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THE DYNAMICS OF CAPITAL STRUCTURE DECISIONS

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The dynamics of capital structure decisions*

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Abstract

In this paper we explore the process of convergence to firms' target leverage ratios. Using a unique dataset of micro, small, medium and large firms, we find that this process is very fast, most notably for smaller firms. We further explore these results by analyzing different convergence trajectories. We find that firms that are currently below their target leverage ratio take more time to reach this target than firms with a symmetrical departure point. Furthermore, smaller firms are able to converge faster to their optimal capital structure, regardless of whether they have to increase or decrease their current leverage ratios. Using a duration analysis framework, we also find that firms that have to increase debt to reach their target leverage ratio take more time to do so if they have more free cash-flow.

JEL Codes: G32.

Keywords: Leverage, Trade-off theory, Duration Analysis

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1 Introduction

In the corporate finance literature, there is a wide debate on whether firms have an optimal debt structure and, if they do, how do they converge to this target leverage ratio (Fama and French, 2002, Leary and Roberts, 2010, De Angelo et al, 2011). One of the theoretical pillars of this debate is the trade-off model, which argues that firms choose the optimal level of debt by trading off the benefits of debt against its costs. According to this theory, there is an optimal level of debt which is attained when the marginal benefit equals the marginal cost of an additional unit of debt. More recently, this literature has also focused on the speed of adjustment towards the target leverage ratio, examining the process of convergence to this optimal level of debt (Leary and Roberts, 2005, Flannery and Rangan, 2006, Strebulaev, 2007, Lemmon et al, 2008, Huang and Ritter, 2009).

In this paper we contribute to the current debate by examining several aspects of capital structure decisions. First, we explore the determinants of firms' leverage choices, finding a significant negative relation between profitability and leverage, as in Graham (2000), Fama and French (2002) or Korajczyk and Levy (2003). Second, we test one of the main predictions of the trade-off theory, i.e., whether firms converge to an optimal leverage ratio. We observe that firms in the sample do converge to a target leverage ratio and that the speed of adjustment is actually very fast, when compared to previous evidence. Furthermore, we observe that this speed of adjustment is significantly faster for smaller firms. This latter result may help to explain the faster speed of adjustment when compared to other studies, given that our database is mainly comprised of micro, small and medium firms, whereas most of the literature considers mainly large and publicly traded firms. We argue that this fast speed of adjustment could also reflect the use of firm fixed effects, as discussed by Flannery and Rangan (2006) and Lemmon et al (2008).

In addition, we explore in more detail the different possible adjustment trajectories towards the target. Unlike the first two issues addressed, these different adjustment paths have not been thoroughly explored in the capital structure literature (to the best of our knowledge, the only exceptions are Byoun, 2008, and De Jong et al, 2011). We argue that the direction in which the adjustment towards the target is performed may not be irrelevant when estimating the speed of convergence to the target leverage ratio. As such, we consider that there may be substantial differences in increasing or decreasing leverage to converge to the optimal leverage level. In the first case, the increase in leverage is not entirely a decision of the firm, as it involves finding creditors (either banks or bondholders) willing to provide more credit to the firm. As such, this positive adjustment may be associated with significant costs and frictions. In the second situation, when firms want to decrease the current leverage ratio to reach their optimal target, they are not so dependent on a negotiation with third parties, as the decrease of the amount of debt outstanding is mainly the firms' own decision, even if not necessarily costless. Given these differences in adjustment paths, it is possible that there is some asymmetry in the speed of adjustment, which may be significantly faster when firms want to decrease their leverage. Indeed, we find that firms with a target leverage ratio below their current leverage are able to reach this target faster than firms with a symmetrical departure point. There are several possible explanations for these results. On one hand, this result may reflect the existence of financial constraints in issuing new financial liabilities. On the other hand, firms may prefer to operate (slightly) below their optimal leverage ratio in order to preserve some debt capacity. In addition, for firms operating above their optimal leverage ratio, the faster speed of adjustment associated with a decrease in leverage may reflect a higher flexibility in decreasing outstanding debt. These results are broadly consistent with those of Byoun (2008) and De Jong et al (2011), who also analyze different convergence trajectories. We contribute to extend existing available evidence on this issue by further exploring differences in adjustment theories for firms in different size categories. While most previous studies focus on large publicly traded firms, our dataset allows us to distinguish convergence trajectories of micro, small, medium and large firms. We obtain consistent evidence that the speed of adjustment is decreasing with firm size in all trajectories considered. This shows that smaller firms are able to converge faster to their optimal capital structure, regardless of whether they have to increase or decrease their current leverage ratios.

Finally, we further explore this issue by analyzing the determinants of the time firms take to get close to their target leverage ratio using a duration analysis framework. We find that these determinants do not differ significantly when firms have to increase or decrease their leverage to reach their optimal capital structure, with the exception of the cash flow ratio. In fact, firms that have to increase debt to reach their target take a longer time to do so if they have more free cash flow, given that they face a less severe pressure to obtain external funds. In contrast, firms which aim to reduce debt are able to do so faster if they are able to internally generate more cash flow.

This article is organized as follows. Section 2 reviews the literature on capital structure decisions. Section 3 briefly characterizes the dataset used. Section 4 analyses the determinants of firms' leverage ratios and Section 5 discusses whether firms converge to an optimal leverage ratio. Given the results obtained, in Section 6 different adjustment trajectories towards the target are explored in further detail. Finally, Section 7 summarizes our main findings.

2 How do firms choose their capital structure?

Since Modigliani and Miller's (1958) irrelevance proposition, firm's capital structure decisions have been intensely investigated. The irrelevance proposition states that under strict assumptions, among which is the absence of corporate taxes, the structure of capital is irrelevant to the determination of a company's value. The assumption on taxes proved to be crucial for the irrelevance proposition. In fact, a few years later, Modigliani and Miller (1963) concluded that the introduction of corporate taxes and the possibility of deducting interest on debt from taxable profits would induce firms to be completely financed by debt. However, as this is not usually observed, several authors, including Modigliani and Miller themselves in Modigliani and Miller (1963), argued that bankruptcy costs, and other costs associated with debt, could explain why firms were not totally financed by debt. This discussion on the benefits and costs of debt is central to the trade-off theory of capital structure. According to this theory, there are forces leading firms to less leverage, for instance bankruptcy costs, and forces leading to more leverage, among them the above mentioned tax benefits of debt and the agency costs of free cash flow. The combination of these forces results in the existence of a target leverage at which the value of firms is maximized.

The main predictions of this theory on leverage ratios are related with the profitability of firms. Profitability should have a positive impact on leverage, as it contributes to a decrease in bankruptcy costs. In addition, more profitable firms benefit more from the tax benefits of debt (DeAngelo and Masulis, 1980). As these firms have more free cash-flow, the existence of debt payments also helps to reduce agency costs of equity, by aligning the interests of managers and shareholders (Jensen and Meckling, 1976, and Jensen, 1986). Besides profitability, there are other characteristics of firms that help to explain target leverages. According to theory, bankruptcy costs are expected to be lower for firms with more tangible assets, as these could be used as collateral. In addition, the existence of depreciation expenses helps to explain less leverage, as these expenses result in tax benefits. Finally, in contrast with the above-mentioned agency models, firms with more investments would have less free cash flow for managers to allocate for their own benefit. Hence, for firms with more investments, debt is not as important as a way to monitor and constrain the actions of managers.

This theory has been tested empirically in several papers that evaluate whether firms converge to a target leverage ratio, focusing on the estimation of the speed of adjustment. There is a significant dispersion in the estimated speed at which firms converge to their optimal capital structure. Fama and French (2002) find a relatively slow speed of adjustment (between 7 and 18 per cent). This slow convergence speed raises questions about whether firms are actually moving towards a target leverage ratio. More recently, Huang and Ritter (2009) obtained similar estimates for the speed of adjustment (around 17 per cent), though using a different estimation methodology.

In turn, Flannery and Rangan (2006) and Lemmon et al (2008) find higher speeds of adjustment. By using a different specification from that used by Fama and French (2002), Flannery and Rangan (2006) obtain estimates close to 34 per cent, i.e., each year the firm is one third closer to its optimal leverage ratio. Furthermore, they conclude that more than half of the changes in firms' capital structure may be attributable to the trade-off theory, while other theories may explain only around 10 per cent of these changes. Using a pooled OLS estimator, Lemmon et al (2008) find a relatively low speed of adjustment (13 to 17 per cent), though this estimate increases significantly when they use a fixed effects estimator (36 to 39 per cent). Both Flannery and Rangan (2006) and Lemmon et al (2008) show that using firm fixed effects leads to significantly higher estimates of the speed of adjustment, when compared to a simple pooled OLS estimation. According to their arguments, neglecting firm fixed effects might lead to biased estimates of the speed of adjustment when firms have relatively stable (and unobserved) variables that contribute to a stable leverage ratio.

