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WORKING PAPER SERIES

OWNERSHIP STRUCTURE, FINANCIAL CONSTRAINTS AND INVESTMENT DECISIONS: EVIDENCE FROM A PANEL OF ITALIAN FIRMS

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Working paper No. 05/2007

Università di Torino

Ownership Structure, Financial Constraints and Investment Decisions: Evidence from a Panel of Italian Firms

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Abstract

Over the past two decades, a wide empirical literature has addressed the theme of firm-level financial constraints, supporting the hypothesis that the availability of internal funds is indeed a major driver of investment decisions (Himmelberg and Petersen, 1994). The largest part of such empirical analyses is based on refinements of the original model by Fazzari, Hubbard and Petersen (1988) which derives the presence of liquidity constraints from the observation of differentials in investment-cash flow elasticities among sub groups of companies. However, the theoretical side of the issue is still debated. Following Hadlock (1998) and Degryse and de Jong (2006), investment – cash flow sensitivities can be attributed to the presence of two different factors: asymmetric information on capital markets or internal agency problems leading to overinvestment by the management.

In this paper, we try to disentangle the different potential determinants underlying the observed positive elasticity between investments and internal resources using a new sample of 1035 Italian manufacturing firms observed in the period 1998-2003.

In order to analyse to what extent investment elasticity might be related to agency problems, we account for both the ownership structure of the companies and the role played by financial intermediaries as both investors and debt-holders.

The most interesting result emerging from our analysis is related to the presence of an inverted – U relationship between concentration of ownership and the elasticity of investment to cashflow. The overall evidence, which includes analysis accounting for innovation effort and for the effect of industrial group membership, is supportive of the hypothesis that the elevated dependence of investment in both tangible and intangible capital on internal resources cannot be fully attributed to frictions on the credit market.

Key words: liquidity constraints, corporate governance, agency costs, investments
JEL classification:

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1. Introduction

Over the past two decades, a wide empirical literature has addressed the theme of firm-level financial constraints, supporting the hypothesis that the availability of internal funds is indeed a major driver of investment decisions (Himmelberg and Petersen, 1994; Schiantarelli, 1996; Carpenter and Petersen, 2002; Audretsch and Elston 2002). The largest part of such empirical analyses is based on refinements of the original model by Fazzari, Hubbard and Petersen (1988) which derives the presence of liquidity constraints from the observation of differentials in investment-cash flow elasticities among sub groups of companies. In this context, a significantly higher dependence through time of investments to internally generated cash flow can be interpreted as a signal of a higher premium on external financial resources[1].

While numerous empirical works have adopted this methodological framework and estimated the impact of financial constraints for different typologies of companies[2], the theoretical side of the issue is still debated. Indeed, following Hadlock (1998) and Degryse and de Jong (2006), investment – cash flow sensitivities can be attributed to the presence of two different factors: asymmetric information on capital markets (Mayers and Majluf, 1984) or internal agency problems leading to overinvestment by the management (Jensen, 1986).

According to the asymmetric information approach, the wedge in the cost of financial resources is due to the limited capability of lenders to value future revenues deriving from investment projects, leading to an under-investment effect for the companies which are forced to pass up some projects with positive net present value. On the contrary, according to the free cash flow theory, the positive relationship between investment and internal finance might be the result of over-investment by managers, whenever their objective function differs from the maximisation of corporate value (Grossman and Hart, 1982; Stulz, 1990). Clearly, any policy implication about the efficiency of credit markets or the rules and practises of corporate governance mechanisms turns out to be strictly dependent on the potential effect that prevails among the two. In previous papers (Scellato 2007;

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[1] This methodological approach based on the observation of heterogeneity among subgroups of firms has been criticized by Kaplan and Zingales (1997, 2000). The authors suggest that all companies face binding financial constraints and provide a theoretical example in which firms facing a steeper supply schedule for external financial resources might show a lower sensitivity of investment to internal finance. Nevertheless, all subsequent empirical contributions have adopted the FHP approach. See Bond et al. (2003) and Fazzari et al. (2000) for a discussion of this topic.

[2] For a review of these contributions, see Hall (2002), focused on financial constraints to R&D investment, and Bond et al. (2003) for country-level analyses.

