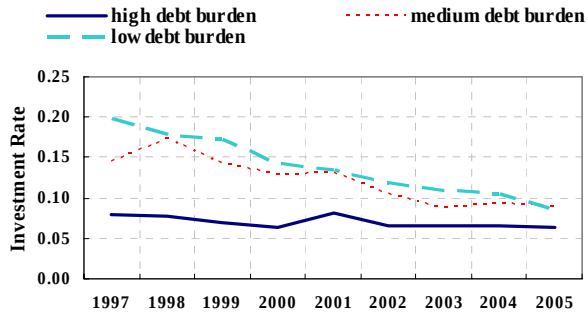


Source: Amadeus, Bureau van Dijk and own calculations

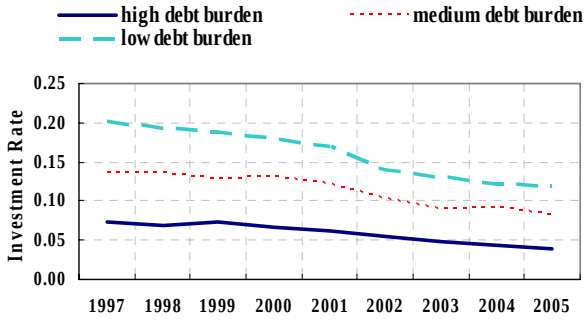
Note: The different panels present the median investment rate in each country for firms with high indebtedness (above the 90th percentile), medium indebtedness (firms for which this ratio stands between the 45th and the 55th percentile) and low indebtednes (lower decile). The investment rate is defined as the ratio of gross fixed capital formation over capital stock, while indebtedness is the ratio of net debt (debt minus cash and cash equivalents) over total assets

Chart 8: Debt burden and level of investment

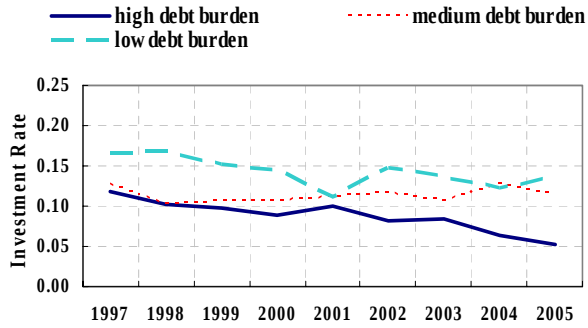
Belgium



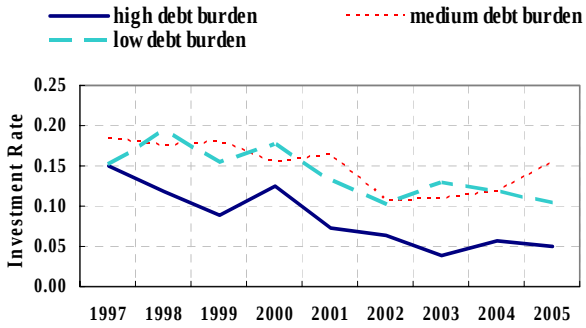
France



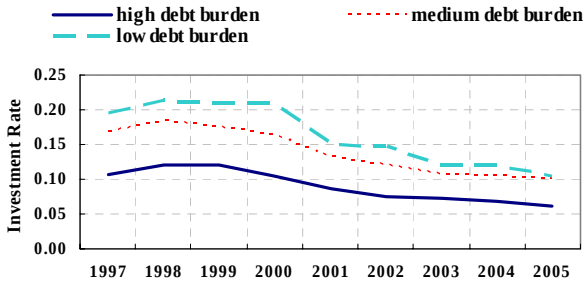
Germany



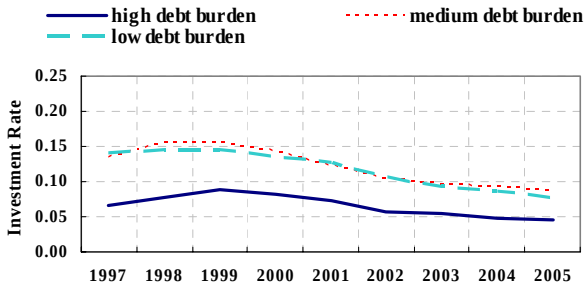
Netherlands



Italy



Spain



Source: Amadeus, Bureau van Dijk and own calculations

Note: The different panels present the median investment rate in each country for firms with high debt burden (above the 90th percentile), medium debt burden (firms for which this ratio stands between the 45th and the 55th percentile) and low debt burden (lower decile). The investment rate is defined as the ratio of gross fixed capital formation over capital stock, while debt burden is the ratio of interest payments over gross revenue plus financial revenue

Appendix 1: Regression results with common instruments for all countries

Table A1. Baseline specification plus cash flow ratio (CF/A)