There are other arguments in the literature to explain why some studies find relatively low speeds of adjustment. For instance, De Angelo et al (2011) explain the slow speed of adjustment with the hypothesis that firms deviate deliberately from their optimal convergence path to the target to issue transitory debt necessary to finance investments. By excluding this effect, these authors obtain a much higher speed of adjustment (60 per cent, compared to 14 per cent if this effect is not considered). In turn, Strebulaev (2007) argues that firms adjust debt infrequently due to transaction costs, thus often deviating from their optimal leverage ratios. Leary and Roberts (2005) also discuss the role of adjustment costs, arguing that it may not be optimal for firms to continuously rebalance their capital structure.

More recently, some discussion emerged on whether the speed of convergence to a target leverage ratio should be different depending on whether firms have to make a positive or a negative adjustment in their current leverage ratio to reach this target. Byoun (2008) finds that firms that have to increase leverage to reach their target record lower speeds of adjustment than firms that have to decrease leverage. This difference is associated with the preference of some firms to preserve debt capacity for future financing needs when the leverage ratio is below the target, thus resulting in a slower adjustment speed. In contrast, firms that are above target and have a financial surplus are able to adjust faster. Similar results are obtained by De Jong et al (2011), who also analyze situations where the trade-off theory conflicts with other capital structure theories.

Some authors have recently analyzed the role of macroeconomic and institutional conditions in the speed of adjustment. Cook and Tang (2010) observe that firms are able to adjust their capital structure faster when macroeconomic conditions are favorable, while Hanousek and Shamshur (2011) argue that firm leverage is very stable even when there are substantial changes in macroeconomic conditions, showing that financial constraints play a key role in explaining the convergence to the target. In turn, Oztekin and Flannery (2012) find that legal and financial features are correlated with the speed of adjustment, as better institutions are associated with lower transaction costs.

It should be noted that, besides the trade-off theory, there are other theories and models that analyze how do firms choose their capital structure. One of the most well-known is the pecking order theory developed by Myers (1984), using the Myers and Majluf (1984) setting of asymmetric information. This theory argues that firms are likely to finance their investments primarily with internal financing, in order to prevent firms from being exposed to the asymmetric information problem. If outside capital is needed, firms are likely to issue debt securities first, that is, those paying a predefined remuneration, which entails lower risk. Only when the firm's debt capacity is reached should the firm consider equity, as it is much riskier and investors would factor in a bigger discount. There is a wide empirical literature that tests several of the predictions of the pecking order theory, contrasting them with the predictions of the trade-off model. Some authors find evidence mainly in favor of the pecking order theory (Shyam-Sunder and Myers, 1999, and Frank and Goyal, 2003), while others show that both theories are relevant and consider complementary dimensions of firms' capital structure decisions (Fama and French, 2002, 2005, Byoun, 2008, Leary and Roberts, 2010, De Jong et al, 2011).

In addition, there are two more recent explanations of capital structure decisions, namely the market timing theory by Baker and Wurgler (2002) and the mechanical stock price explanation by Welch (2004). Baker and Wurgler (2002) argue that managers tend to "time the market" by issuing shares when the equity market is perceived as more favorable. The Welch (2004) explanation of capital structure is based on share price fluctuations, arguing that managers simply let market leverage ratios change because of share price fluctuations.

Our paper focuses on testing some of the predictions of the trade-off theory. Our contribution to the existing literature lies on the analysis of different trajectories of adjustment towards the target. Furthermore, we analyze the determinants of the time firms take to reach their target leverage ratio using a duration analysis framework, to better understand why some firms are able to converge faster to their optimal capital structure.

3 Data

Most of the empirical research on capital structure relies on data for large publicly traded firms. In this paper, we use a dataset available at Banco de Portugal, the Central Balance Sheet Database, which has a wide coverage for micro, small, medium and large firms. This database provides detailed accounting information on Portuguese firms, and is used mostly for economic and statistical purposes, covering around 390 000 firms. Reporting was not compulsory before 2006. Despite that, the database covers around 60 per cent of total gross value added in the Portuguese economy up to 2005, with larger firms being covered more exhaustively than small and medium-sized ones. Even though this bias constitutes a shortcoming, the database is still an extremely rich and unique dataset on non-financial corporations.

From 2006 onwards the dataset covers all firms operating in Portugal, based on a unified report submitted to the Ministry of Finance, Ministry of Justice, Statistics Portugal and Banco de Portugal. In 2006 firms were asked to report information for the previous fiscal year and, as a result, the information in the Central Balance Sheet database from 2005 onwards refers to all companies operating in Portugal, instead of just to a representative sample. The use of data from the Central Balance Sheet database enables to take into account differences in firm size, economic sector and age.

In Table 1 we present the debt structure of all the firms included in the database. We observe that bank loans are the main source of external finance for the companies included in the sample, accounting for more than 55 per cent of total debt. Trade credit accounts for slightly more than one fifth of firms' debt, though its importance has declined during the sample period. Debt securities represent a smaller fraction of firms' debt (less than 10 per cent), even for the larger firms in the sample, reflecting the fact that very few Portuguese firms raise funding in wholesale debt markets.

In order to enhance the quality of the data used for our analysis and to obtain non-spurious regression results, we need to apply some filters to the data. First, we remove from the dataset observations with a negative value of assets and observations with zero employees. We also remove observations for which there are less than two consecutive years of data and with no information on firm foundation date. Moreover, to deal with spurious outlier observations, we winsorize observations below (and above) the 1st (99th) percentile for some relevant variables. We end up with a total number of about 350 000 observations for the period from 1990 to 2007. These observations correspond to about 48 000 firms. On average, we observe firms for 9 years.

Table 1 also displays summary statistics for the leverage ratio, defined as bank loans and bonds as a percentage of total assets. When the whole sample is considered, the leverage ratio is, on average, 32 per cent, having remained relatively stable during the sample period. This stability is in line with evidence found by Lemmon et al (2008). When only the reduced sample is considered, after applying the abovementioned filters, the leverage ratio decreases to around 20 per cent. Moreover, the median values for this sub-sample are much lower, standing at 4 per cent.

We created four classes of firms with different sizes considering simultaneously the value of sales and the number of employees (firm size definitions are presented in Table 2). Most of the firms in the sample are micro firms, having less than 10 employees and less than 2 million euros in turnover. As it would be expected, most of these firms do not use external finance, more specifically bonds and bank loans, as the median leverage ratio for these firms is zero during the sample period. Small firms also represent a significant part of the sample. Their median leverage ratio stands at 8 per cent, referring almost exclusively to bank loans. Medium-sized firms are the most leveraged (their median leverage ratio is 14 per cent). Finally, large firms show a slightly lower median leverage ratio (12 per cent). Most bonds are issued by this last group of firms.

We also grouped firms according to their age. The average age of a firm in this dataset is 18 years and 10 per cent of the observations correspond to firms with less than 5 years. On the other hand, the 90th percentile corresponds to firms with 36 years. We defined four age classes according to the percentiles 25, 50 and 75 (see Table 3). We observe that leverage seems to be (non-linearly) increasing with firm age.

Finally, we also examine differences between economic sectors (Table 4), observing that the most leveraged sectors (taking into account median values) are real estate firms (18.4 per cent), followed by utilities (9.9), mining firms (7.5) and construction (6.1).

4 Explaining leverage ratios

One preliminary step in this paper is to analyze the determinants of the leverage ratio. Our empirical research strategy is to estimate a fixed effects panel data model such that:

$$\frac{D}{A}_{it} = f_i + \beta_1 + \beta_2 X_{it} + \psi_t + \varepsilon_{it}. \quad (1)$$

The dependent variable is $\frac{D}{A}_{it}$, the leverage ratio, defined as bonds and loans as a percentage of total assets.[1] X_{it} is a set of relevant firm characteristics which may affect firms' leverage, including $\frac{Cash-flow}{Assets}$, *Sales Growth*, $\frac{Tangible\ Assets}{Assets}$, *Assets*, *Group Dummy*, *Liquidity*, *R&D Dummy* and *Depreciation*. All these variables are firm-specific and time-varying. We control for firm and time fixed effects (f_i and ψ_t, respectively).

$\frac{Cash-flow}{Assets}$ is computed as net earnings before provisions and depreciation, scaled by firms' assets.[2] *Sales growth* is the year-on-year change of sales, which is included in the regressions to control for firm's growth. $\frac{Tangible\ Assets}{Assets}$, the share of tangible assets in total assets, controls for the asset structure of the firm, and also for the collateral potentially available for debt contracts. Firms whose assets are mostly comprised of intangibles may find it harder to obtain bank financing, thus displaying lower leverage ratios. In fact, as bankruptcy costs play a prominent role in the trade-off theory, asset tangibility is predicted to have a positive impact on leverage. We also consider a dummy variable which considers whether the firm belongs to a group, as this may yield important differences in terms of capital structure decisions, given the possibility of access to intra-group funding. If a firm records assets or liabilities within a group, then this variable takes the value one. In our regressions we also control for *Liquidity*, defined as cash and short-term securities as a percentage of short-term

[1] The leverage measure is based on book values. In the capital structure literature, many papers use the market value instead, which is available for publicly traded firms. However, several authors show that using book or market leverage does not yield substantial differences in the results (Fama and French, 2002, Flannery and Rangan, 2006, Huang and Ritter, 2009, De Jong et al, 2011).

