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di

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Tutti i saggi sono soggetti al referaggio di due Membri del Comitato Scientifico prima di essere pubblicati nella Collana dei Working Paper Cranec edita da Vita e Pensiero.

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www.vitaepensiero.it

ISBN 978-88-343-5348-6

Investment, Implicit Debt Targets and Debt Maturity

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October 2022

Abstract

We analyse industrial firms' financial policies by modelling investment and debt issuances as endogenous variables. In our setup, firms issue costly short-and long-term debt to cover their capital expenditure. This strategy does not assume the existence of explicit debt targets but allows the recovery of *implicit* debt targets from firms' investment and financing decisions. The empirical analysis reveals sizeable cross-sectional variation: Implicit debt targets vary with financial conditions, firm size, and investment opportunities. Furthermore, we find that the magnitude of the implicit debt target ratio is sensitive to the investment type.

Keywords: Implicit Debt Targets; Debt Maturity; Financial Cost; Maturity-matching.

1 Introduction

Following the seminal work of Myers (1977), a vast body of literature on corporate finance has analysed the relevance of leverage targets, estimated the speed of adjustment toward these targets, and studied the determinants of debt levels. The most recent examples, such as Frank and Shen (2019), use a simple two-factor model composed of the market-to-book ratio and asset size to calculate leverage targets from firm-level regressions, finding that this simple model of leverage can explain several dimensions of corporate financing decisions. Although Yin and Ritter (2020) find evidence consistent with the existence of debt targets, the authors suggest that the speed of adjustment toward the target leverage is rather low. By contrast, DeAngelo and Roll (2016) and DeAngelo et al. (2017) provide evidence that leverage dynamics are unstable and difficult to rationalise within the standard models used in the literature. They argue that, while the existence of an optimal leverage target, grounded in trade-off theory, might be appealing and consistent from a theoretical perspective, the

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resulting dynamics can be at odds with the actual financial policies adopted by firms and their managers. DeAngelo et al. (2011) propose an alternative model in which the investment policy is endogenously determined because firms use debt as a short-term instrument to meet their investment needs, and leverage targets are strictly related to investment opportunities. The authors provide evidence that the model accurately predicts the industry leverage target ratios. More recently, DeAngelo (2022) further develops these views by suggesting that the main focus of corporate managers is to ensure reliable and prompt access to capital markets to meet expected and unexpected capital needs, rather than to follow a permanent leverage target arising from a cost-benefit analysis of liabilities only. Similarly, DeAngelo (2021) highlights the need for a theoretical approach consistent with the evidence that business firms tailor the use of debt to match changes in the composition of their asset portfolios, emphasising the interdependence between asset and liability decisions. In line with this view, Korteweg et al. (2022) find that firms adjust their capital structure following the need to finance capital expenditure, working capital, and inventories.

We contribute to the extant literature by developing and estimating a theoretical model in which investment policy and debt issuance are endogenous variables and firms issue costly short-and long-term debt to finance their capital expenditure. This strategy does not assume the existence of explicit debt targets; instead, it allows for the recovery of *implicit* debt targets from firms' investment and financing decisions. In the presence of both linear and quadratic cost terms for debt, optimizing behavior involves the definition of implicit debt targets, but these targets are contingent on investment opportunities. In this work we define these contingent targets in a theoretical model and recover the correspondent estimated values from reduced-form estimates of the model based on a large panel of U.S. firms. We then analyze how these targets vary as a function of the type of investment, the risk profile and the size of business firms.

Specifically, the model nests a cost function for external finance into Tobin's Q model with financial frictions. Hence, the model includes both quadratic industrial adjustment costs and convex costs in external finance because of capital market imperfections. Our financial cost function exhibits debt maturity heterogeneity between short-and long-term debt and is composed of linear and non-linear terms that capture transaction costs and information costs, respectively. Our specification allows the retrieval of implicit debt targets from the estimated parameters of investment equations, which depend on two critical determinants: investment opportunities, consistent with DeAngelo et al. (2011) and Frank and Shen (2019), and the convexity parameters associated with risk premium effects. In addition, we calculate implicit targets specific to each financing source, in line with the findings of Bontempi et al. (2020) that short-and long-term debt follow different dynamics.

We estimate separate investment equations for fixed assets, inventories, and working capital in our empirical analysis. Furthermore, we derive the corresponding implicit debt targets because a maturity-matching strategy can help reduce refinancing risks and requires different debt strategies for different types of investment. For instance, Hart and Moore (1994) suggests that many specific features of debt contracts are related to the types of assets and that firms should follow a close match between the respective maturities of assets and liabilities.

We find that debt targets are always significantly different from zero, except for working capital, which firms finance exclusively with long-term debt. In addition, the relative shares of the two classes of debt are broadly similar in the case of fixed asset investments, while inventories are mainly financed with long-term debt. Short-term debt complements internally generated funds and only low-risk firms use them. Long-term debt targets are larger for firms with a lower capability to generate cash but only if these flows are stable and predictable. Riskier firms cannot adopt this strategy because the market imposes a tighter constraint. Firms of different sizes have positive implicit long-term debt targets, but the amount of this target decreases with firm size. Therefore, smaller firms have larger debt targets on average because they face better investment opportunities. However, firms in the smallest quarter of our classification face substantial barriers to accessing external finance and have a negative implicit short-term debt target involving a positive cash balance to generate a liquidity buffer. We find evidence that non-investment-grade firms have consistently higher implicit debt target ratios than investment-grade firms, mainly because the former benefit from better investment opportunities.

The remainder of this paper is organised as follows. Section 2 describes the financial cost function and its rationale. Section 3 nests the financial specification in a standard Q-theoretic framework and derives the optimal investment equation. Section 4 discusses the basic estimates of the model, illustrating the implicit debt targets retrieved for different classes of firms and investment types. Section 5 presents the robustness checks, and Section 6 concludes the paper.

2 Financial costs and financial frictions

The introduction of financing frictions in an otherwise standard Q-theoretic framework departs from the Modigliani–Miller frictionless world, altering first-order optimality conditions. As discussed by Bolton et al. (2011), the general formulation of the investment-Q relationship in the presence of financial frictions becomes:

marginal cost of investing = marginal q – marginal cost of financing.

In this case, firms invest up to the point where the shadow value of installed capital is equal to the marginal cost of investment, considering the costs of funds; hence, the marginal benefit must also cover the marginal increase in the cost of external finance. By considering costly external finance, the general formulation of the optimal condition is given by:

$$q - C_E(E,K) = 1 + G_I(I,K) \implies q = 1 + C_E(E,K) + G_I(I,K),$$

where $C_E(E,K)$ and $G_I(I,K)$ are the adjustment costs on finance and the convex adjustment costs on capital, respectively.

2.1 Financial cost specification

The financial cost specification that we adopt is given by:

$$C(s_t, l_t, S_t, L_t, K_{t-1}) = \gamma_1 s_t + \gamma_2 l_t + \frac{1}{2}\delta_1 \frac{S_t^2}{K_{t-1}} + \frac{1}{2}\delta_2 \frac{L_t^2}{K_{t-1}}, \tag{1}$$

where s_t and l_t indicate the new issuance of short-and long-term debt, respectively, and S_t and L_t are the current corresponding stocks of outstanding debt, which can be expressed as the sum of the new issuance and the stock inherited from the previous period, $S_t = s_t + S_{t-1}$ and $L_t = l_t + L_{t-1}$. Although firms can control new issuances only, the existing stock of debt matters because debt choices are strongly dependent on past funding decisions, as discussed by Admati et al. (2018). The linear parameters γ_1 and γ_2 control for transaction costs, while δ_1 and δ_2 are loading parameters that capture information costs. Following Gomes (2001), transaction costs depend on the total amount of new issuances, while the risk premia produced by information costs depend on the total stock of debt. Information costs grow non-linearly with the size of the funds that any individual firm raises because higher leverage involves a larger default risk, often associated with either liquidity risk or maturity mismatches. While transaction costs are broadly similar for different types of debt instruments, information costs are instrument-specific and strongly depend on the structural characteristics of the industry's market and the risk premium associated with firms' financial characteristics.

2.1.1 Implicit debt targets

To calculate implicit debt targets, we rewrite the cost function by adding and subtracting additional terms as:

$$C(s_t, l_t, S_t, L_t, K_{t-1}) = \gamma_1 s_t + \gamma_2 l_t + \frac{1}{2}\delta_1 \frac{S_t^2}{K_{t-1}} + \frac{1}{2}\delta_2 \frac{L_t^2}{K_{t-1}} + \gamma_1 S_{t-1} - \gamma_1 S_{t-1} + \\ \gamma_2 L_{t-1} - \gamma_2 L_{t-1} + \frac{\gamma_1^2}{2\delta_1} K_{t-1} - \frac{\gamma_1^2}{2\delta_1} K_{t-1} + \frac{\gamma_2^2}{2\delta_2} K_{t-1} - \frac{\gamma_2^2}{2\delta_2} K_{t-1}. \tag{2}$$

We can then rearrange the expression by combining the linear and quadratic terms to obtain:

$$C(s_t, l_t, S_t, L_t, K_{t-1}) = K_{t-1}\frac{\delta_1}{2}\left(\frac{S_t}{K_{t-1}} + \frac{\gamma_1}{\delta_1}\right)^2 + K_{t-1}\frac{\delta_2}{2}\left(\frac{L_t}{K_{t-1}} + \frac{\gamma_2}{\delta_2}\right)^2 - \gamma_1 S_{t-1} - \gamma_2 L_{t-1} \\ - \frac{\gamma_1^2}{2\delta_1} K_{t-1} - \frac{\gamma_2^2}{2\delta_2} K_{t-1}. \tag{3}$$

Equation (3) highlights that $-\frac{\gamma_1}{\delta_1}$ and $-\frac{\gamma_2}{\delta_2}$ are the implicit targets for short-and long-term debt, and their sign is not restricted *a priori* because each target can be either positive or negative (indicating, in this case, a cash balance target, consistent with DeAngelo et al. (2011)).