Scellato and Ughetto 2006), we have already investigated the issue of financial constraints using different samples of Italian manufacturing companies. The results highlight a situation characterised by a strong dependence of investments, both in tangible capital and R&D, on cash flow eventually causing an inefficient delay in the start of in-house R&D activities and contributing towards generating the peculiar size distribution of Italian firms which is heavily skewed toward very small companies[3]. In those papers, we focused on the asymmetric information hypothesis which predicts a higher cost wedge for small innovative companies due to the lack of collateralisable assets, uncertainty of future cash flows related to innovation projects and risk of exploitation of innovative knowledge by external financers (Bester, 1985).

In this paper, we try to disentangle the different potential determinants underlying the observed positive elasticity between investments and internal resources using a new sample of Italian manufacturing firms observed in the period 1998-2003.

Our analysis builds on recent contributions which have made an attempt to separate the different potential determinants according to two distinct perspectives.

On the one side, Degryse and de Jong (2006), building on Hoshi et al. (1991), distinguish between the asymmetric information problem and the managerial discretion problem by looking at firms with good prospects (with Tobin's Q above average) and bad prospects (with Tobin's Q below average). This methodological approach is based on Myers and Majluf (1984) who stress that underinvestment increases in investment opportunities.

On the other side, Hadlock (1998) focuses the analysis on companies characterised by different degrees of alignment of interests between managers and shareholders. If the sensitivity of investment to cash flow is mainly generated by a managerial preference to overinvest internal funds, when the manager's objective function is more aligned with that of shareholders, we should expect a decrease in the cash flow elasticity. If, on the contrary, the sensitivity of investment to cash flow is due to capital market imperfections, then a better alignment of managers' and shareholders' objectives should steer management

[3] Previous firm-level studies on financial constraints in Italy include Sembenelli and Schiantarelli (2000) which analyse the effect of group membership, Bertero and Rondi (2002) which analyse investment decisions of Italian state owned companies, Guiso (1997) which analyse the specific constraints for hi-tech companies.

towards limiting the use of external resources given their elevated mispricing. This would generate a higher sensitivity of investment to internal cash flow.

In our contribution, we adopt the latter research framework. Specifically, in order to analyse to what extent investment elasticity might be related to agency problems, we account for both the ownership structure of the companies and the role played by financial intermediaries as both investors and debt-holders.

In principle, if financial constraints are only generated by informational asymmetries between firms and finance providers, the actual composition of the ownership should have a neutral effect, after controlling for industry and other firm-specific effects. On the contrary, if investment elasticities come from a lack of alignment between management and stockholders' objectives, a more concentrated ownership structure should be linked to relatively lower sensitivities. In Hadlock (1998), managerial concerns about the maximisation of corporate value are derived from the direct observation of managers' ownership stakes in their firms. Unfortunately, we do not have this information for our sample of companies[4]. Hence, we have been forced to use the concentration of ownership, measured by a CR3 concentration index, calculated considering the shares owned by the first three investors in each company. A more concentrated ownership structure is expected to be associated with higher control over managerial practises, given the decrease in monitoring incentives when there is no controlling shareholder (Stiglitz, 1985; Goodhart, 1993).

In order to disentangle the actual determinants of investment cash flow elasticity further, we have analysed the impact of a specific corporate governance mechanism, the control of management's decisions exerted by banks. The traditional literature on corporate governance stresses the role of banks and institutional investors in monitoring managers' activities, particularly for public companies (Diamond, 1984; Chirinko and Elston, 2006). This implies that we should observe a reduction in the sensitivity of investment to cash flow when banks are directly involved in the ownership structure of companies.

Banks can also perform their monitoring when operating as lenders. However, the theoretical contributions on the issue of multiple lending suggest that costly monitoring efforts by banks are exposed to free-riding problems which become more relevant as the

[4] As will be clarified in detail in section 3, we deal with a sample of non-listed companies whose data on ownership is private. The only available data on ownership, including the presence of banks and other institutional investors, comes from survey data.

number of banks providing financial resources to a company increases (Sapienza, 1997). Hence, we should expect it to increase for companies engaged in multiple lending relationships if the measured elasticity is due to free cash flow problems.

In our models we have investigated the relevance of both the effects connected to the role of banks by considering the interaction between ownership concentration and the presence of a bank among the first three stockholders, and the interaction between ownership concentration and the number of lending banks.

Finally, we have explored the potential impact of external asymmetric information for different levels of ownership concentration. Building on the literature on financial constraints and innovation, we have chosen to approximate the extent of potential informational frictions faced in the credit market by means of the innovation characteristics of each company. In particular, we have considered the companies that stated they were involved in product and process innovation. If investment - cash flow elasticity mainly derives from credit market imperfection, we should observe a significant increase in its level for the companies conducting R&D activities and introducing innovations.