[2] Alternatively, it would be possible to use profitability measures, such as net earnings over assets. The results obtained with this alternative variable are similar to those associated with the cash-flow ratio.

debt. Another potentially relevant explanatory variable is the *R&D Dummy*, which takes the value one whenever the firm records some R&D investment. In addition, this variable, together with the variable *Depreciation*, also helps to control for non-debt tax shields. Thus, we also control for depreciations and provisions, measured as a percentage of total assets. Finally, given the apparent importance of firm size on leverage ratios, we use the logarithm of assets as a control variable as well.

In Table 5 we present a brief statistical description of the variables considered in this analysis and in Table 6 we include a correlation matrix of the same variables.

Table 7 presents our first regression results. In the first column we estimate equation (1). We control, as in all other regressions, for time and firm fixed effects. The coefficients obtained for the control variables are all statistically significant at 5 per cent (except for the *Group Dummy*).

We obtain a significant negative coefficient for cash-flow, thus showing that firms with more available funds will use less external funding than other companies. Many authors also found a significant negative relation between these two variables (see, for example, Graham, 2000, Fama and French, 2002, Korajczyk and Levy, 2003, Frank and Goyal, 2003), including for small and medium enterprises (Sogorb-Mira, 2005, Degryse et al, 2010). In contrast, Korteweg (2010) recently found that more profitable firms have higher optimal debt ratios.

Firms with stronger sales growth show lower leverage ratios, even though this effect is very small. If this variable is seen as a proxy for growth opportunities, this negative coefficient is consistent with the trade-off theory, as risk tends to be higher for these firms, pushing up bankruptcy costs. Firms with more tangible assets (and hence with more collateral potentially available for credit) are also more indebted than other firms, as the trade-off theory predicts. Firm size seems to be extremely important in explaining leverage ratios, as larger firms show much higher leverage ratios than other firms, other firm characteristics being controlled for. This is consistent with the view that larger firms tend to be more diversified and, hence, less volatile, as discussed by Fama and French (2002). Firms with stronger liquidity buffers are also less indebted. In contrast, we observe that firms engaging in R&D activities show higher leverage ratios than others. Finally, firms with more significant depreciations and provisions, as a percentage of their assets, also record higher leverage ratios. This effect does not comply with the predictions of the trade-off theory, as the tax benefits of debt should be less relevant for firms that already have significant depreciation and provisioning expenses.

Nevertheless, the results for this specification may be seriously affected by simultaneity issues. In fact, it is possible that there are some unobserved time-varying variables which simultaneously affect the leverage ratio and other firm-specific variables, thus leading to potential endogeneity problems. In order to minimize this problem, we consider an alternative specification, in which all explanatory variables are lagged by one year, such that:

$$\frac{D}{A}_{it} = f_i + \beta_1 + \beta_2 X_{it-1} + \psi_t + \varepsilon_{it} \tag{2}$$

This specification is presented in the second column of Table 7. The estimated coefficient for cash-flow remains consistent with that previously observed: firms with more available funds are less indebted than other firms, controlling for other relevant firm characteristics. As regards the other firm control variables, there are some differences worth noticing. In particular, *Sales Growth* and *Depreciation* are no longer statistically significant at a 5 per cent level. For all other control variables, the results are generally consistent with those observed in the previous specification.

Our results are broadly in line with those obtained by Fama and French (2002). These authors estimate a model similar to (2) without considering firm-level fixed effects. However, we consider that the inclusion of firm level-fixed effects is crucial, as they control for time invariant unobserved heterogeneity at the firm level.

The results presented in the previous section suggest that the determinants of firm leverage may be considerably different depending on firms' size and age. In order to better explore these possible differences, we estimate the regression with all explanatory variables lagged by one year for different size and age cohorts. The results of these estimations are displayed in Table 8. First, we observe that the estimated coefficient for $\frac{CF}{A}_{it-1}$ remains negative and statistically significant regardless of firm size (columns 1-4). Moreover, we observe that this coefficient becomes larger, in absolute value, as firm size increases, thus suggesting that large firms with more internal funds available use less external funding than comparable smaller firms. We obtain a similar result when we estimate the regressions by firm age: older firms have a similar behavior to that of larger firms (columns 5-8).

In what concerns the other control variables, the results are broadly consistent with those previously obtained. *Sales Growth*, *Group Dummy* and *Depreciation* are not significant in most firm groups and the remaining variables hold the same signals, when significant.

For robustness purposes, we also estimate the regression for different sectors. In Table 8 we present the results for manufacturing firms, as these represent a large part of the sample (column 9). The results are broadly consistent with those previously obtained and there is a slight improvement in the model's adjustment quality.

Micro firms might be different in some aspects, possibly not being so able to optimize their leverage choices, as they usually face more restrictions in access to funding. To be sure that these firms do not bias the results, we estimate the regression excluding these micro firms, obtaining consistent results (column 10).

It is important to notice that more than 40 percent of the firms in the sample do not rely either on bank or market financing, thus having null leverage ratios. Given the possibility that this feature may affect the results of the estimations, we also present in Table 8 the regression estimated only for firms with positive leverage (column 11). The only difference in the determinants of leverage ratios for this specific group of firms is that *Depreciation* now has a positive significant impact on leverage. Nevertheless, the results of the other control variables remain unchanged. Considering that the decision on whether to seek external funding or not can be made before the choice of the leverage ratio, we also estimate a discrete choice regression to empirically analyze this preliminary decision to use external funds. In this regression, the dependent variable is a binary variable which takes the value one when the firm has positive leverage. The results are also shown in Table 8 (column 12). Firms with positive leverage ratios have lower cash-flow ratios than firms with no external funding, other characteristics controlled for. All other firm characteristics considered yield results consistent with those previously obtained.

Furthermore, we also test alternative definitions of leverage, considering only long-term debt (bonds and bank loans), as done by Flannery and Rangan (2006), and a broader definition of leverage, that also includes debt from suppliers of tangible assets (columns 13 and 14, respectively). Again, the results remain broadly consistent with those obtained in the other specifications.

Finally, we also control for the total amount of debt a firm has outstanding on the group it belongs to, instead of having a simple dummy variable indicating whether or not the firm has debt from the group (column 15). The impact of this variable on leverage is now statistically significant, though not economically meaningful.

All in all, our results are broadly consistent with those obtained in the literature on the determinants of leverage ratios. We find that leverage ratios are higher for firms with lower profits, more tangible assets, lower liquidity ratios and positive R&D investments, as well as for larger firms.

5 Do firms have a target leverage ratio?

As discussed in Section 2, firms may have target leverage ratios to which they converge over time. This is a central result of the trade-off theory. In order to test whether this conclusion is valid for the firms in our dataset, we estimate a two-step regression, in a spirit similar to that of Fama and French (2002). In the first step, we estimate a regression as defined in equation (2). However, given that the distribution of the leverage ratio has a clear discontinuity, with more than 40 percent of the firms having null leverage ratios, we have to treat differently the firms without leverage. To control for that effect, we include a dummy variable (contemporaneous and lagged) that takes the value one only when the firm has positive leverage. We then compute the target leverage ratio for all firms, defined as the fitted values of this regression. When firms have a negative target leverage ratio, we consider that their target is zero.