3 Investment model with financial frictions

Firms can use either internal funds by retaining earnings or external funds to finance their investments.[1]We split total external finance into short-and long-term debt, as follows:

$$EF_t = \theta s_t + (1-\theta) l_t; \tag{4}$$

firms must satisfy the following use of fund constraints over time:

$$P_t^I I_t = EF_t + \alpha NCF_t, \tag{5}$$

where $NCF_t = P_t^Y F(K_t, N_t) - w_t N_t$ is the cash flow, α is the (fixed) share of cash flows that are not distributed, I_t is real investment, K_t is the stock of capital, N_t is labour, w_t is the nominal cost of labour, and P_t^Y and P_t^I indicate the prices of output and investment, respectively. After renaming the variables, $s_t = \frac{s_t}{P_t^I}, l_t = \frac{l_t}{P_t^I}$, $W_t = \frac{w_t}{P_t^I}$, and $R_t = \frac{P_t^Y}{P_t^I}$, the final expression in real terms is given by:

$$\begin{aligned} I_t &= EF_t + \alpha CF_t = EF_t + \alpha[R_t F(K_t, N_t) - W_t N_t] \\ &= \theta s_t + (1-\theta) l_t + \alpha[R_t F(K_t, N_t) - W_t N_t]. \end{aligned}$$

As is the standard in the literature, we also introduce convex adjustment costs on investment, specified as:

$$G(I_t, K_{t-1}) = \frac{1}{2}\delta_I K_{t-1}\left[\frac{I_t}{K_{t-1}} - \alpha\right]^2. \tag{6}$$

The complete Lagrangian function of the model is:

$$\begin{aligned} \mathcal{L} = \sum_{t=0}^{\infty} \beta^{t+j} [P_t^Y (F(K_t, N_t) - C(s_t, l_t, S_t, L_t, K_{t-1}) - G(I_t, K_{t-1})) - P_t^I I_t] \\ - \lambda_t [K_t - K_{t-1}(1-\delta) - I_t] - \mu_t [\theta s_t + (1-\theta) l_t - I_t + \alpha(R_t F(K_t, N_t) - W_t N_t)]. \end{aligned} \tag{7}$$

The first-order conditions concerning the two financing sources are given by:

$$\frac{\partial \mathcal{L}}{\partial s_{t+j}} = \beta^{t+j}\left[-\theta \mu_{t+j} - P_{t+j}^Y \left(\gamma_1 + \delta_1 \frac{S_{t+j}}{K_{t+j-1}}\right)\right] = 0, \tag{8}$$

[1]Given that the focus of the analysis is on debt, we abstract from equity financing.

and

$$\frac{\partial \mathcal{L}}{\partial l_{t+j}} = \beta^{t+j}\Big[-(1-\theta)\mu_{t+j} - P^{Y}_{t+j}\Big(\gamma_2 + \delta_2 \frac{L_{t+j}}{K_{t+j-1}}\Big)\Big] = 0. \tag{9}$$

Combining the two first-order conditions helps obtain a better understanding of the optimality conditions, as presented below:

$$\mu_{t+j} = \theta\mu_{t+j} + (1-\theta)\mu_{t+j} = -P^{Y}_{t+j}\Big(\gamma_1 + \gamma_2 + \delta_1 \frac{S_{t+j}}{K_{t+j-1}} + \delta_2 \frac{L_{t+j}}{K_{t+j-1}}\Big). \tag{10}$$

Equation (10) states that the shadow value of the external finance constraint is equal to the total marginal external finance cost, which comprises transaction and information costs. The model is closed by deriving the optimal condition concerning the investment rate, which is the other control variable, as follows:

$$\frac{\partial \mathcal{L}}{\partial I_{t+j}} = \beta^{t+j}[-P^{I}_{t+j} - P^{Y}_{t+j}G(I_{t+j})' + \lambda_{t+j} + \mu_{t+j}] = 0. \tag{11}$$

Given the investment adjustment cost specification, we can write the optimal condition for investment as follows:

$$\lambda_{t+j} = -\mu_{t+j} + P^{I}_{t+j} + P^{Y}_{t+j}\delta_I \frac{I_{t+j}}{K_{t+j-1}} - P^{Y}_{t+j}\delta_I \alpha, \tag{12}$$

which, given the definition $q = \frac{\lambda_{t+j} - P^{I}_{t+j}}{P^{Y}_{t+j}}$ for Tobin's Q, can be rewritten as:

$$q_{t+j} = P^{Y}_{t+j}\Big(\gamma_1 + \gamma_2 + \delta_1 \frac{S_{t+j}}{K_{t+j-1}} + \delta_2 \frac{L_{t+j}}{K_{t+j-1}}\Big) + \delta_I \frac{I_{t+j}}{K_{t+j-1}} - \alpha\delta_I. \tag{13}$$

By combining the optimal conditions for external finance and investment, we obtain the optimal equation linking investment to Tobin's Q and the two external finance sources:[2]

$$\frac{I_{t+j}}{K_{t+j-1}} = \Big(\alpha - \frac{\gamma_1 - \gamma_2}{\delta_I}\Big) + \frac{1}{\delta_I} q_{t+j} - \frac{\delta_1}{\delta_I}\frac{S_{t+j}}{K_{t+j-1}} - \frac{\delta_2}{\delta_I}\frac{L_{t+j}}{K_{t+j-1}}. \tag{14}$$

[2]Our analysis follows Casalin and Dia (2014) and Casalin and Dia (2013).

3.1 Estimation approach

To estimate the implicit debt target ratios, we use yearly data from Compustat, spanning the 1975–2019 period. In line with the corporate finance literature, we exclude utilities and firms in the financial and public services industries, all firm-year observations with a negative value of total assets, and sales and gross capital value lower than five million. Finally, we winsorise the data at 0.5% to remove extreme outliers. From the optimal investment specification of Equation (14), by adding firm and year fixed effects and the error term, we obtain the following empirical specification:

$$\frac{I_{i,t}}{K_{i,t-1}} = \beta_0 + \beta_1 Q_{i,t-1} + \beta_2 \frac{S_{i,t-1}}{K_{i,t-2}} + \beta_3 \frac{L_{i,t-1}}{K_{i,t-2}} + \sum_i \alpha_i + \sum_t \tau_t + \epsilon_{i,t}, \tag{15}$$

where the independent financial variables are lagged by one period to reduce endogeneity concerns. The estimation allows the reconstruction of the implicit debt target ratios when assuming that the γ_1 and γ_2 values are time-invariant. To obtain our numerical results, following Gomes (2001), we initially set $\gamma_1 = \gamma_2 = 0.028 \approx 0.03$, which corresponds to a common transaction cost of 3%; however, we test for a range of alternative values. In particular, we use two alternative values for the γs obtained from the time-mean value of short-and long-term debt in our sample.[3]

We summarise the relationship between the estimated coefficients and the model's parameters in the following equations:

$$\hat{\delta}_1 = -\frac{\hat{\beta}_2}{\hat{\beta}_1} \tag{16}$$

$$\hat{\delta}_2 = -\frac{\hat{\beta}_3}{\hat{\beta}_1}, \tag{17}$$

where δ_1 and δ_2 are increasing functions of the short-and long-term debt coefficients ($\hat{\beta}_2$ and $\hat{\beta}_3$) and a decreasing function of the coefficient on Tobin's Q ($\hat{\beta}_1$). Hence, the corresponding implicit debt target ratios, $\frac{\hat{S}}{\hat{K}} = -\frac{\gamma_1}{\hat{\delta}_1}$ and $\frac{\hat{L}}{\hat{K}} = -\frac{\gamma_2}{\hat{\delta}_2}$, are decreasing functions of the estimated coefficient of short-and long-term debt, and positive functions of the estimated investment opportunities.

[3] For the former, we use the average 3-month treasury bill rate (4.5%) and for the latter, the average of the 10-Year treasury bill rate (6%) during the 1975–2019 period.

As discussed by Strebulaev and Whited (2013), empirical analyses of capital structure theories are troublesome when proxy variables subject to measurement errors are used. In light of the well-known measurement issues associated with Tobin's Q, we adopt an estimation method that allows for a more precise estimate in the presence of measurement errors, the error-in-variable model estimated through the cumulant regression proposed by Erickson et al. (2014). The method[4] uses higher-order cumulants of the joint distribution of observable variables to obtain estimates free from measurement bias. Following Erickson et al. (2014), we use a multiple-regressor version of the classical errors-in-variables model:

$$\frac{I_{i,t}}{K_{i,t-1}} = z_{i,t-1}\alpha + \chi_{i,t-1}\beta + u_i \tag{18}$$

$$x_{i,t-1} = \chi_{i,t-1} + \epsilon_i, \tag{19}$$

where the first equation is a linear regression model containing regressors assumed to be measured without error, $z_{i,t-1} = \left[\frac{S_{i,t-1}}{K_{i,t-2}}, \frac{L_{i,t-1}}{K_{i,t-2}}\right]$, and a regressor that is imperfectly measured, $\chi_{i,t-1} = Q_{i,t-1}$. The estimation procedure is based on a two-step plug-in approach wherein the second-step sample cumulants estimate the coefficients of the within-transformed variables. Unlike classic econometrics, which builds on normality assumptions, the cumulant estimator requires mismeasured variables to be skewed, as in the case of Q. A drawback of this procedure is that it does not provide an optimal order of cumulants; therefore, a data analyst must choose this. To select the appropriate order of cumulants, we select the one that provides a higher and significant ρ^2, which is the estimated R^2 of the regression, and a higher and statistically significant τ^2, which indicates the quality of measurement for the proxy for Tobin's Q. We discuss the results for our chosen order; however, the appendix shows that the empirical results for several orders of cumulants provide broadly similar results. We also run traditional Q-regressions as a robustness test.