Such firms, given the serendipity of innovative activities, especially those concerning the development of new products, should face higher levels of liquidity constraints (Cohen and Klepper, 1994; Hall, 2002)

The econometric analysis is based on panel data models, accounting for both firm fixed effect and potential endogeneity problems. Since we are mainly treating non-listed firms, we could not refer to models including average Tobin's Q as a predictor of future expected profitability of the company. Hence, we referred to investment accelerator models in which lagged values of growth rate of company's turnover are adopted as control variables[5].

The most interesting result emerging from our analysis is related to the presence of an inverted – U relationship between concentration of ownership and the elasticity of investment to cashflow. The result appears to be qualitatively in line with the outcomes obtained by Hadlock (1998) who also identifies a non-linear relationship between insider shareholdings and cash flow sensitivity. Such a pattern, which also turns out to be robust to different estimation techniques, is shown to be independent from the influence of variables, such as average firm size or sectoral distribution which might be thought to be

[5] See Schiantarelli (1996) for a discussion of different modelling techniques to evaluate financial constraints. The model specification adopted follows the one applied by Schiantarelli and Sembenelli (2000) on Italian data.

potentially correlated with ownership structure. Moreover, our result also appears to be robust when we control for other firms' characteristics that can influence cash flow sensitivity such as age and group membership. The econometric evidence suggests that a non-negligible component of the observed dependence of investment on internal finance might not be simply due to informational frictions on the credit market.

When moving to the analysis of interactions between ownership structure and innovation intensity and bank monitoring, some interesting results emerge.

While the presence of a bank among the first three share holders is associated with lower investment cash flow elasticities in the pooled sample, such an effect is stronger and significant only for the low concentrated companies. This might signal, for our sample, that more dispersed ownership is actually linked to managerial sub optimal behaviour. In particular, the latter result is coherent with the recent evidence provided by Chirinko and Elston (2006) for the German economy: the presence of a bank among major shareholders is not linked to a lower cost of capital but rather to lower agency costs which are a priori more pervasive in low concentrated companies.

Concerning the role of asymmetric information on the credit market, the results on the effect of innovation turn out to be less straightforward. In fact, we can observe that although being involved in process innovation reduces investment cashflow sensitivities, performing product innovation has a positive but not significant effect on elasticities when pooling all the companies. However, when focusing on the interaction with concentration levels, we find a positive significant effect for low concentration companies only. The evidence on process innovation is fully in line with theoretical predictions. The higher dependence of investment on internal resources for companies performing product innovation and characterised by a more dispersed ownership structure can be the result of credit rationing by banks which do not fully trust management investment plans.

The overall evidence is supportive of the hypothesis that the elevated dependence of investment in both tangible and intangible capital on internal resources cannot be fully attributed to frictions on the credit market. In this perspective, any improvement in the rules designed to guarantee an efficient corporate governance system would also have an indirect effect on the channelling of financial resources from the banking system to

companies. If these reliable control structures are lacking, the strong concentration of ownership seems to be the only response to strengthen control over managerial practises[6].

The rest of the paper is organised in this way. In Section Two, we describe the characteristics of the dataset and show descriptive statistics. Section Three contains the discussion of our modelling approach and the econometric results. Finally, in Section Four, we discuss the main evidence that has emerged in the analysis and highlight possible developments of the study.

2. Dataset and summary statistics

The analysis is based on a dataset derived from the questionnaire surveys developed originally by the investment bank Mediocredito Centrale (MCC, now Capitalia), regarding a representative sample of Italian manufacturing firms with no less than 11 employees. The original MCC database comes from two different questionnaire waves, each of them collecting contemporary and retrospective (previous three years) data from samples of more than four thousand firms. In order to obtain a panel dataset for our study, we merged two waves (covering years from 1998 to 2003). We matched this database with complete company financial accounting data for the years 1998-2003. In our analysis, we only considered joint stock companies. We cleaned the dataset by eliminating outliers and cases of M&As[7], ending up with a panel of 1035 manufacturing firms over a 6-year period.