In the second-step regression, we use the fitted values of the first-step as a proxy for the target leverage (TL) in a partial adjustment model. In this model, changes in leverage ratios partly reflect the difference between firms' target leverage and the previous year's observed leverage ratio. In this second step we estimate the following regression:

$$\Delta\frac{D}{A}_{it} = f_i + \beta_1 + \beta_2 adjust_{it} + \beta_3 \Delta\frac{CF}{A}_{it} + \beta_4 \Delta\frac{CF}{A}_{it-1} + \beta_5 \frac{Inv}{A}_{it} + \beta_6 \frac{Inv}{A}_{it-1} + \psi_t + \varepsilon_{it} \quad (3)$$

where,

$$adjust_{it} = \left[TL_{it} - \frac{D}{A}_{it-1} \right]$$

$\frac{CF}{A}$ is the ratio of cash-flow to assets, and the variable $\frac{Inv}{A}$ measures investment expenditures scaled by total assets. The estimation of this partial adjustment model allows us to test some of the predictions of the trade-off theory given that, according to this theory, firms have target leverage ratios and move toward the target over time.[3] Hence, β_2, which measures the speed of adjustment, should be positive. The investment and cash flow variables are included to control for any short-term movements in leverage away from the target, in line with the work of Fama and French (2002). The results of this estimation are presented in

[3]In the presence of a cointegration relationship, a different estimation approach should be followed. However, as the results presented in Table 9 use almost 40,000 firms, observed over 5 years, on average, the stationarity and cointegration tests for panel datasets cannot benefit from the necessary asymptotic properties. In this case, as the panel dataset has a small T and a large N, the existing panel data procedures are sufficient to consider very general temporal correlation patterns (see Hsiao, 2003).

the first column of Table 9. The adjustment variable has a coefficient of 0.62, which means that every year firms get roughly 60 percent closer to their target leverage ratio. Hence, the results are clearly in favor of an adjustment toward the target, thus providing evidence supporting the trade-off theory. Our results are consistent with the ones in Fama and French (2002), Flannery and Rangan (2006), Antoniou et al (2008) and Huang and Ritter (2009), although the speed of adjustment found by these authors is much slower than ours. Flannery and Rangan (2006) and Lemmon et al (2008) found that using firm fixed effects leads to significantly higher estimates of the speed of adjustment, when compared to a simple pooled OLS estimation.[4] In both papers, the authors argue that it is appropriate to account for unobserved firm heterogeneity through fixed effects when firms have relatively stable (and unobserved) variables that contribute to a stable leverage ratio. Neglecting these fixed effects might lead to biased estimates of the speed of adjustment.

Given that firm size may be associated with different adjustment capabilities, we also run the second step regression for different firm size groups (columns 2-5). Interestingly, we observe that there are indeed different adjustment speeds (in contrast with what is found by Flannery and Rangan, 2006, who do not find significant differences across firm size using a large sample of publicly traded firms). In fact, we find that smaller firms are able to adjust much faster towards their target leverage ratio. The adjustment variable has a coefficient of 0.73 for micro firms and of only 0.45 for large firms.[5] This difference between smaller and larger firms may also help to explain the differences between our results and those obtained by Fama and French (2002), given that their dataset covers only large firms.

In columns 6 to 9 we run the same regressions for firms in different age quartiles. As observed for firm size, the speed of adjustment is decreasing with firm age: younger firms converge much faster to their target leverage ratios. Indeed, for firms in the first quartile this adjustment is almost immediate, though it should be noted that these firms display very low leverage ratios, as shown in Table 3. These results show that younger and smaller firms are able to reach their target leverage ratios faster, possibly reflecting more flexibility in the adjustment of their capital structure.

For robustness purposes, we estimate these regressions for other sub-groups of firms and for other leverage definitions. In column 10 we present the results only for the most representative sector in the sample, manufacturing firms, obtaining an adjustment speed

[4] The same pattern is observed in our sample. The results are available upon request.

[5] We conducted the same exercise but estimating target leverage ratios in separate regressions according to firm size. The results remain consistent.

of 0.59.[6] As micro firms may face more active financing constraints that compromise their ability to optimize their leverage choices (i.e., borrowing close to the limit granted by banks), we also exclude them from the regressions, to ensure that these firms do not bias the results. Again, the results are consistent (column 11). Given the discontinuity in the distribution of leverage ratios, we estimate the same regression including a dummy for firms with positive leverage and, in addition, we run the regression only for the firms with positive leverage (columns 12 and 13, respectively). The results obtained are perfectly consistent with the ones for the full sample. Finally, as in the previous section, we also test alternative definitions of leverage. The speed of adjustment is faster when only long term debt is considered (column 14). This result is in line with DeAngelo et al (2011), who find that firms may deviate from their adjustment paths by issuing transitory debt to finance investments. When these transitory financing decisions are excluded, DeAngelo et al (2011) find that the speed of adjustment is significantly faster. In turn, for the broader definition of leverage (that includes also debt from suppliers of tangible assets), the results are globally in line with those obtained with the baseline definition of leverage (column 15).

6 Exploring the adjustment towards the target

The highly significant speed of adjustment found in the previous section may not be the same for all firms, depending on how are they currently positioned vis-à-vis their optimal leverage ratio. For instance, if a firm has to increase debt to reach its target, it will have to find new creditors (either banks or bondholders) willing to provide more credit to the firm. In contrast, if the firm needs to decrease its leverage ratio to reach an optimal capital structure (either by letting loans reach their maturity or by doing pre-payments on loans outstanding), it will not be so dependent on the negotiation with third parties, as the decrease of the amount of debt outstanding is mainly the firms' own decision. As such, the positive adjustment (i.e., when firms have to increase leverage) may be associated with higher costs and frictions than a negative adjustment. Furthermore, some firms may prefer to operate (slightly) below their optimal leverage ratio in order to preserve some debt capacity. Hence, given these differences in adjustment paths, we argue that there may be some asymmetry in the speed of adjustment, which may be significantly faster when firms want to decrease their leverage.

[6] In addition to this, we also estimate separately target leverage ratios for all the sectors considered in the sample. The results are broadly consistent and are available upon request.

This issue had not, until recently, been explored in the empirical capital structure literature. To the best of our knowledge, the only exceptions are Byoun (2008) and De Jong et al (2011), who analyze firms' adjustment trajectories by considering simultaneously several dimensions and predictions of the trade-off and pecking order theories. Byoun (2008) finds that firms that have to increase leverage to reach their target record slower speeds of adjustment than firms that have to decrease leverage. This difference is associated with the preference of some firms to preserve debt capacity for future financing needs when the leverage ratio is below the target, thus resulting in a slower adjustment speed. In contrast, firms that are above target and have a financial surplus are able to adjust faster. Similar results are obtained by De Jong et al (2011), who also analyze situations where the trade-off model conflicts with the pecking order theory.

In this section we shed some more light on this issue, by focusing exclusively on the estimation of the speed of adjustment for firms with different initial positions in relation to their target leverage ratio. In addition, given the differences in adjustment speeds found for firms across size categories, we evaluate the speed of adjustment in separate trajectories for these different groups of firms. Finally, to better understand why some firms converge faster than others to their target leverage ratio, we explore the determinants of this process using a duration analysis framework.

6.1 Positive and negative adjustment paths

As discussed above, positive and negative adjustment paths may be associated with some asymmetry in the speed of adjustment. In this section we analyze whether the speed of adjustment is significantly faster when firms want to decrease their leverage.

In Table 10 we provide some evidence on these adjustment paths. Even though our main goal is to distinguish firms with positive and negative adjustments, we have to consider two different types of positive adjustments. More specifically, we distinguish firms that have to make a positive adjustment to reach their target having no leverage as a departure point, from those firms that already have debt and have to increase their current leverage ratio. We consider that this distinction is relevant because firms that are currently not borrowing may face more difficulties in reaching their optimal leverage ratio (or, alternatively, they may prefer to remain debt-free, even if that is not consistent with the predicted optimal capital structure for these firms). Firms that do not make any adjustments from one period to another are excluded from this analysis.

We observe that two thirds of the firms are currently below the target leverage ratio, what may suggest that many firms face funding constraints. As expected, the current leverage ratio is much higher for the firms that have to decrease leverage, even though the target leverage ratio for firms with leverage is very similar, regardless of whether they are above or below their target. For firms without leverage, their predicted target is, nevertheless, relatively small (4 per cent, compared to 19 per cent for the remaining firms). In sum, there are fewer firms that need to reduce their current debt levels, even though the magnitude of the adjustment for these firms is larger.

Larger firms display higher leverage ratios, as well as higher targets. There are proportionally more large firms that need to increase their leverage and, furthermore, the magnitude of this adjustment is more significant. Many micro firms do not have debt in their balance sheets (nearly 40 per cent) and their target is comparatively low (2.5 per cent). However, there are also many micro firms that may be considered as over-indebted (33 per cent), having to decrease their observed leverage ratio more than other firms.

In Table 10 we also analyze differences in sectors, observing that there is a significant heterogeneity in leverage ratios and adjustment paths. Whereas in some sectors many firms with debt operate below their target leverage ratios (most notably in mining, manufacturing and education), in others, a large number of firms may be considered as over-indebted (especially real estate, agriculture and construction[7]). The magnitude of adjustment is, by far, larger for real estate firms.

The next step is to explore these differences in adjustment trajectories in a multivariate setting. In order to do that, we estimate equation (3) for the three possible adjustment paths: negative adjustment, positive adjustment for firms with leverage and positive adjustment for firms without leverage (Table 11). Comparing firms that currently show positive leverage (columns 1 and 2), we observe that the speed of adjustment is faster for firms that have to decrease leverage to reach their optimal capital structure (63 per cent, against 53 per cent for firms that need to make a positive adjustment). As discussed above, in the absence of financial constraints and other frictions, it would be expected that the speed associated with negative and positive adjustments would be relatively similar. However, as the decision to increase debt is not strictly the firm's own, the speed of positive adjustments should be slower, as it requires finding a borrower willing to finance the firm's investment projects.