4 Test results

4.1 Implicit debt targets: whole sample analysis

Table (1) displays the results of a third-order cumulant regression for different asset classes and the corresponding results for the implicit short-and long-term debt targets associated

[4] We use the within-transformed variables as suggested by Erickson et al. (2017).

with different classes of investments. We find that debt targets always significantly differ from zero, except for short-term debt when related to working capital. Furthermore, we find that the relative shares of the two classes of debt are broadly similar in the case of fixed asset investments, whereas inventories are mainly financed with long-term debt, even if short-term debt targets are significant. Industrial firms, instead, finance working capital investments with long-term debt only.

TABLE 1
Results for whole sample

	Fixed asset investments	Inventory investments	Working capital investments
Q_{t-1}	0.159***	0.362***	1.257***
	(0.00626)	(0.0403)	(0.00690)
$short-term_{t-1}$	0.0131***	0.169***	-0.0113
	(0.00317)	(0.0166)	(0.0407)
$long-term_{t-1}$	0.0166***	0.0591***	0.0914***
	(0.00129)	(0.00630)	(0.0156)
Observations	153661	153949	153661
τ^2	0.291**	0.085**	0.186**
ρ^2	0.272**	0.109**	0.231**

Implicit debt targets

	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
Fixed assets	0.3641***	0.2873***	0.5462***	0.5747***
Inventories	0.0643***	0.1838***	0.0964***	0.3675***
Working capital	(-)	0.4126***	(-)	0.8252***

Note: The table displays linear third-order cumulant regressions with firm and year fixed effects and cluster-robust standard errors at the firm level in parentheses. The dependent variables are the investments in fixed assets, inventories and working capital. ρ^2 is the R2. $\tau^2 \in (0,1)$ is the index of the measurement quality of the proxy. * = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets.

4.2 Implicit debt targets: firm's financial conditions

While the complete sample analysis provides information about the significance and magnitude of debt targets, it does not provide any information concerning the cross-sectional variations in the targets based on different financial characteristics. Therefore, we estimate the model for different quartiles of the pooled distribution of cash flows and cash flow volatility, which provides widely used metrics to assess corporate debt risk over the business cycle. Tables (2) and (3) show the results of the estimations and implicit debt targets obtained by classifying firms based on the quartiles of cash flows and cash flow volatility distribution. For example, firms belonging to q_1 have cash flows higher than the third quartile and cash flow volatility lower than the first quartile.

The pattern emerging for fixed asset investments indicates that debt targets differ substantially among firms. Firms with high cash flows and low cash flow volatility have positive and significant implicit short-term debt target ratios. However, as financial conditions deteriorate, the targets become insignificant, suggesting that these firms may find potential difficulties in accessing debt markets.

The long-term debt targets become larger as cash flows decline, but the targets drop substantially beyond a critical value for firms with low or negative cash flows. The same targets decline monotonically as cash flow volatility increases. Hence, long-term debt can offset the reduced capability to generate financial flows internally, but only if cash flows are stable and predictable.

The emerging picture is that short-term debt complements internally generated funds and is used only by solid, low-risk firms. Long-term debt targets are more significant for firms with a lower capability to generate cash but only if these flows are stable and predictable. The riskier ones cannot adopt this strategy because the market imposes a much tighter constraint; hence, their financial structure may be inefficient, as suggested by Chernenko et al. (2019).

Next, we analyse the implicit targets associated with inventory investment. Short-term debt is a consistent substitute for cash flows because the implicit short-term debt target ratios are higher for firms with lower cash flows. Simultaneously, firms with higher cash flow volatility have both higher short-term and long-term debt targets, in contrast to the case of fixed asset investments. As the volatility of cash flows increases, a combination of short-term and long-term debt targets can guarantee additional financial flexibility for firms.

Finally, in the case of working capital investments, only firms with high cash flow availability exhibit positive and statistically significant short-term target ratios. Hence, short-term debt cannot substitute for internal funds to finance working capital. As the level of cash flow decreases, the implicit short-term debt target ratios become negative and statistically signif-

TABLE 2
Cash flows quartiles and implicit debt targets

	Fixed assets			
	Cash flows (q_1)	Cash flows (q_2)	Cash flows (q_3)	Cash flows (q_4)
Q_{t-1}	0.105***	0.131***	0.214***	0.143***
	(0.00493)	(0.00680)	(0.0134)	(0.00596)
$short-term_{t-1}$	0.0198***	0.0329***	0.00139	-0.000765
	(0.00389)	(0.00756)	(0.00802)	(0.00505)
$long-term_{t-1}$	0.0137***	0.0128***	0.0216***	0.0168***
	(0.00144)	(0.00243)	(0.00348)	(0.00215)
Observations	38056	40004	38698	36011
τ^2	0.382**	0.432**	0.313**	0283**
ρ^2	0.242**	0.208**	0.233**	0.227**
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
CF(1)	0.1591***	0.2299***	0.2386***	0.4599***
CF(2)	0.1195***	0.3070***	0.1792***	0.6141***
CF(3)	(-)	0.2972***	(-)	0.5944***
CF(4)	(-)	0.2554***	(-)	0.5107***
	Inventories			
	Cash flows (q_1)	Cash flows (q_2)	Cash flows (q_3)	Cash flows (q_4)
Q_{t-1}	0.396***	0.494***	0.0163	0.190***
	(0.127)	(0.172)	(0.139)	(0.0460)
$short-term_{t-1}$	0.226***	0.220***	0.207***	0.0851***
	(0.0270)	(0.0311)	(0.0347)	(0.0171)
$long-term_{t-1}$	0.0666***	0.0670***	0.0637***	0.0434***
	(0.0104)	(0.0120)	(0.0159)	(0.00608)
Observations	38043	40030	38595	36006
τ^2	0.085**	0.053**	1.544	0.105**
ρ^2	0.118**	0.127**	0.051**	0.064**
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
CF(1)	0.0526***	0.1784***	0.0788***	0.3568***
CF(2)	0.0674***	0.2212***	0.1010***	0.4424***
CF(3)	(-)	(-)	(-)	(-)
CF(4)	0.0670**	0.1313***	0.1005***	0.2627***
	Working capital			
	Cash flows (q_1)	Cash flows (q_2)	Cash flows (q_3)	Cash flows (q_4)
Q_{t-1}	1.405***	1.241***	1.046***	1.227***
	(0.0633)	(0.0814)	(0.0184)	(0.0494)
$short-term_{t-1}$	0.205***	-0.151***	-0.104*	-0.158***
	(0.0640)	(0.0454)	(0.0574)	(0.0532)
$long-term_{t-1}$	0.110***	0.0942***	0.0761***	0.0790***
	(0.0215)	(0.0203)	(0.0214)	(0.0256)
Observations	37452	39563	38030	35822
τ^2	0.172**	0.125**	0.102**	0.193**
ρ^2	0.195**	0.196**	0.257**	0.249**
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short(γ_1 = 4.5%)	Long (γ_2 = 6%)
CF(1)	0.2056***	0.3832***	0.3084***	0.7664***
CF(2)	-0.2466***	0.3952***	-0.3698***	0.7904***
CF(3)	-0.3017*	0.4124***	-0.4526*	0.8247***
CF(4)	-0.2330***	0.4659***	-0.3495**	0.9319***

Note: The table displays linear sixth-order cumulant regressions with year and firm fixed effects for fixed assets and working capital and third-order cumulant regressions for inventories across the pooled distribution of cash flows. Cluster-robust standard errors at the firm level are in parentheses. q_1 includes firms with cash flows higher than the third quartile, q_2 between the second and the third quartile included, q_3 between the first and the second quartile included and q_4 lower or equal to the first quartile. ρ^2 is the R2. $\tau^2 \in (0,1)$ is the index of the measurement quality of the proxy. * = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets.