	Belgium		Germany		France		Italy		Netherlands		Spain	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
$(I/K)_{it-1}$	0.012	0.724	-0.149	0.173	-0.146	0.000	-0.140	0.014	0.112	0.259	0.323	0.000
$(\Delta y)_{it}$	0.045	0.338	0.080	0.185	0.421	0.000	0.250	0.000	0.100	0.193	0.210	0.000
$(\Delta y)_{it-1}$	0.068	0.001	0.066	0.036	0.183	0.000	0.160	0.000	0.105	0.009	0.124	0.000
$(k-y)_{it-2}$	-0.069	0.000	-0.041	0.064	-0.145	0.000	-0.141	0.000	-0.090	0.004	-0.105	0.000
$(CF/A)_{it-1}$	0.635	0.000	0.286	0.070	0.605	0.000	0.783	0.000	0.373	0.074	0.244	0.007
M_1	0.00		0.00		0.00		0.00		0.00		0.00	
M_2	0.99		0.14		0.00		0.71		0.09		0.00	
Sargan	0.20		0.83		0.00		0.00		0.32		0.00	

Note : see note in Table 2

Table A2. Baseline specification plus indebtedness (D-L/A)

	Belgium		Germany		France		Italy		Netherlands		Spain	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
$(I/K)_{it-1}$	0.015	0.606	-0.019	0.872	-0.138	0.000	0.271	0.000	0.030	0.737	-0.111	0.000
$(\Delta y)_{it}$	0.092	0.037	0.047	0.383	0.496	0.000	0.211	0.000	0.158	0.040	0.175	0.000
$(\Delta y)_{it-1}$	0.101	0.000	0.040	0.210	0.226	0.000	0.100	0.000	0.143	0.000	0.146	0.000
$(k-y)_{it-2}$	-0.081	0.000	-0.016	0.428	-0.146	0.000	-0.075	0.000	-0.096	0.001	-0.117	0.000
$((D-L)/A))_{it-1}$	-0.061	0.050	0.035	0.469	-0.102	0.000	-0.115	0.000	-0.109	0.178	-0.032	0.022
M_1	0.00		0.00		0.00		0.00		0.00		0.00	
M_2	0.66		0.78		0.00		0.00		0.35		0.00	
Sargan	0.00		0.93		0.00		0.00		0.39		0.00	

Note: see Note in Table 2

Table A3. Baseline specification plus debt burden (db)

	Belgium		**Germany**		**France**		**Italy**		**Netherlands**		**Spain**	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
$(I/K)_{it-1}$	0.025	0.416	0.010	0.801	-0.182	0.000	0.008	0.883	-0.055	0.325	-0.186	0.000
$(\Delta y)_{it}$	0.103	0.020	0.130	0.022	0.411	0.000	0.183	0.000	0.094	0.234	0.246	0.000
$(\Delta y)_{it-1}$	0.078	0.000	0.071	0.034	0.244	0.000	0.159	0.000	0.165	0.000	0.196	0.000
$(k-y)_{it-2}$	-0.066	0.000	-0.053	0.029	-0.186	0.000	-0.141	0.000	-0.115	0.005	-0.164	0.000
$(db)_{it-1}$	-0.139	0.000	-0.013	0.803	-0.131	0.000	-0.051	0.001	-0.165	0.036	-0.053	0.016
M_1	0.00		0.00		0.00		0.00		0.00		0.00	
M_2	0.00		0.78		0.00		0.01		0.73		0.00	
Sargan	0.02		0.27		0.00		0.00		0.42		0.00	

Note: see Note in Table 2

Appendix 2: Data appendix

Investment (*I*)

The AMADEUS database does not contain data on gross investment directly, but it can be calculated using the data on capital stock and depreciation as follows:

$$I_{it} = K_{it} + K_{it-1} + Depreciation_{it}$$

Capital stock (*K*)

The capital stock is constructed using the perpetual inventory method. Since the values available for the capital stock are at book value (that is, at historical prices), we multiply the value at historical prices for the first year of observation available for each firm by a factor adjusting for historical inflation to get an estimation of the initial value ($\widehat{K}_{it_1}$) of the capital stock at replacement value (that is, at time t_1 prices).

The perpetual inventory formula is then used to obtain the estimated value of the stock of capital at replacement cost:

$$\widehat{K}_{it} = (1-\delta)\widehat{K}_{it-1} + I_{it}$$

where δ is the depreciation rate of the stock of capital (based on aggregate data at country level).

Investment rate (*I/K*)

Investment divided by the capital stock

Indebtedness ratio *((D-L)/A)*

Debt minus cash and cash equivalents divided by total assets

Debt burden *(br)*

Interest payments divided by gross revenue plus financial revenue

Cash flow *(CF/A)*

Post-tax profit plus depreciation of fixed assets divided by total assets

For interest debt burden, when companies have a negative or zero value for the denominator and a positive value for the numerator, the ratio is set equal to the value of the 99th percentile that year; when the numerator is zero, the ratio is set equal to zero, for any value of the denominator.

For all the variables used in the analysis, when the value is over the 99th percentile, this value is changed for that corresponding to this percentile.

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