[7] In the utilities sector, many firms also display leverage ratios above their target. However, some firms in this sector are regulated and capital structure decisions may be affected by regulatory restrictions.

When the three possible adjustment paths are compared, the faster adjustment is associated with firms that currently do not have leverage (73 per cent). This result is somewhat unexpected, as these firms have to move from a debt-free capital structure to a positive leverage ratio. In other words, these firms need more than to increase the amount of debt outstanding, as they have to engage into a new lending relationship, being more exposed to asymmetric information problems. However, we observe, in Table 10, that this group of firms typically has a very low target leverage ratio, what should explain this convergence speed, as the amounts involved should be relatively small.

In Table 12 we further explore the differences in the speed of adjustment for different trajectories. In Panel A we compare the speed of adjustment for different firm size categories. For all the adjustment paths, the speed is decreasing with firm size, confirming that smaller firms are able to converge faster to their optimal capital structure, regardless of whether they have to increase or decrease their current leverage ratios. The faster adjustment is observed when firms still do not have debt for all firm sizes, except for the larger firms in the sample. However, it should be noted that very few large firms have null leverage ratios.

When we consider the entire distribution of adjustments, our results reflect both very small and very large adjustments. However, some of these small adjustments may be transitory and/or driven by reasons other than the optimization of the capital structure. Furthermore, the economic and financial costs of adjustments of different magnitudes are substantially different, thus making it relevant to explore possible differences in the speed of adjustment. Hence, in Panel B we explore this question, focusing only on firms that have to make significant adjustments to reach their optimal capital structure. To do that, we consider only adjustments above the median. When all firm size categories are considered, there are some interesting changes in the results. The speed of adjustment for firms that have a leverage ratio significantly above the median is now much faster. For these firms, the costs of being significantly over-indebted may be so high that they commit to reducing their debt ratios as fast as possible. In turn, the speed of adjustment for firms without leverage is now substantially lower. This result reinforces our previous argument to explain the fast adjustment process for these firms (based on the fact that these were mainly small adjustments). When only large adjustments are considered, their speed is considerably slower and closer to that of other firms that have to increase leverage ratios. Nevertheless, this speed continues to be fast, if we consider that these firms have to create a lending relationship. Still, these are firms with very low target leverage ratios. When we run these regressions for firms in different size categories, we continue to observe that, in general, smaller firms adjust faster than larger firms.

In sum, we observe that firms which have a negative adjustment are able to reach their target faster than firms that have to increase leverage. This result seems to suggest the existence of financial constraints in issuing new financial liabilities, as well as relatively high flexibility in decreasing leverage if firms are operating above their equilibrium leverage ratio.

6.2 The determinants of the speed of adjustment in a duration analysis framework

The results obtained so far show that firms converge rapidly to their target leverage ratio. The speed of adjustment is especially fast for the smallest firms in the sample, what can help to explain the differences between our results and those usually found in the literature, as most available databases include mainly large and publicly traded firms. To further explore these results, we analyze the determinants of the time firms take to get close to their target leverage ratio using a duration analysis framework. As a baseline definition we consider that the firm is close to the target when the observed leverage ratio is within the interval [90%,110%] of the initial estimated target.[8]

This econometric framework allows us to estimate semiparametric Cox regressions in order to evaluate which firm characteristics are relevant to explain differences in the time firms take to reach their target ratio. The Cox proportional hazard model may be defined as: $h(t, X(t), Z(t)) = \kappa(X(t), Z(t))h_0(t)$, where $\kappa(.)$ is a non-negative function of $X(t)$ and $Z(t)$, and $h_0(t)$ is defined as the baseline hazard, which is common to all firms (individual hazard functions differ from each other proportionally, as a function of $\kappa(X(t), Z(t))$. This is a partly non-parametric approach, given that we can estimate unknown parameters of $\kappa(.)$ without specifying the form of the baseline hazard. In these regressions, an estimated coefficient lower than 1 should be interpreted as contributing a longer time until the firm reaches its target.

We find that firms which belong to a group or that have higher liquidity ratios take, on average, a longer time to converge to their optimal debt ratio (Table 13, column 1). In turn,

[8] For robustness purposes we also consider the broader interval [80%, 120%]. Our approach differs from the one by Leary and Roberts (2005) who also employ duration analysis to assess how do firms rebalance their leverage to stay within an optimal range.

larger firms[9], as well as those with more tangible assets, more expenses in depreciations and provisions and with some R&D investments are able to reach their targets sooner.

As discussed previously, the rebalancing pattern of firms with positive or negative adjustments may be very different, even though this issue has not been much discussed in the literature. By running separate regressions for the three possible adjustment paths (columns 2-4), we observe that the signal of the determinants does not differ significantly with the exception of the cash flow ratio. In fact, firms that have to increase debt to reach their target take a longer time to do so if they have more available cash flow, given that they face a less severe pressure to obtain external funds. In contrast, firms which aim to reduce debt are able to do so faster if they are capable of internally generating more cash flow, as expected. Sales growth is only significant for firms that have to decrease leverage, thus providing further support to this argument.

Belonging to a group only influences the time to reach the target for the firms that have to increase leverage, starting from a zero leverage ratio. If these firms belong to a group, they take more time to reach this target, what should reflect the fact that these firms are able to have access to funding within the group, thus not feeling so pressured to obtain external funding.

7 Concluding remarks

In this paper we examine several dimensions of one of firms' most important financial decisions: capital structure. In order to do so, we explore the information contained in the Portuguese Central Balance Sheet database. We observe that banks are the most important source of long-term debt for Portuguese non-financial corporations, as access to market funding is to some extent limited to larger firms.

Our analysis was performed using two complementary steps. First, we explored the determinants of firms' leverage ratios, finding a significant negative relation between profitability and leverage. Second, we focused our analysis on the speed of adjustment towards an optimal target ratio. The optimal leverage ratio was estimated using the analysis of the

[9]It should be noted that the result regarding firm size is not directly comparable to the different speeds of adjustment found in the previous subsection for different firm size categories, as here we are relying on a continuous measure of size, based solely on total assets (whereas the definition of firm size categories is based on turnover and number of employees). When we run this Cox regression for the four size groups, we find that micro and small firms with more total assets converge faster to their target leverage ratio, whereas medium and large firms with more assets show the opposite pattern (results available upon request).

determinants of firms' leverage ratios, in a spirit similar to that of Fama and French (2002). We observe that most firms converge to a target leverage ratio and that the speed of adjustment is actually very fast, when compared to previous evidence. Furthermore, we observe that this speed of adjustment is much faster for smaller firms. This latter result may help to explain the faster speed of adjustment we obtain when compared to other studies, given that our database is mainly comprised of micro, small and medium firms, whereas most of the literature considers mainly large and publicly traded firms.

Given the speed of adjustment found in this and other studies, we further explored the possibility that different adjustment paths are associated with difference convergence speeds. This issue has not been explored in great detail in the capital structure literature. However, we argue that this is an important dimension of the convergence process towards the target, as the adjustments performed may be very different depending on whether the firm is currently above or below its optimal leverage ratio. When we do not distinguish between these two possibilities, only the average behavior is captured. Hence, we consider separately two possible adjustment trajectories, distinguishing between negative and positive adjustments. Furthermore, there may be two different types of positive adjustments, depending on whether or not the firm currently has debt outstanding. We consider that this distinction is relevant because firms that are currently not borrowing may face higher difficulties in reaching their optimal leverage ratio (or may prefer to remain debt-free, even if that is not consistent with the predicted optimal capital structure for these firms).

In our sample, we find a significant asymmetry in positive and negative adjustment trajectories, observing that firms with a target leverage ratio below their current leverage are able to reach this target faster than firms that are currently above this optimal level. There are several possible explanations for these results. On one hand, this result may reflect the existence of financial constraints in issuing new financial liabilities. On the other hand, firms may prefer to operate (slightly) below their optimal leverage ratio in order to preserve some debt capacity. In addition, for firms operating above their optimal leverage ratio, the faster speed of adjustment associated with a decrease in leverage may reflect a higher flexibility in decreasing outstanding debt.

In addition, we further explore the speed of adjustment by analyzing the determinants of the time firms take to get close to their target leverage ratio using a duration analysis framework. We find that the main difference between positive and negative adjustment paths is related to the cash flow ratio. When firms have to increase debt to reach their target, they take a longer time to do so if they have more available cash flow, possibly reflecting the fact that they have less pressure to obtain external funds. In contrast, firms which aim to reduce debt are able to do so faster if they are able to internally generate more cash flow.

The results obtained illustrate the relevance of considering the heterogeneity of firms' characteristics when analyzing capital structure decisions. As most of the empirical research on this topic focuses on large publicly traded firms, several important aspects may be left unexplained when smaller firms are not part of the sample. Furthermore, examining differences in firms' adjustment trajectories towards the optimal capital ratio may also provide important insights, as illustrated by our results.