TABLE 3
Cash-flow volatility quartiles and implicit debt targets

	Fixed assets			
	Cash-flow vol (q_1)	Cash-flow vol (q_2)	Cash-flow vol (q_3)	Cash-flow vol (q_4)
Q_{t-1}	0.138***	0.161***	0.108***	0.132***
	(0.0142)	(0.00909)	(0.00519)	(0.00513)
$short-term_{t-1}$	0.0288***	0.0308***	0.0191***	-0.00699
	(0.00661)	(0.00575)	(0.00446)	(0.00594)
$long-term_{t-1}$	0.0107***	0.0148***	0.0136***	0.0185***
	(0.00355)	(0.00222)	(0.00196)	(0.00205)
Observations	36039	39895	40002	37616
τ^2	0.383*	0.312**	0.479**	0.314**
ρ^2	0.155**	0.271**	0.200**	0.244**
	Implicit debt targets			
	Short ($\gamma = 3\%$)	Long ($\gamma = 3\%$)	Short ($\gamma_1 = 4.5\%$)	Long ($\gamma_2 = 6\%$)
VOL(1)	0.1438***	0.3869***	0.2156***	0.7738***
VOL(2)	0.1568***	0.3264***	0.2352***	0.6527***
VOL(3)	0.1696***	0.2382***	0.2545***	0.4765***
VOL(4)	(-)	0.2141***	(-)	0.4281***
	Inventories			
	Cash-flow vol (q_1)	Cash-flow vol (q_2)	Cash-flow vol (q_3)	Cash-flow vol (q_4)
Q_{t-1}	0.396***	0.494***	0.0163	0.190***
	(0.127)	(0.172)	(0.139)	(0.0460)
$short-term_{t-1}$	0.226***	0.220***	0.207***	0.0851***
	(0.0270)	(0.0311)	(0.0347)	(0.0171)
$long-term_{t-1}$	0.0666***	0.0670***	0.0637***	0.0434***
	(0.0104)	(0.0120)	(0.0159)	(0.00608)
Observations	38043	40030	38595	36006
τ^2	0.085**	0.053**	1.544	0.105**
ρ^2	0.118**	0.127**	0.051**	0.064**
	Implicit debt targets			
	Short ($\gamma = 3\%$)	Long ($\gamma = 3\%$)	Short ($\gamma_1 = 4.5\%$)	Long ($\gamma_2 = 6\%$)
VOL(1)	0.079*	(-)	0.118*	(-)
VOL(2)	0.037***	0.144***	0.055***	0.289***
VOL(3)	0.065***	0.161***	0.097***	0.323***
VOL(4)	0.188***	0.252***	0.282***	0.504***
	Working capital			
	Cash-flow vol (q_1)	Cash-flow vol (q_2)	Cash-flow vol (q_3)	Cash-flow vol (q_4)
Q_{t-1}	1.405***	1.241***	1.046***	1.227***
	(0.0633)	(0.0814)	(0.0184)	(0.0494)
$short-term_{t-1}$	0.205***	-0.151***	-0.104*	-0.158***
	(0.0640)	(0.0454)	(0.0574)	(0.0532)
$long-term_{t-1}$	0.110***	0.0942***	0.0761***	0.0790***
	(0.0215)	(0.0203)	(0.0214)	(0.0256)
Observations	37452	39563	38030	35822
τ^2	0.172**	0.125**	0.102**	0.193**
ρ^2	0.195**	0.196**	0.257**	0.249**
	Implicit debt targets			
	Short ($\gamma = 3\%$)	Long ($\gamma = 3\%$)	Short($\gamma_1 = 4.5\%$)	Long ($\gamma_2 = 6\%$)
VOL(1)	(-)	0.1690***	(-)	0.3380***
VOL(2)	(-)	0.5047***	(-)	1.0095***
VOL(3)	(-)	(-)	(-)	(-)
VOL(4)	-0.2842*	0.3466***	-0.4264*	0.6932***

Note: The table displays linear sixth-order cumulant regressions with year and firm fixed effects for fixed assets and working capital and third-order cumulant regressions for inventories across the pooled distribution of cash-flow volatility. Cluster-robust standard errors at the firm level are in parentheses. q_1 includes firms with cash-flow volatility lower or equal to the first quartile, q_2 between the first and the second quartile included, q_3 between the second and the third quartile included and q_4 higher than the third quartile. ρ^2 is the R2. $\tau^2 \in (0, 1)$ is the index of the measurement quality of the proxy. * = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets.

icant, implying that firms belonging to these classes need to target a positive cash balance. Similarly, firms with the highest cash flow volatility display a significant short-term debt target with a negative sign and require a cash buffer to face the considerable uncertainty associated with the volatility of operating profits. These regressions reveal that the lack of significance of short-term debt targets for working capital results from the radically different behaviour of different classes of firms. While the less risky firms with considerable cash flows have positive, large, and highly significant implicit debt targets, their riskier counterparts hold equally large and significantly negative implicit targets. These results align with recent findings from Denis and McKeon (2021) that "firms exhibiting persistent negative net cash flows (NCFs) play an empirically important role in the surge in average cash balances over recent decades."[5] By contrast, the implicit long-term debt targets are always positive and statistically significant, and they follow a clear pattern across the cash flow distribution: firms with the lowest cash flows have the largest long-term debt targets. The implicit long-term debt target reaches the maximum for firms with cash flow volatility lower than the median, again suggesting that firms with the most volatile cash flows need moderate debt targets.

4.3 Firm size and credit rating

Information costs generate substantial fixed costs, and the issuance of instruments such as corporate bonds or commercial papers requires multiples of hundreds of millions of dollars that are accessible only to the largest firms. Conversely, banks may obtain economies of scale by monitoring large firms rather than many small firms, rendering long-term debt more expensive for small firms, even when provided by banks.[6] Hence, in this section, we test whether firms of different sizes differ in their strategic choices of debt targets. In light of the evidence on market segmentation for large buyers of long-term debt instruments such as insurance companies, we also test whether owning an investment-grade rating is associated with higher implicit debt targets.

Dang et al. (2018) provide a comprehensive review on the measurement of firm size, indicating that corporate finance results are sensitive to different proxies for the firm size. Based on their classification, we use the following proxies for firm size:

[5] Denis and McKeon (2021) pp. 293.

[6] Campello and Hackbarth (2012) argue that small firms are typically young, and therefore, more likely to face capital market frictions.

a) Asset size, measured as the logarithm of total assets. This variable is a proxy for the total amount of resources used in the firm.

b) Sale size, measured as the logarithm of total sales. This measure is affected by the degree of product market competition.

c) Market valuation size, measured as the logarithm of market valuation, captures growth opportunities and equity market conditions.

d) Employment size, measured as the full-time equivalent number of employees.

In Tables (4) and (5), we display the results of the different regressions and estimates of the implicit debt targets, where we classify firms based on the quartiles of the pooled distribution of firm size. For example, firms belonging to q_1, have a size value lower or equal than those in the first quartile and are among the smallest firms.

The most critical result is that small firms, independent of their classification, exhibit a negative and significant implicit short-term debt target, which means that small firms face substantial barriers to accessing external finance and need to target a positive cash balance to generate a liquidity buffer. However, firms of all sizes have a positive and significant implicit long-term debt target ratio, and the size of this target declines with firm size. A plausible explanation for this result is that, on average, small firms have better investment opportunities, as indicated by the larger estimated parameter for Tobin's Q in all the regressions. A declining pattern also emerges for short-term debt targets for quartiles beyond the first, indicating that firms use both classes of debt to finance investment.

Finally, in Table (6), we display the results for partitioning firms with an investment-grade rating from their high-yield counterparts. We find that speculative-grade firms have larger debt targets than investment-grade firms; long-term debt targets are always significant for both firms, while short-term targets are not significant. This result can be understood by observing that non-investment-grade companies have far better investment opportunities, measured by Q, than their counterparts; higher expected investment returns can support larger implicit debt target ratios.

TABLE 4
Size quartiles and implicit debt targets: total assets and sales

	Fixed assets			
	Total assets (q_1)	Total assets (q_2)	Total assets (q_3)	Total assets (q_4)
Q_{t-1}	0.156***	0.142***	0.123***	0.100***
	(0.0111)	(0.00602)	(0.00444)	(0.00537)
$short-term_{t-1}$	-0.0160**	0.0152***	0.0186***	0.0149***
	(0.00786)	(0.00470)	(0.00554)	(0.00492)
$long-term_{t-1}$	0.00728	0.0143***	0.0130***	0.0188***
	(0.00654)	(0.00254)	(0.00160)	(0.00164)
Observations	31188	38577	41037	42859
τ^2	0.201**	0.378**	0.484**	0.468**
ρ^2	0.144**	0.226**	0.225**	0.250**
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
Asset(1)	-0.2925**	(-)	-0.4388**	(-)
Asset(2)	0.2803***	0.2979***	0.4204***	0.5958***
Asset(3)	0.1984***	0.2838***	0.2976***	0.5677***
Asset(4)	0.0201***	0.1596***	0.0302***	0.3191***

	Fixed assets			
	Total sales (q_1)	Total sales (q_2)	Total sales (q_3)	Total sales (q_4)
Q_{t-1}	0.171***	0.131***	0.116***	0.0806***
	(0.0100)	(0.00573)	(0.00431)	(0.00607)
$short-term_{t-1}$	-0.0172*	0.0126***	0.0192***	0.0172***
	(0.00912)	(0.00453)	(0.00506)	(0.00452)
$long-term_{t-1}$	0.0185***	0.0171***	0.0148***	0.0134***
	(0.00480)	(0.00231)	(0.00158)	(0.00153)
Observations	30537	37792	40328	41595
τ^2	0.204**	0.435**	0.525**	0.474**
ρ^2	0.188**	0.222**	0.252**	0.226**
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
Sales(1)	-0.2983*	0.2773***	-0.4474*	0.5546***
Sales(2)	0.3119***	0.2298***	0.4679***	0.4596***
Sales(3)	0.1813***	0.2351***	0.2719***	04703***
Sales(4)	0.1406***	0.1804***	0.2109***	0.3609***

Note: The table displays linear sixth-order cumulant regressions with year and firm fixed effects and cluster-robust standard errors at the firm level in parentheses across the pooled distribution of the logarithm of total assets and sales. q_1 includes firms with a value of the size's proxy lower or equal to the first quartile, q_2 between the first and the second quartile included, q_3 between the second and the third quartile included and q_4 higher than the third quartile. ρ^2 is the R2. $\tau^2 \in (0, 1)$ is the index of the measurement quality of the proxy. * = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets.

TABLE 5
Size quartiles and implicit debt targets: mve and employment

	Fixed assets			
	Market value (q_1)	Market value (q_2)	Market value (q_3)	Market value (q_4)
Q_{t-1}	0.186***	0.214***	0.177***	0.132***
	(0.0184)	(0.0144)	(0.00850)	(0.00478)
$short-term_{t-1}$	-0.00947**	0.0276***	0.0220***	0.0166**
	(0.00462)	(0.00606)	(0.00611)	(0.00677)
$long-term_{t-1}$	0.0166***	0.0101***	0.0169***	0.0192***
	(0.00248)	(0.00249)	(0.00218)	(0.00201)
Observations	34529	36894	39310	42010
τ^2	0.184**	0.201**	0.297**	0.340**
ρ^2	0.187**	0.260**	0.303**	0.373**
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
MVE(1)	-0.5892**	0.3361***	-0.8838**	0.6723***
MVE(2)	0.2326***	0.6356***	0.3489***	1.2713***
MVE(3)	0.2414***	0.3142***	0.3620***	0.6284***
MVE(4)	0.2386**	0.2063***	0.3578**	0.4125***
	Fixed assets			
	Employment (q_1)	Employment (q_2)	Employment (q_3)	Employment (q_4)
Q_{t-1}	0.149***	0.122***	0.123***	0.0605***
	(0.00948)	(0.00462)	(0.00489)	(0.00519)
$short-term_{t-1}$	0.00201	0.0101**	0.0172***	0.0144**
	(0.00781)	(0.00454)	(0.00553)	(0.00574)
$long-term_{t-1}$	0.0159***	0.0153***	0.0155***	0.0137***
	(0.00357)	(0.00187)	(0.00166)	(0.00167)
Observations	32234	35619	37559	38242
τ^2	0.225**	0.460**	0.496**	0.670*
ρ^2	0.202**	0.229**	0.244**	0.195**
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
Employment(1)	(-)	0.2811***	(-)	0.5623***
Employment(2)	0.3624**	0.2392***	0.5436**	0.4784***
Employment(3)	0.2145***	0.2381***	0.3218***	0.4761***
Employment(4)	0.1260**	0.1325***	0.1891**	0.2650***

Note: The table displays linear sixth-order and fifth-order cumulant regressions with year and firm fixed effects and cluster-robust standard errors at the firm level in parentheses across the pooled distribution of the logarithm of market value and employment. q_1 includes firms with a value of the size's proxy lower or equal to the first quartile, q_2 between the first and the second quartile included, q_3 between the second and the third quartile included and q_4 higher than the third quartile. ρ^2 is the R2. $\tau^2 \in (0,1)$ is the index of the measurement quality of the proxy. * = significant at 10%, ** = at 5% and *** = at 1%.(-) corresponds to the absence of statistically significant debt targets.

TABLE 6
Credit rating: Investment vs speculative grades

		Fixed asset investments	Fixed asset investments	
Q_{t-1}		0.138***	0.0698***	
		(0.0101)	(0.0116)	
$short-term_{t-1}$		0.0112	0.00582	
		(0.00683)	(0.00642)	
$long-term_{t-1}$		0.0214***	0.0126***	
		(0.00190)	(0.00314)	
Firm FE		Yes	Yes	
Year FE		Yes	Yes	
Observations		15186	14554	
τ^2		0.471*	0.393*	
ρ^2		0.205**	0.245**	
		Implicit debt targets		
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
Speculative grade	(-)	0.1836***	(-)	0.3673***
Investment grade	(-)	0.1229***	(-)	0.2458***

Note: The table displays linear third-order cumulant regressions with firm and year fixed effects and cluster-robust standard errors at the firm level in parentheses. ρ^2 is the R2. $\tau^2 \in (0,1)$ is the index of the measurement quality of the proxy. * = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets

5 Robustness checks

5.1 Controls for heteroskedasticity: clustered standard errors

One drawback of the cumulant estimation procedure is that it does not allow control for heteroskedasticity. To account for the within-firm correlation typical of firm-level studies, we run a panel fixed effects analysis with standard errors clustered at the firm level.

TABLE 7
Results for whole sample

		Fixed asset investments	Fixed asset investments	Fixed asset investments
Q_{t-1}		0.0457***	0.0441***	0.0386***
		(0.00122)	(0.00118)	(0.00119)
$short-term_{t-1}$		0.0135***	0.00776***	0.00633**
		(0.00275)	(0.00264)	(0.00276)
$long-term_{t-1}$		0.0127***	0.0142***	0.0126***
		(0.00108)	(0.00103)	(0.000992)
Firm FE		Yes	Yes	Yes
Year FE		No	Yes	No
Industry-Year FE		No	No	Yes
Observations		151947	151947	150222
R2		0.379	0.416	0.491

Implicit debt targets

	Short ($\gamma = 3\%$)	Long ($\gamma = 3\%$)	Short ($\gamma_1 = 4.5\%$)	Long ($\gamma_2 = 6\%$)
Firm FE	0.102***	0.108**	0.152***	0.216**
Firm-Year FE	0.170***	0.093***	0.256***	0.186***
Firm Industry-Year FE	0.183**	0.092***	0.274**	0.184***

		Fixed asset investments	Fixed asset investments	Fixed asset investments
Q_{t-1}		0.0441***	0.0427***	0.0375***
		(0.00120)	(0.00117)	(0.00118)
$short-term_{t-1}$		0.0151***	0.00921***	0.00805***
		(0.00270)	(0.00258)	(0.00270)
$long-term_{t-1}$		0.0123***	0.0138***	0.0125***
		(0.00109)	(0.00103)	(0.000991)
$cash-flow_{t-1}$		0.0302***	0.0272***	0.0240***
		(0.00178)	(0.00174)	(0.00178)
Firm FE		Yes	Yes	Yes
Year FE		No	Yes	No
Industry-Year FE		No	No	Yes
Observations		151056	151056	149326
R2		0.384	0.421	0.495

Implicit debt targets

	Short ($\gamma = 3\%$)	Long ($\gamma = 3\%$)	Short ($\gamma_1 = 4.5\%$)	Long ($\gamma_2 = 6\%$)
Firm FE	0.088***	0.108**	0.131***	0.215**
Firm-Year FE	0.139***	0.093***	0.209***	0.186***
Firm Industry-Year FE	0.140**	0.090***	0.210**	0.180***

Note: The table displays panel regressions with year and firm fixed effects and cluster-robust standard errors at the firm level.* = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets.

Table (7) displays the results of the fixed effect regression for the whole sample of firms, excluding or including lagged cash flows as a control variable, and the corresponding implicit debt target ratios for the case of fixed asset investments. The results suggest that both short-and long-term debt targets are always positive and stable across the different specifications. Moreover, the fact that the coefficients are always statistically significant is reassuring because the results are robust when we use heteroskedasticity robust standard errors. However, as expected, the results differ from those obtained from cumulant regressions. The main reason for this downward discrepancy is the correction for the measurement error of the Q coefficient in the cumulant regressions, which makes its magnitude more than three times larger than that of the fixed effect regressions (0.159 vs. 0.0441). Suppose we compute the implicit debt target ratios by using the short- and long-term debt coefficients obtained in a model with both firm and year fixed effects (0.0078 for short and 0.014 for long) and the investment opportunity set corrected for the measurement error. In this case, we would obtain similar results for implicit debt targets obtained through cumulant regressions. Furthermore, while the coefficient of long-term debt is barely affected by the estimation method, the coefficient of short-term debt is consistently lower, which explains the higher difference between the two implicit debt targets when we use ordinary least squares with fixed effects.

5.2 Instrumental variable approach

Another potential issue that could affect our analysis is the endogeneity of debt and investment that might induce reverse causality, which can bias the estimated coefficients of short-and long-term debt. Although our methodology is relatively standard in the literature, we use an instrumental variable approach as a robustness test to compare the magnitude of the coefficients and assess any potential bias. To find suitable instruments, we rely on the maturity-matching principle, which states that industrial firms aim to match the maturity of their debt liabilities with that of assets, as suggested by Hart and Moore (1994), Stohs and Mauer (1996), and Aivazian et al. (2005). As we have two endogenous variables, we need to find three instruments. The first instrument we choose is average industry asset tangibility, which, in light of the evidence provided by Giambona and Schwienbacher (2007), exhibits a strong and positive relationship with firm-level tangibility measures. The rationale behind our strategy is that we expect firms to use long-term debt to finance long-term assets. The other two instruments we use are lagged values of short-and long-term debt-to-capital ratios, measured at the firm level, given the evidence of a strong autocorrelation in leverage choice measures highlighted by Admati et al. (2018). We can directly test for endogeneity in the presence of heteroskedasticity using the two-stage approach proposed by Wooldridge (2010), which requires estimating the following regressions:

$$\frac{L_{i,t-1}}{K_{i,t-2}} = \beta_0 + \beta_1 Ind\_tan_t + \beta_2 \frac{L_{i,t-2}}{K_{i,t-3}} + \beta_3 \frac{S_{i,t-2}}{K_{i,t-3}} + \beta_4 Q_{t-1} + \sum_i \alpha_i + \sum_t \tau_t + v_{si,t} \quad (20)$$

$$\frac{S_{i,t-1}}{K_{i,t-2}} = \beta_0 + \beta_1 Ind\_tan_t + \beta_2 \frac{L_{i,t-2}}{K_{i,t-3}} + \beta_3 \frac{S_{i,t-2}}{K_{i,t-3}} + \beta_4 Q_{t-1} + \sum_i \alpha_i + \sum_t \tau_t + v_{li,t}, \quad (21)$$

calculate the fitted values of the residuals, and introduce these values in the investment regression.[7]

$$\frac{I_{i,t}}{K_{i,t-1}} = \beta_0 + \beta_1 Q_{i,t-1} + \beta_2 \frac{S_{i,t-1}}{K_{i,t-2}} + \beta_3 \frac{L_{i,t-1}}{K_{i,t-2}} + \rho_1 \widehat{v_{si,t}} + \rho_2 \widehat{v_{li,t}} + \sum_i \alpha_i + \sum_t \tau_t + \epsilon_{i,t}. \quad (22)$$

Testing for endogeneity simply requires a Wald test for the joint significance of the ρ_1 and ρ_2 coefficients:

[7]Although in principle the use of fitted values causes measurement error in the computation of standard errors, we adopt procedures, developed following Dumont(2005) that are robust.