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Tables and Figures

Table 1 – Debt decomposition and leverage of the corporate sector – Central Balance Sheet sample

	Debt composition of the total sample (% of total debt)				Leverage [(Loans + Bonds)/Assets]		
	Loans (1)	Debt securities	Trade credit (2)	Other debt	Total Sample (3)	Average values for the reduced sample (4)	Median values for the reduced sample
1990	50.7	6.5	22.5	19.5	32.1	25.4	3.0
1991	49.8	5.7	22.4	21.3	30.7	25.2	2.3
1992	50.3	5.4	21.5	22.2	30.7	25.1	1.8
1993	55.9	4.9	18.3	20.4	30.1	24.7	0.7
1994	48.5	7.8	18.6	24.7	26.6	24.5	0.7
1995	50.8	6.7	23.6	18.4	29.6	22.2	1.6
1996	49.4	6.7	24.6	18.7	29.5	20.3	2.0
1997	50.0	8.0	23.4	18.0	29.5	21.0	2.4
1998	49.2	9.1	23.8	17.4	27.3	18.9	3.7
1999	50.3	9.9	22.3	16.9	30.4	20.9	4.8
2000	56.3	4.7	22.1	16.1	31.5	21.0	7.3
2001	58.0	4.1	21.3	15.7	32.9	22.2	7.2
2002	59.0	4.1	20.8	15.4	32.7	20.8	7.5
2003	58.5	3.7	20.6	16.5	32.2	18.9	7.7
2004	58.3	6.0	19.7	15.0	32.9	19.4	7.1
2005	55.2	4.4	21.2	18.4	33.1	20.3	5.9
2006	55.9	4.5	20.6	18.4	34.8	20.7	5.3
2007	56.5	5.0	19.7	17.9	35.6	19.8	5.2
Total	55.2	5.4	21.0	17.7	32.5	20.7	4.4
Number of observations	1 319 202	1 319 202	1 319 202	1 319 202	1 319 202	348 291	348 291
Number of firms	388 356	388 356	388 356	388 356	388 356	48 631	48 631
Median number of years a firm	3	3	3	3	3	9	9

Source: Central Balance Sheet database.

Notes: weighted averages except for the last column which reports median values. (1) It includes loans granted by other firms in the same financial group and Accounts Payable to suppliers of fixed assets. (2) It considers only Accounts Payables. (3) It includes loans granted by other firms in the same financial group and Accounts Payables to suppliers of fixed assets. (4) Reduced sample after the application of filters.

Table 2 – Characterization of data by firm size

	Number of employees (E)	Annual Sales (S) in million euros	Number of observations	Number of firms	Leverage (median)
Micro	E ≤ 10	S ≤ 2	168,188	35,018	0.0
Small	10 < E ≤ 50	2 < S ≤ 10	120,734	25,764	8.3
Medium	50 < E ≤ 250	10 < S ≤ 50	47,272	9,120	14.2
Large	E > 250	S > 50	12,097	1,982	12.4

Note: the sum of the column with the number of firms is higher than 50 000 as firms changed from one class size to another.

Table 3 – Characterization of data by firm age

Age class	Firm age in number of years (Y)	Number of observations	Leverage (median)
1	$Y \leq 7$	76,526	0.6
2	$7 < Y \leq 13$	88,688	4.3
3	$13 < Y \leq 22$	92,222	6.2
4	$Y > 22$	90,855	5.6

Table 4 – Leverage by sector

	Number of observations	Leverage mean	Leverage median
Agriculture	11,647	14.6	5.8
Trade	82,369	12.5	5.4
Construction	50,388	15.3	6.1
Education	1,303	13.6	4.8
Fishing	1,100	14.1	4.9
Health care	1,709	12.6	2.8
Manufacturing	144,205	12.0	5.3
Mining	3,754	13.2	7.5
Other	2,525	11.1	1.5
Other services	7,032	10.5	1.5
Real estate	3,725	25.1	18.4
Tourism	7,884	12.1	0.0
Transports	29,454	7.1	-
Utilities	1,196	19.9	9.9
Total	348,291		

Table 5 – Summary statistics

	N	mean	sd	min	p5	p25	p50	p75	p95	max
Leverage	348 291	12.4	16.7	0.0	0.0	0.0	4.4	20.6	47.8	81.1
CF_A	341 670	7.0	12.4	-67.9	-12.0	2.2	6.5	12.6	26.3	51.7
Inv_A	341 400	5.5	9.1	-10.7	0.0	0.0	1.5	6.9	25.5	55.5
Sales growth	276 004	5.9	38.4	-100.0	-46.7	-10.5	2.9	17.6	65.4	293.0
Tang_assets	344 896	26.0	22.6	0.0	0.4	6.9	20.2	40.5	71.5	91.5
ln_Assets	348 291	13.2	2.0	0.0	10.2	11.9	13.1	14.5	16.6	23.4
D_group	348 291	0.2	0.4	0.0	0.0	0.0	0.0	0.0	1.0	1.0
Liquidity	338 581	55.9	156.3	0.0	0.3	3.1	11.2	38.1	245.8	1851.4
D_RD	348 291	0.2	0.4	0.0	0.0	0.0	0.0	0.0	1.0	1.0
Dep_prov_A	344 938	6.3	5.9	0.0	0.1	2.0	4.7	8.7	18.2	35.1

Notes: Leverage is defined as bonds and loans over total assets. CF_A is net earnings before provisions and depreciation as a % of assets. Inv_A stands for investment as a % of assets and Tang_assets is the share of tangible assets in total assets. D_group is a dummy variable which takes the value one when the firm is consolidated in a group. Liq is a measure of liquidity, defined as short term securities and cash as a % of short term debt. D_RD is a dummy variable which takes the value one whenever the firm has invested in R&D. Dep_prov_A is depreciations and provisions for the year as a % of total assets.

Table 6 – Correlation matrix

	Leverage	CF_A	Inv_A	Sales growth	Tang_asset	Ln_assets	D_group	Liquidity	D_RD	Dep_prov_A
Leverage	1									
CF_A	-0.1417*	1								
Inv_A	-0.0135*	0.2132*	1							
Sales growth	-0.0215*	0.2083*	0.1390*	1						
Tang_assets	0.0494*	0.1695*	0.4042*	0.0471*	1					
Ln_assets	0.3247*	-0.0061*	-0.0142*	0.0241*	0.0585*	1				
D_group	0.1226*	-0.0189*	-0.0247*	-0.0065*	0.0404*	0.4613*	1			
Liquidity	-0.1584*	0.0965*	-0.0508*	-0.0222*	-0.0672*	-0.1629*	-0.0651*	1		
D_RD	0.1383*	0.0062*	0.0498*	0.0077*	0.1233*	0.3669*	0.2454*	-0.0650*	1	
Dep_prov_A	-0.1045*	0.4019*	0.3627*	0.0614*	0.5032*	-0.1862*	-0.0624*	-0.0047	0.0036	1

Notes: * indicates that the correlation is significant at the 5% level. Leverage is defined as bonds and loans over total assets. CF_A is net earnings before provisions and depreciation as a % of assets. Inv_A stands for investment as a % of assets and Tang_assets is the share of tangible assets in total assets. D_group is a dummy variable which takes the value one when the firm is consolidated in a group. Liq is a measure of liquidity, defined as short term securities and cash as a % of short term debt. D_RD is a dummy variable which takes the value one whenever the firm has invested in R&D. Dep_prov_A is depreciations and provisions for the year as a % of total assets.

Table 7 – Regressions

Table 7 - Regressions

Dependent variable: leverage

	All firms	Lagged variables
CF_A	-0.15	-0.09
	-41.34	*-23.12*
Sales growth	-0.006	-0.001
	-8.17	*-1.24*
Tangible assets	0.03	0.04
	8.09	*9.24*
Log assets	4.43	3.47
	39.45	*27.60*
D_group	-0.16	-0.14
	-1.00	*-0.82*
Liquidity	-0.004	-0.002
	-16.10	*-8.60*
D_RD	0.41	0.47
	3.39	*3.55*
Dep_prov_A	0.03	-0.005
	3.10	*-0.45*
Constant	-45.82	-33.99
	-31.58	*-20.85*
Number of observations	260,794	200,357
Number of firms	46,903	40,979
R-sq: within	0.063	0.039
between	0.143	0.129
overall	0.120	0.109

Notes: t-ratios in italics. Time and firm fixed-effects and robust standard errors are considered. Leverage is defined as bonds and loans over total assets. CF_A is net earnings before provisions and depreciation as a % of assets. Tang_assets is the share of tangible assets in total assets. D_group is a dummy variable which takes the value one when the firm is consolidated in a group. Liq is a measure of liquidity, defined as short term securities and cash as a % of short term debt. D_RD is a dummy variable which takes the value one whenever the firm has invested in R&D. Dep_prov_A is depreciations and provisions for the year as a % of total assets.