TABLE 8
Test for endogeneity

	$Long-term_{t-1}$	$Short-term_{t-1}$	Fixed asset Investments
Q_{t-1}	-0.021***	-0.00227***	0.0383***
	(0.0043)	(0.00105)	(0.00114)
$short-term_{t-1}$			0.030***
			(0.009)
$long-term_{t-1}$			0.00879***
			(0.00213)
Ind_tan_t	0.297***	-0.0192	
	(0.067)	(0.0186)	
$Short-term_{t-2}$	0.045*	0.3033***	
	(0.025)	(0.013)	
$Long-term_{t-2}$	0.454***	0.0192***	
	(0.013)	(0.0026)	
$\widehat{v_{si,t}}$			-0.0279***
			(0.009)
$\widehat{v_{li,t}}$			0.0055***
			(0.002)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	139110	139110	139110
R2	0.582	0.685	0.405
F	158.9	329.46	249.0
Wald test			6.81(0.001)

Note: The table displays the regressions to perform the two-step approach to test for endogeneity. Wald test is an F-test for the joint significance of ρ_1 and ρ_2. Cluster-robust standard errors at the firm level are in parentheses. * = significant at 10%, ** = at 5% and *** = at 1%.

Table (8) shows that we cannot reject the hypothesis of the absence of endogeneity. In particular, we can observe the direction of the bias we commit by using ordinary least squares: we estimate a downward biased coefficient for short-term debt and an upward biased coefficient for long-term debt. Consistent with the earlier analysis, we use an instrumental variable approach with fixed effects and firm-level clustered standard errors. Furthermore, we adopt a two-stage least squares regression with the following two stages:

$$\frac{L_{i,t-1}}{K_{i,t-2}} = \beta_0 + \beta_1 Ind\_tan_t + \beta_2 \frac{L_{i,t-2}}{K_{i,t-3}} + \beta_3 \frac{S_{i,t-2}}{K_{i,t-3}} + \beta_4 Q_{t-1} + \sum_i \alpha_i + \sum_t \tau_t + \epsilon_{i,t} \tag{23}$$

$$\frac{S_{i,t-1}}{K_{i,t-2}} = \beta_0 + \beta_1 Ind\_tan_t + \beta_2 \frac{L_{i,t-2}}{K_{i,t-3}} + \beta_3 \frac{S_{i,t-2}}{K_{i,t-3}} + \beta_4 Q_{t-1} + \sum_i \alpha_i + \sum_t \tau_t + \epsilon_{i,t} \tag{24}$$

$$\frac{I_{i,t}}{K_{i,t-1}} = \beta_0 + \beta_1 Q_{i,t-1} + \beta_2 \frac{\widehat{S_{i,t-1}}}{K_{i,t-2}} + \beta_3 \frac{\widehat{L_{i,t-1}}}{K_{i,t-2}} + \sum_i \alpha_i + \sum_t \tau_t + \epsilon_{i,t}, \tag{25}$$

where $\frac{S_{i,t-1}}{K_{i,t-2}}$ and $\frac{L_{i,t-1}}{K_{i,t-2}}$ are the debt-to-capital ratios estimated in the first regression. Table (9) displays the results of these two regression steps.

The results show that the measure of industry tangibility is statistically significant and positively associated with long-term debt while not significant but negatively associated with short-term debt, as expected. Furthermore, the lagged values of both the short-and long-term debt-to-capital ratios are statistically significant for both financing sources. The Sanderson-Windmeijer and Kleibergen-Paap Wald F statistics show that we reject the null hypothesis of weakly identified instruments. Moreover, we find that the instruments we use, that is, the two times lagged value of the short-and long-term debt-to-capital ratios and the contemporaneous industry tangibility ratio, are not correlated with the error process as the Hansen test fails to reject the null at standard significance levels. Both coefficients of the financing sources in the second-stage regression are positive and statistically significant, in line with the results in the main text. Table (9) shows that the values of recovered implicit debt targets for short-and long-term debt are positive and statistically significant. The former is substantially lower than the corresponding values from the ordinary least squares estimates displayed in the second column of Table (7), whereas the latter is higher than the ordinary least squares estimates. Furthermore, in the case of long-term debt, the potential bias from the ordinary least squares estimates is far smaller than that in the short-term case.

TABLE 9
Instrumental variable regression with fixed effects

	First stage IV-FE regression	
	$Long-term_{t-1}$	$Short-term_{t-1}$
Ind_tan_t	0.297***	-0.0192
	(0.067)	(0.0186)
$Long-term_{t-2}$	0.454***	0.0192***
	(0.013)	(0.0026)
$Short-term_{t-2}$	0.0478*	0.303***
	(0.025)	(0.0132)
Q_{t-1}	-0.021***	-0.00227**
	(0.0043)	(0.00105)
Observations	139110	139110
SW F $statistic^a$	612.43 (13.91)	263.45 (13.91)

	Second stage IV-FE regression
	Fixed asset Investments
Q_{t-1}	0.0383***
	(0.00114)
$Long-term_{t-1}$	0.00879***
	(0.00215)
$Short-term_{t-1}$	0.030***
	(0.009)
Observations	139110
Sargan-Hansen $test^b$	0.197 (0.657)
KP Wald rk F^c	180.26 (13.43)

	Implicit debt targets	
	($\gamma = 3\%$)	($\gamma_1 = 4.5\%$, $\gamma_2 = 6\%$)
Short	0.038***	0.057***
Long	0.130***	0.261***

Note: The table displays instrumental-variable with firm and year fixed effects for fixed asset investments. Clustered standard errors at the firm level are in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$. *(a)* Sanderson-Windmeijer F statistic, Stock-Yogo critical values at 5 % maximum relative bias in parenthesis, *(b)* Hansen J-statistic. P-values in parenthesis and *(c)* Kleibergen-Paap rk Wald F statistic, Stock-Yogo critical values at 10% maximal IV size in the parenthesis.

6 Conclusions

This study provided a simple theoretical model to explain debt heterogeneity with a financial cost specification. We can reconstruct implicit debt target ratios for short-and long-term debt by nesting the financial specification in an otherwise standard Q-theoretic framework. Our empirical estimates were robust to measurement errors, and we found that implicit long-term debt target ratios followed a decreasing pattern across the cash flow volatility distribution. Firms with lower cash flow volatility had larger implicit long-term debt targets than their high-volatility counterparts. Furthermore, firms belonging to the highest cash flow volatility quarter of our classification faced substantial difficulties in accessing debt markets, as shown by the non-significant short-term debt targets and low long-term debt targets. By contrast, firms with large cash flows displayed positive and statistically significant short-and long-term debt targets, with long-term debt targets rising consistently for higher cash flow quartiles. Finally, small firms had a cash target instead of a positive short-term debt target, and the magnitude of the implicit long-term debt target ratio decreased with size, declining substantially because a larger size is associated with worse investment opportunities.

To inspect the sensitivity of the targets to the type of investment, we estimated the implicit debt target ratios for investments in inventories and working capital. Analogous to fixed asset investments, working capital is primarily financed by long-term debt. On the contrary, we found evidence of a substitution and flexibility channel in inventories: firms with low cash flows and high cash flow volatility had large implicit short-and long-term debt targets.

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7 Appendix

7.1 Descriptive statistics

7.2 Cumulant regressions: different orders

Table (11) shows that most results are coherent for the different orders of cumulants, and the estimated coefficients of both Q and the long-term debt variables remain very similar after the introduction of cash flows as controls. The implicit debt target ratios decrease when we

TABLE 10
Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max	Median
Mean pooled sample						
$\frac{S_{i,t}}{K_{i,t-1}}$	196063	0.17	0.41	0	3.57	0.04
$\frac{L_{i,t}}{K_{i,t-1}}$	195865	0.69	1.51	0	13.52	0.28
Mean within firms						
$\frac{S_{i,t}}{K_{i,t-1}}$	19174	0.23	.44	0	3.57	0.08
$\frac{L_{i,t}}{K_{i,t-1}}$	19173	0.85	1.65	0	13.52	0.36
Median within firms						
$\frac{S_{i,t}}{K_{i,t-1}}$	19174	0.19	.44	0	3.57	0.05
$\frac{L_{i,t}}{K_{i,t-1}}$	19173	0.75	1.65	0	13.52	0.29
Mean within year						
$\frac{S_{i,t}}{K_{i,t-1}}$	44	.17	0.02	0.14	0.23	0.16
$\frac{L_{i,t}}{K_{i,t-1}}$	44	.68	0.19	0.42	1.33	0.66
Median within year						
$\frac{S_{i,t}}{K_{i,t-1}}$	44	.04	0.02	0.01	0.06	0.04
$\frac{L_{i,t}}{K_{i,t-1}}$	44	.28	0.06	0.17	0.49	0.29

Note: The table displays sample statistics using the variation between and within firms of the debt target ratios. Mean, and Median within firms correspond to each firm's average and median values. Mean and Median within a year correspond to the average and median values of the debt ratios for each year (1975-2019).

introduce cash flows as an additional regressor because short-term debt is a close substitute for available cash flows.