Table 8 – Robustness regressions

Dependent variable: leverage

	By firm size:				By firm age:				Robustness:						
	Micro firms	Small firms	Medium firms	Large firms	1st quartile	2nd quartile	3rd quartile	4th quartile	Manufacturing firms	All firms excluding micro	Firms with positive leverage	Dependent variable: dummy leverage	Dependent variable: long term leverage	Dependent variable: leverage (broad definition)	Controlling for debt from group
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
CF_A	-0.04	-0.12	-0.21	-0.27	-0.03	-0.05	-0.08	-0.12	-0.11	-0.16	-0.16	-0.01	-0.04	-0.09	-0.09
	-9.23	*-15.70*	*-13.56*	*-8.53*	*-3.36*	*-6.91*	*-9.76*	*-14.58*	*-18.19*	*-23.19*	*-22.38*	*-20.52*	*-14.93*	*-17.35*	*-23.20*
Sales growth	-0.001	-0.003	-0.004	-0.001	0.000	-0.003	-0.004	0.002	0.000	-0.002	-0.002	0.000	0.000	0.001	-0.001
	-0.48	*-2.27*	*-1.63*	*-0.18*	*0.11*	*-1.91*	*-2.52*	*1.08*	*0.20*	*-1.94*	*-1.73*	*2.39*	*-0.41*	*1.11*	*-1.22*
Tangible assets	0.02	0.05	0.04	0.08	0.01	0.04	0.03	0.03	0.04	0.05	0.03	0.01	0.04	0.11	0.04
	3.65	*6.44*	*3.37*	*3.01*	*1.38*	*5.49*	*3.74*	*3.85*	*6.94*	*8.04*	*4.60*	*21.17*	*13.27*	*21.03*	*9.18*
Log assets	2.81	3.95	4.47	4.43	1.59	2.49	2.71	4.21	3.70	4.00	3.05	0.52	1.86	4.54	3.49
	15.94	*16.90*	*11.90*	*6.18*	*4.92*	*9.28*	*10.12*	*15.43*	*19.03*	*21.05*	*16.12*	*81.92*	*21.10*	*28.43*	*27.75*
D_group	-1.05	-0.19	-0.06	-0.02	-0.61	-0.61	0.21	0.10	-0.06	-0.08	-0.15	-0.14	0.12	-0.30	-
	-2.43	*-0.69*	*-0.21*	*-0.04*	*-1.18*	*-1.71*	*0.69*	*0.36*	*-0.24*	*-0.40*	*-0.74*	*-7.18*	*0.87*	*-1.55*	-
Liquidity	-0.001	-0.004	-0.01	-0.02	-0.002	0.001	-0.001	-0.003	-0.004	-0.005	-0.002	-0.002	0.001	-0.002	-0.002
	-4.58	*-6.25*	*-6.78*	*-3.25*	*-2.05*	*1.28*	*-2.81*	*-7.41*	*-8.53*	*-9.07*	*-2.05*	*-37.36*	*3.60*	*-7.04*	*-8.61*
D_RD	0.36	0.45	0.48	0.52	-0.07	-0.17	0.35	0.80	0.61	0.52	0.31	0.13	0.25	0.51	0.46
	1.19	*2.29*	*2.04*	*1.15*	*-0.17*	*-0.69*	*1.56*	*3.58*	*3.47*	*3.55*	*2.07*	*7.45*	*2.40*	*3.53*	*3.50*
Dep_prov_A	0.04	-0.01	-0.03	-0.04	0.03	-0.02	0.01	-0.03	-0.02	-0.03	0.04	-0.01	-0.03	-0.02	0.00
	2.85	*-0.66*	*-1.02*	*-0.53*	*1.21*	*-1.33*	*0.61*	*-1.31*	*-1.42*	*-1.51*	*2.52*	*-6.17*	*-4.00*	*-1.13*	*-0.41*
Debt from group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*-3.23*
Constant	-25.03	-40.85	-51.99	-54.47	-9.49	-20.67	-23.95	-44.28	-38.09	-41.95	-21.69	-6.23	-21.82	-48.45	-34.24
	-11.98	*-13.30*	*-8.80*	*-4.55*	*-2.38*	*-5.64*	*-6.88*	*-11.90*	*-14.18*	*-15.93*	*-8.55*	*-73.51*	*-18.95*	*-23.08*	*-20.99*
Number of observations	83,578	74,684	32,926	9,169	28,443	54,018	58,572	59,324	91,740	116,779	126,064	200,357	200,357	200,357	200,357
Number of firms	23,532	17,687	6,610	1,571	13,306	19,118	19,614	13,080	16,115	22,750	30,458	40,979	40,979	40,979	40,979
R-sq within	0.024	0.052	0.065	0.071	0.011	0.020	0.023	0.042	0.045	0.054	0.034	-	0.022	0.067	0.039
between	0.127	0.121	0.093	0.070	0.096	0.109	0.121	0.156	0.159	0.093	0.032	-	0.092	0.117	0.131
overall	0.108	0.109	0.090	0.072	0.087	0.095	0.111	0.124	0.139	0.080	0.032	-	0.071	0.106	0.110

Notes: t-ratios in italics. Time and firm fixed-effects and robust standard errors are considered. All explanatory variables are lagged by 1 year. Leverage is defined as bonds and loans over total assets. CF_A is net earnings before provisions and depreciation as a % of assets. Tang_assets is the share of tangible assets in total assets. D_group is a dummy variable which takes the value one when the firm is consolidated in a group. Liq is a measure of liquidity, defined as short term securities and cash as a % of short term debt. D_RD is a dummy variable which takes the value one whenever the firm has invested in R&D. Dep_prov_A is depreciations and provisions for the year as a % of total assets. The dummy leverage takes the value one when firms have positive leverage. Long term leverage considers long term loans and bonds as a percentage of total assets. The broad definition of leverage includes debt from suppliers of tangible assets. Debt from group considers the total amount of debt obtained within the economic group a firm belongs to.

Table 9 – Target leverage ratio – two step regressions

Dependent variable: change in leverage

	Two-step regressions														
		By firm size:				By firm age:				Robustness:					
	Full sample	Micro firms	Small firms	Medium firms	Large firms	1st quartile	2nd quartile	3rd quartile	4th quartile	Manufac turing firms	All firms excluding micro	Full sample (dummy leverage)	Firms with positive leverage	Dependent variable: long term leverage	Dependent variable: leverage (broad definition)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Adjustment	0.62	0.73	0.62	0.54	0.45	1.00	0.86	0.75	0.56	0.59	0.56	0.60	0.58	0.79	0.59
	131.81	*90.57*	*85.75*	*54.08*	*23.59*	*78.77*	*90.14*	*85.00*	*65.67*	*87.43*	*101.28*	*128.09*	*115.87*	*140.66*	*129.19*
D.CF_A $_t$	-0.090	-0.052	-0.120	-0.188	-0.234	-0.064	-0.080	-0.089	-0.097	-0.092	-0.144	-0.089	-0.168	-0.014	-0.095
	-33.85	*-16.20*	*-23.16*	*-18.40*	*-12.22*	*-10.75*	*-16.42*	*-16.11*	*-17.61*	*-25.53*	*-32.58*	*-33.62*	*-33.12*	*-10.77*	*-32.65*
D.CF_A $_{t-1}$	-0.030	-0.010	-0.041	-0.079	-0.094	-0.025	-0.029	-0.030	-0.042	-0.034	-0.056	-0.029	-0.068	-0.010	-0.040
	-13.34	*-3.81*	*-8.72*	*-9.25*	*-6.01*	*-4.27*	*-6.58*	*-6.44*	*-9.57*	*-10.61*	*-14.03*	*-12.79*	*-15.38*	*-8.47*	*-15.16*
Inv_A $_t$	0.036	0.039	0.026	0.043	0.066	0.028	0.018	0.027	0.047	0.038	0.032	0.036	0.049	0.011	0.192
	11.00	*8.41*	*4.75*	*4.85*	*2.97*	*3.31*	*2.94*	*4.07*	*7.00*	*8.51*	*7.01*	*11.05*	*9.61*	*5.69*	*46.29*
Inv_A $_{t-1}$	0.022	0.013	0.022	0.050	0.081	0.003	0.020	0.026	0.020	0.022	0.031	0.020	0.029	0.010	0.029
	7.76	*3.06*	*4.92*	*6.47*	*3.99*	*0.44*	*3.57*	*4.27*	*3.69*	*5.87*	*7.94*	*7.18*	*6.83*	*5.40*	*8.53*
Dummy leverage	-	-	-	-	-	-	-	-	-	-	-	2.391	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	*24.90*	-	-	-
Constant	-0.84	0.27	-1.22	-2.25	-3.18	0.82	0.07	-0.75	-1.23	-1.02	-1.45	-2.18	0.51	-0.69	-2.02
	-5.47	*0.91*	*-5.32*	*-8.99*	*-4.31*	*1.11*	*0.28*	*-2.18*	*-4.35*	*-9.00*	*-8.13*	*-13.37*	*2.15*	*-6.84*	*-12.07*
Number of observations	190,512	77,362	72,177	32,046	8,927	26,406	51,290	56,295	56,521	88,026	113,150	190,512	121,418	197,708	194,351
Number of firms	39,861	22,436	17,319	6,509	1,549	12,567	18,422	19,104	12,706	15,774	22,376	39,861	29,741	40,825	40,421
R-sq: within	0.36	0.43	0.37	0.33	0.28	0.58	0.50	0.43	0.33	0.35	0.33	0.37	0.33	0.56	0.37
between	0.07	0.10	0.08	0.05	0.05	0.12	0.10	0.08	0.06	0.07	0.06	0.08	0.07	0.27	0.07
overall	0.16	0.20	0.15	0.12	0.11	0.20	0.18	0.14	0.12	0.16	0.14	0.17	0.13	0.39	0.17