TABLE 11
Fixed assets cumulant regressions with and without controls

	Fixed assets			
	Cumulant(3)	Cumulant(4)	Cumulant(5)	Cumulant(6)
Q_{t-1}	0.159***	0.133***	0.161***	0.141***
	(0.00626)	(0.00427)	(0.00434)	(0.00329)
$short-term_{t-1}$	0.0131***	0.0126***	0.0132***	0.0128***
	(0.00317)	(0.00298)	(0.00319)	(0.00303)
$long-term_{t-1}$	0.0166***	0.0158***	0.0167***	0.0161***
	(0.00129)	(0.00118)	(0.00129)	(0.00121)
Observations	153661	153661	153661	153661
τ^2	0.291**	0.347**	0.286**	0.327**
ρ^2	0.272**	0.232***	0.276**	0.245***
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
3th order	0.3641***	0.2873***	0.5462***	0.3305***
4th order	0.3167***	0.2525***	0.4750***	0.2627***
5th order	0.3659***	0.2892***	0.5489***	0.4957***
6th order	0.0643***	0.1838***	0.5784***	0.5255***
	Fixed assets			
	Cumulant(3)	Cumulant(4)	Cumulant(5)	Cumulant(6)
Q_{t-1}	0.158***	0.135***	0.160***	0.144***
	(0.00647)	(0.00442)	(0.00437)	(0.00353)
$short-term_{t-1}$	0.0136***	0.0134***	0.0136***	0.0135***
	(0.00315)	(0.00297)	(0.00317)	(0.00303)
$long-term_{t-1}$	0.0165***	0.0157***	0.0166***	0.0160***
	(0.00129)	(0.00119)	(0.00129)	(0.00122)
$cash-flow_{t-1}$	0.00896***	0.0132***	0.00859***	0.0116***
	(0.00242)	(0.00212)	(0.00229)	(0.00211)
Observations	153661	153661	153661	153661
τ^2	0.288**	0.337**	0.284**	0.316**
ρ^2	0.274**	0.238***	0.277**	0.252***
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
3th order	0.3485***	0.2873***	0.5258***	0.5745***
4th order	0.3022***	0.2580***	0.4534***	0.5159***
5th order	0.3529***	0.2892***	0.5294***	0.5783***
6th order	0.32***	0.27***	0.48***	0.54***

Note: The table displays linear order cumulant regressions with year and firm fixed effects for the different orders of cumulants, from the third order in Column(1) to the sixth order in Column(4). ρ^2 is the R2. $\tau^2 \in (0,1)$ is the index of the measurement quality of the proxy. Cluster-robust standard errors at the firm level are in parentheses. * = significant at 10%, ** = at 5% and *** = at 1%.

TABLE 12
Inventories cumulant regressions with and without controls

	Inventories			
	Cumulant(3)	Cumulant(4)	Cumulant(5)	Cumulant(6)
Q_{t-1}	0.362***	0.0744***	0.0532***	0.00880
	(0.0403)	(0.0200)	(0.0170)	(0.0127)
$short-term_{t-1}$	0.169***	0.164***	0.163***	0.162***
	(0.0166)	(0.0160)	(0.0160)	(0.0160)
$long-term_{t-1}$	0.0591***	0.0495***	0.0488***	0.0473***
	(0.00630)	(0.00599)	(0.00600)	(0.00604)
Observations	153949	153949	153949	153949
τ^2	0.085**	0.410	0.573	3.458
ρ^2	0.109**	0.051***	0.046***	0.038***
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
3th order	0.0643***	0.1838***	0.0964****	0.3675***
4th order	0.0136***	0.0451***	0.0204***	0.0902***
5th order	0.0098***	0.0327***	0.0147***	0.0654***
6th order	(-)	(-)	(-)	(-)
	Inventories			
	Cumulant(3)	Cumulant(4)	Cumulant(5)	Cumulant(6)
Q_{t-1}	0.361***	0.0871***	0.0671***	-0.00138
	(0.0421)	(0.0211)	(0.0168)	(0.0131)
$short-term_{t-1}$	0.173***	0.170***	0.170***	0.169***
	(0.0166)	(0.0159)	(0.0159)	(0.0159)
$long-term_{t-1}$	0.0593***	0.0496***	0.0489***	0.0465***
	(0.00639)	(0.00598)	(0.00599)	(0.00602)
$cash-flow_{t-1}$	0.0364***	0.0847***	0.0882***	0.100***
	(0.0100)	(0.00655)	(0.00641)	(0.00641)
Observations	153041	153041	153041	153041
τ^2	0.081***	0.308*	0.397	-18.84
ρ^2	0.116**	0.068***	0.065***	0.053***
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
3th order	0.0626***	0.1826***	0.0939***	0.3653***
4th order	0.0154***	0.0527***	0.0231***	0.1054***
5th order	0.0118***	0.0412***	0.0178***	0.0823***
6th order	(-)	(-)	(-)	(-)

Note: The table displays linear order cumulant regressions with year and firm fixed effects for the different orders of cumulants, from the third order cumulant in Column(1) to the sixth order in Column(4). ρ^2 is the R2. $\tau^2 \in (0,1)$ is the index of the measurement quality of the proxy. Cluster-robust standard errors at the firm level are in parentheses. * = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets.

Table (12) shows the cumulant estimations for the different orders of cumulants. Third-order cumulant results are preferred because they deliver a higher R^2 and statistically significant values for the quality of the proxy used for investment opportunities. Depending on the magnitude of the transaction costs, the implicit short-term debt target ranges from 6.26% to 9.64% and the implicit long-term debt target ranges from 18.26% to 36.75%. Compared with fixed asset investments, the short-term debt target is always lower than the long-term debt target, irrespective of the magnitude of the transaction cost used.

TABLE 13

Working capital cumulant regressions with and without controls

	Working capital			
	Cumulant(3)	Cumulant(4)	Cumulant(5)	Cumulant(6)
Q_{t-1}	1.257***	1.337***	1.232***	1.309***
	(0.0690)	(0.0413)	(0.0371)	(0.0322)
$short-term_{t-1}$	-0.0113	-0.00964	-0.0119	-0.0102
	(0.0407)	(0.0412)	(0.0406)	(0.0411)
$long-term_{t-1}$	0.0914***	0.0942***	0.0905***	0.0932***
	(0.0156)	(0.0156)	(0.0154)	(0.0155)
Observations	152056	152056	152056	152056
τ^2	0.186**	0.175***	0.189**	0.178***
ρ^2	0.231**	0.245**	0.227**	0.240**
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
3th order	(-)	0.4126***	(-)	0.8252***
4th order	(-)	0.4258***	(-)	0.8516***
5th order	(-)	0.4084***	(-)	0.8168***
6th order	(-)	0.4214***	(-)	0.8427***
	Working capital			
	Cumulant(3)	Cumulant(4)	Cumulant(5)	Cumulant(6)
Q_{t-1}	1.260***	1.353***	1.254***	1.288***
	(0.0696)	(0.0419)	(0.0378)	(0.0333)
$short-term_{t-1}$	-0.00500	-0.00436	-0.00504	-0.00481
	(0.0392)	(0.0399)	(0.0392)	(0.0394)
$long-term_{t-1}$	0.0903***	0.0938***	0.0901***	0.0913***
	(0.0155)	(0.0154)	(0.0152)	(0.0152)
$cash-flow_{t-1}$	0.112***	0.0950***	0.113***	0.107***
	(0.0306)	(0.0298)	(0.0289)	(0.0286)
Observations	151210	151210	151210	151210
τ^2	0.181**	0.170***	0.182**	0.178***
ρ^2	0.239**	0.255**	0.238***	0.244**
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
3th order	(-)	0.4186***	(-)	0.8372***
4th order	(-)	0.4327***	(-)	0.8655***)
5th order	(-)	0.4175***	(-)	0.8351***
6th order	(-)	0.4232***	(-)	0.8464***

Note: The table displays linear order cumulant regressions with year and firm fixed effects for the different orders of cumulants, from the third order in Column(1) to the sixth order in Column(4). ρ^2 is the R2. $\tau^2 \in (0, 1)$ is the index of the measurement quality of the proxy. Cluster-robust standard errors at firm-level in parentheses. * = significant at 10%, ** = at 5% and *** = at 1%.(-) corresponds to the absence of statistically significant debt targets. (-) corresponds to the absence of statistically significant debt targets.

Table (13) shows the results for the different orders of cumulants. The results are robust across all the different orders of cumulants in this case. The coefficient of short-term debt is always negative and not statistically significant, whereas the coefficient of long-term debt is always positive and statistically significant. Depending on the magnitude of the transaction cost, the min-max range of long-term debt targets is (41.75%,43.27%) or (83.51%,86.55%).

7.3 Panel fixed effects: financial characteristics

We analyse the cross-sectional variation in the implicit debt target ratios for different firms' financial characteristics by subsetting the whole sample into four quartiles based on the firms' distribution of cash flows and cash flow volatility.

TABLE 14
Cash flows quartiles

	Fixed assets			
	Cash flows (q_1)	Cash flows (q_2)	Cash flows (q_3)	Cash flows (q_4)
Q_{t-1}	0.0358***	0.0569***	0.0704***	0.0331***
	(0.00166)	(0.00303)	(0.00548)	(0.00187)
$short-term_{t-1}$	0.00737**	0.0218**	-0.00573	0.00143
	(0.00357)	(0.00899)	(0.00897)	(0.00464)
$long-term_{t-1}$	0.0111***	0.0164***	0.0192***	0.0166***
	(0.00143)	(0.00281)	(0.00463)	(0.00218)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	36095	37485	36160	33015
R2	0.504	0.546	0.481	0.458
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
CF(1)	0.146**	0.097***	0.219**	0.194***
CF(2)	0.078**	0.104***	0.117**	0.208***
CF(3)	(-)	0.110***	(-)	0.220***
CF(4)	(-)	0.060***	(-)	0.120***

Note: The table displays panel regressions with year and firm fixed effects and firm-level cluster-robust standard errors across the pooled distribution of cash flows. q_1 includes firms with cash flows higher than the third quartile, q_2 between the second and the third quartile included, q_3 between the first and the second quartile included and q_4 lower or equal to the first quartile. * = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets. (-) corresponds to the absence of statistically significant debt targets.

TABLE 15
Cash-flow volatility quartiles

	Fixed assets			
	Cash-flow vol (q_1)	Cash-flow vol (q_2)	Cash-flow vol (q_3)	Cash-flow vol (q_4)
Q_{t-1}	0.0572***	0.0495***	0.0484***	0.0372***
	(0.00362)	(0.00273)	(0.00227)	(0.00167)
$short-term_{t-1}$	0.0204***	0.0212***	0.0122***	-0.00351
	(0.00690)	(0.00500)	(0.00442)	(0.00480)
$long-term_{t-1}$	0.0128***	0.0119***	0.0127***	0.0163***
	(0.00375)	(0.00167)	(0.00174)	(0.00173)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	35471	39635	39673	37064
R2	0.512	0.466	0.417	0.363
	Implicit debt targets			
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
VOL(1)	0.0841**	0.1341***	0.1262**	0.2681***
VOL(2)	0.070**	01248***	0.1051**	0.2496***
VOL(3)	0.1190**	0.1143***	01785**	0.2287***
VOL(4)	-	0.0685***	-	0.1369***

Note: The table displays panel regressions with year and firm fixed effects and firm-level cluster-robust standard errors across the pooled distribution of cash-flow volatility. q_1 includes firms with cash-flow volatility lower or equal to the first quartile, q_2 between the first and the second quartile included, q_3 between the second and the third quartile included and q_4 higher than the third quartile. * = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets. (-) corresponds to the absence of statistically significant debt targets.

Tables (14) and (15) summarise the results, and the pattern indicates that debt targets differ substantially among different classes: firms with high cash flows and low cash flow volatility have positive and significant implicit short-term debt target ratios. However, as financial conditions deteriorate, the targets become insignificant and negative, suggesting that these firms may need to hold a cash buffer to manage their cash flow volatility and the potential difficulties in accessing debt markets. Next, we perform robustness checks for the different proxies of firm size.

TABLE 16

Size quartiles and implicit debt targets: total assets and sales

	Fixed assets			
	Total assets (q_1)	Total assets (q_2)	Total assets (q_3)	Total assets (q_4)
Q_{t-1}	0.0191***	0.0488***	0.0574***	0.0461***
	(0.00153)	(0.00217)	(0.00247)	(0.00259)
$short-term_{t-1}$	-0.0248***	-0.00454	0.00592	0.00629
	(0.00635)	(0.00475)	(0.00507)	(0.00517)
$long-term_{t-1}$	-0.00668**	0.00439*	0.00517***	0.0172***
	(0.00311)	(0.00243)	(0.00162)	(0.00188)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	29704	36955	39932	42403
R2	0.406	0.496	0.522	0.531
F	58.84	169.0	181.3	116.8
	Implicit debt targets			
	Short ($\gamma = 3\%$)	Long ($\gamma = 3\%$)	Short ($\gamma_1 = 4.5\%$)	Long ($\gamma_2 = 6\%$)
Asset(1)	-0.0231***	-0.0858**	-0.0347***	-0.1716**
Asset(2)	(-)	0.3335**	(-)	0.6670**
Asset(3)	(-)	0.3708***	(-)	0.7416***
Asset(4)	(-)	0.0804***	(-)	0.1608***

	Fixed assets			
	Total sales (q_1)	Total sales (q_2)	Total sales (q_3)	Total sales (q_4)
Q_{t-1}	0.0262***	0.0529***	0.0571***	0.0375***
	(0.00188)	(0.00260)	(0.00253)	(0.00215)
$short-term_{t-1}$	-0.0236***	0.00174	0.00850*	0.00990**
	(0.00812)	(0.00454)	(0.00465)	(0.00476)
$long-term_{t-1}$	0.0116***	0.00844***	0.00954***	0.0120***
	(0.00373)	(0.00217)	(0.00182)	(0.00157)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	29012	36234	39384	41238
R2	0.421	0.509	0.553	0.509
	Implicit debt targets			
	Short ($\gamma = 3\%$)	Long ($\gamma = 3\%$)	Short ($\gamma_1 = 4.5\%$)	Long ($\gamma_2 = 6\%$)
Sales(1)	-0.0333***	0.0678**	-0.05***	0.1355**
Sales(2)	(-)	0.1880**	(-)	0.3761**
Sales(3)	0.2015*	0.1796**	0.3023*	0.3591**
Sales(4)	0.1136**	0.0938**	0.1705**	0.1875**

Note: The table displays panel regressions with year and firm fixed effects and firm-level cluster-robust standard errors across the pooled distribution of the logarithm of total assets and sales. q_1 includes firms with a value of the size's proxy lower or equal to the first quartile, q_2 between the first and the second quartile included, q_3 between the second and the third quartile included and q_4 higher than the third quartile.* = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets. (-) corresponds to the absence of statistically significant debt targets.

TABLE 17
Size quartiles and implicit debt targets: mve and employment

	Fixed assets			
	Market value (q_1)	Market value (q_2)	Market value (q_3)	Market value (q_4)
Q_{t-1}	0.0268***	0.0328***	0.0458***	0.0423***
	(0.00270)	(0.00222)	(0.00226)	(0.00198)
$short-term_{t-1}$	-0.00803**	0.0180***	0.0145**	0.00791
	(0.00345)	(0.00591)	(0.00588)	(0.00583)
$long-term_{t-1}$	0.0120***	0.00467**	0.00752***	0.0152***
	(0.00202)	(0.00230)	(0.00173)	(0.00183)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	32457	34690	37678	41253
R2	0.399	0.485	0.509	0.558
F	47.83	75.75	140.2	162.5
	Implicit debt targets			
	Short ($\gamma = 3\%$)	Long ($\gamma = 3\%$)	Short ($\gamma_1 = 4.5\%$)	Long ($\gamma_2 = 6\%$)
MVE(1)	-0.1001**	0.0670***	-0.1502**	0.1340***
MVE(2)	0.0547***	0.2107**	0.0820***	0.4214**
MVE(3)	0.0948**	0.1827***	01421**	0.3654***
MVE(4)	(-)	0.0835***	(-)	0.1670***

	Fixed assets			
	Employment (q_1)	Employment (q_2)	Employment (q_3)	Employment (q_4)
Q_{t-1}	0.0275***	0.0523***	0.0602***	0.0403***
	(0.00172)	(0.00231)	(0.00297)	(0.00232)
$short-term_{t-1}$	-0.00385	0.00428	0.00218	0.00408
	(0.00711)	(0.00426)	(0.00488)	(0.00617)
$long-term_{t-1}$	0.00945***	0.0109***	0.0119***	0.0133***
	(0.00322)	(0.00207)	(0.00152)	(0.00201)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	30871	34279	36693	37917
R2	0.419	0.485	0.543	0.504
	Implicit debt targets			
	Short ($\gamma = 3\%$)	Long ($\gamma = 3\%$)	Short ($\gamma_1 = 4.5\%$)	Long ($\gamma_2 = 6\%$)
Employment(1)	(-)	0.0873***	(-)	0.1746***
Employment(2)	(-)	0.1439***	(-)	0.2879***
Employment(3)	(-)	0.1518***	(-)	0.3035***
Employment(4)	(-)	0.0909***	(-)	0.1818***

Note: The table displays panel regressions with year and firm fixed effects and firm-level cluster-robust standard errors across the pooled distribution of the logarithm of market value and employment. q_1 includes firms with a value of the size's proxy lower or equal to the first quartile, q_2 between the first and the second quartile included, q_3 between the second and the third quartile included and q_4 higher than the third quartile. Panel regressions with year and firm fixed effects and cluster-robust standard errors at the firm level are in parentheses. * = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets. (-) corresponds to the absence of statistically significant debt targets.

Finally, we separate firms with investment-grade ratings from their high-yield counterparts.

TABLE 18
Credit rating: Investment vs speculative grades

		Fixed asset investments	Fixed asset investments	
Q_{t-1}		0.0634***	0.0236***	
		(0.00526)	(0.00188)	
$short-term_{t-1}$		0.00979	0.00616	
		(0.00637)	(0.00616)	
$long-term_{t-1}$		0.0187***	0.00821**	
		(0.00207)	(0.00368)	
Firm FE		Yes	Yes	
Year FE		Yes	Yes	
Observations		14800	14436	
R2		0.555	0.577	
		Implicit debt targets		
	Short (γ = 3%)	Long (γ = 3%)	Short (γ_1 = 4.5%)	Long (γ_2 = 6%)
Speculative grade	(-)	0.1017***	(-)	0.2034***
Investment grade	(-)	0.0862***	(-)	0.1725***

Note: Panel regressions with year and firm fixed effects and cluster-robust standard errors at the firm level are in parentheses. * = significant at 10%, ** = at 5% and *** = at 1%. (-) corresponds to the absence of statistically significant debt targets.

Printed by
Gi&Gi srl - Triuggio (MB)
November 2022

9788834353486