Notes: t-ratios in italics. Time and firm fixed-effects and robust standard errors are considered. Leverage is defined as bonds and loans over total assets. CF_A is net earnings before provisions and depreciation as a % of assets. Inv_A stands for investment as a % of assets. All other variables defined in previous tables. For columns (14) and (15), specific target leverage ratios were considered (i.e., for long term leverage and for the broad definition of leverage, respectively).

Table 10 – Positive versus negative adjustments

Panel A

Firm size	% of observations			Leverage (median)			Target (median)			Adjustment (median)		
	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage
Micro firms	32.6	28.5	38.8	23.9	7.7	0.0	16.3	16.6	2.5	-12.3	7.8	2.5
Small firms	33.6	37.9	28.6	28.6	9.3	0.0	19.5	19.0	4.6	-10.9	8.9	4.6
Medium firms	35.1	44.5	20.4	31.9	11.7	0.0	22.8	22.2	8.1	-10.1	9.8	8.1
Large firms	28.7	50.6	20.7	35.8	10.2	0.0	26.3	25.9	11.9	-10.8	13.5	11.9
Total	33.3	36.3	30.4	28.5	9.4	0.0	19.1	19.0	4.3	-11.1	9.0	4.3

Panel B

Sector	% of observations			Leverage (median)			Target (median)			Adjustment (median)		
	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage
Agriculture	39.0	32.0	29.1	31.6	8.6	0.0	18.6	18.8	4.4	-14.7	8.8	4.4
Trade	33.1	35.0	31.9	28.7	9.3	0.0	19.0	19.0	4.4	-11.3	8.9	4.4
Construction	38.3	34.2	27.5	30.6	10.3	0.0	18.9	18.6	4.0	-14.4	8.8	4.0
Education	33.3	38.3	28.5	32.2	7.5	0.0	19.7	19.3	5.0	-12.6	9.7	5.0
Fishing	34.7	37.0	28.3	31.2	9.2	0.0	20.2	21.8	5.4	-15.3	11.2	5.4
Health care	31.6	36.1	32.3	28.3	8.0	0.0	19.1	18.9	6.3	-12.7	9.0	6.3
Manufacturing	33.0	38.3	28.7	27.5	9.6	0.0	19.3	19.1	4.1	-9.9	8.9	4.1
Mining	32.8	41.2	26.0	27.7	9.2	0.0	19.9	19.9	5.4	-10.6	10.0	5.4
Other	26.5	35.9	37.6	26.3	9.9	0.0	19.3	21.7	5.7	-10.0	9.9	5.7
Other services	24.5	37.9	37.5	28.1	6.4	0.0	19.5	19.9	6.5	-11.4	11.2	6.5
Real estate	52.0	26.8	21.2	43.9	9.5	0.0	23.0	22.4	8.3	-22.1	9.9	8.3
Tourism	30.4	33.4	36.2	33.3	7.5	0.0	20.1	21.1	4.9	-16.4	11.2	4.9
Transports	24.0	34.5	41.5	23.9	7.4	0.0	17.0	18.2	3.7	-10.3	9.3	3.7
Utilities	43.8	29.8	26.4	40.6	8.0	0.0	25.7	25.0	8.0	-17.1	11.9	8.0
	33.3	36.3	30.4	28.5	9.4	0.0	19.1	19.0	4.3	-11.1	9.0	4.3

Notes: A negative adjustment means that the firm's current leverage ratio is above its target. Firms that do not make any adjustments from one period to another are excluded from this analysis. Observations labeled as with or without leverage are classified using the lagged values for this variable.

Table 11 – Target leverage ratio with negative and positive adjustments

		Dependent variable: change in leverage Two-step regressions		
		Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage
		(1)	(2)	(3)
	Adjustment	0.63	0.53	0.73
		68.45	*68.03*	*62.66*
	D.CF_A $_t$	-0.202	-0.125	-0.035
		-23.65	*-21.86*	*-10.78*
	D.CF_A $_{t-1}$	-0.081	-0.053	0.012
		-10.74	*-10.43*	*3.94*
	Inv_A $_t$	-0.052	0.078	0.050
		-5.90	*12.55*	*9.63*
	Inv_A $_{t-1}$	0.053	0.029	-0.001
		7.11	*5.66*	*-0.35*
	Constant	5.96	-4.79	-1.75
		13.26	*-17.64*	*-9.33*
	Number of observations	57,026	63,124	51,970
	Number of firms	19,734	20,538	18,117
R-sq:	within	0.26	0.15	0.34
	between	0.06	0.01	0.23
	overall	0.10	0.04	0.25

Notes: t-ratios in italics. A negative adjustment means that the firm's current leverage ratio is above its target. Time and firm fixed-effects and robust standard errors are considered. Leverage is defined as bonds and loans over total assets. All other variables defined in previous tables. We consider that the firm has to make a negative adjustment (column 1) if the target leverage ratio is below the observed leverage ratio and the opposite for positive adjustments. There are two different types of positive adjustments: for firms with and without debt in the previous period (columns 2 and 3, respectively).

Table 12 – Positive versus negative adjustments by firm size

Panel A

Firm size	Speed of adjustment		
	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage
Micro firms	0.72	0.60	0.86
Small firms	0.60	0.57	0.68
Medium firms	0.58	0.53	0.58
Large firms	0.54	0.46	0.43
Total	0.63	0.53	0.73

Panel B

Firm size	Speed of adjustment (for adjustment above the median)		
	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage
Micro firms	0.81	0.73	0.80
Small firms	0.68	0.69	0.62
Medium firms	0.65	0.57	0.59
Large firms	0.72	0.48	0.36
Total	0.72	0.56	0.61

Notes: the speed of adjustment is the coefficient for the variable adjustment in each regression (each cell refers to a different regression). All these coefficients are significant at a 1% confidence level. A negative adjustment means that the firm's current leverage ratio is above its target.

Table 13 – Cox proportional hazard regressions

	Dependent variable: time to target			
	Full sample	Negative adjustment	Positive adjustment with leverage	Positive adjustment without leverage
	(1)	(2)	(3)	(4)
CF_A $_{t}$	0.999	1.022	0.990	0.997
	-0.52	*8.93*	*-5.57*	*-0.78*
Sales growth $_{t-1}$	1.001	1.001	1.000	0.999
	2.17	*2.42*	*0.64*	*-1.27*
Tangible assets $_{t}$	1.003	1.002	1.001	1.004
	5.75	*2.19*	*0.97*	*2.39*
Log assets $_{t}$	1.148	1.055	0.982	1.061
	18.97	*4.13*	*-1.46*	*2.35*
D_group $_{t}$	0.861	1.047	0.913	0.662
	-4.65	*0.93*	*-1.91*	*-3.45*
Liquidity $_{t}$	0.995	0.999	0.997	0.995
	-19.35	*-3.96*	*-7.35*	*-8.32*
D_RD $_{t}$	1.159	1.060	1.138	1.271
	5.14	*1.28*	*3.08*	*2.46*
Dep_prov_A $_{t}$	1.009	1.000	1.014	1.013
	3.38	*0.07*	*3.39*	*1.63*
Log pseudo likelihood	-73147	-24236	-28052	-6594
Number of observations	225753	45262	46399	49536
Number of failures	46833	18301	18974	17673
Number of subjects	7837	3001	3470	835
Time at risk	226854	45262	46399	49536

Notes: z-scores in italics. The dependent variable is the time a firm takes to reach its target leverage ratio, considering that a firm is close to the target when the observed leverage ratio is within the interval [90%,110%] of the initial estimated target. An estimated coefficient lower than 1 should be interpreted as contributing a longer time until the firm reaches its target. All variables defined in previous tables. We consider that the firm has to make a negative adjustment (column 2) if the target leverage ratio is below the observed leverage ratio and the opposite for positive adjustments. There are two different types of positive adjustments: for firms with and without debt in the previous year (columns 3 and 4, respectively).

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