For each company we computed the level of concentration of ownership, using survey data, as a CR3 index of the shares of the first three stockholders (variable CONC)[8]. This measure was available for 2001 , a mid-point in the panel dataset. We then divided the full sample into three subsamples according to ownership concentration levels: Low-Conc

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[6] With respect to this point, it has to be stressed that, since 2003 the Italian corporate governance systems is undergoing a series of relevant reforms. The most relevant one attains the introduction of a dual control system taken from the German experience. Such system specifically aims at providing better informed control mechanism also for non-listed companies.

[7] We computed the ratios of cash flow, debt, sales and investment to the beginning of the capital stock period and then dropped the companies showing implausible data for at least one year. The data about the presence of relevant M&A activities is drawn from the questionnaire.

[8] The value of CONC for each company is equal to $\sum_{i=1}^{i=3}(s_i)^2$ where s_i is the share of stocks owned by investor i.

(CONC<0.2, accounting for 207 companies), Mid-Conc (0.8<CONC<0.2 accounting for 650 companies) and High-Conc (CONC>0.8 accounting for 178 companies). In the following table, we report summary statistics for a series of company specific data for the three subsamples defined according to the level of ownership concentration in 2001. The data are grouped into four main dimensions.

Table 1 – Summary statistics for company data by ownership concentration group

	Variable	Low Conc		Mid Conc		High Conc	
		Mean	Std. dev.	mean	std. dev	Mean	std. dev.
General	SIZE	11.242	3.495	11.340	3.494	12.099	3.715
	AGE	2.978	0.844	2.811	0.916	2.927	0.939
	HITECH	0.033	0.180	0.036	0.187	0.075	0.264
Ownership	GROUP	0.077	0.266	0.155	0.362	0.497	0.500
	BANK	0.039	0.194	0.032	0.178	0.043	0.204
Innovation	R&D	0.357	0.479	0.359	0.479	0.520	0.499
	PRODUCT INNOVATION	0.249	0.432	0.234	0.423	0.351	0.477
	PROCESS INNOVATION	0.429	0.495	0.386	0.486	0.378	0.485
Finance	INTERNAL FINANCE	62.642	33.616	63.372	34.700	69.090	32.105
	INTERNAL FINANCE RD	87.418	22.449	86.343	25.686	88.322	21.808
	ADDITIONAL FINANCE	0.161	0.368	0.166	0.372	0.154	0.361
	NOCRED	0.042	0.200	0.047	0.213	0.046	0.210

The variable SIZE is the average log of total assets along the panel years, GROUP is a dummy variable equal to one if the company belongs to a corporate group, R&D is a dummy variable which is equal to one if the company states it has performed R&D activities during the panel years, HITECH is equal to one if a company is classified in a science based sector according to the Pavitt's taxonomy, AGE is the log of the age of the company in year 1998, INTERNAL FINANCE is the average share of physical investment financed through internal resources, INTERNAL FINANCE RD is the average share of R&D investment financed by means of internally generated resources, ADDITIONAL FINANCE is a dummy variable which equals one if the company declares that she would have required additional credit and. NOCRED is a dummy variable equal to one if the company, in year 2001, states it has asked a bank for additional financial resources and been denied.

The summary evidence reported in the above table turns out to be particularly important for our subsequent analysis since it shows the absence of significant biases among the samples when observing the area of innovation and the general data. With regard to the ownership data, while the variable BANK turns to be rather uniformly distributed, the variable GROUP is significantly higher for the subsample of companies characterised by higher concentration of ownership. This might be due to the fact that high concentrated companies can also include wholly owned subsidiaries. Finally, it is interesting to note how the distribution of the variables proxying the presence of financial constraints on capital markets does not show any significant change for the three subsamples of companies. In particular, given the evidence on NOCRED (on average less than 5% of the companies across our subsamples state that they have been denied additional credit), one might be inclined to hypothesise that any differential in investment cash flow elasticity among the sub groups of companies has to be eventually ascribed to managerial suboptimal practises.
Furthermore, the data reported in the Table 1 on the actual financial sources used to support investments in both physical and intangible capital highlight the strong incidence, particularly for the latter kind of investment, of internal cash flow (more than 85% for R&D performers). The joint observation of the above data poses some questions about the actual extent and the reasons underlying the non-negligible sensitivity of investment to cash flow previously identified in other studies on the Italian economy. In the following paragraph, we present our econometric analyses which specifically aim at singling out different potential determinants.

3. Models and econometric results

In our modelling approach we have tried to account for all the major drawbacks that have interested the stream of literature on the empirical relevance of financial constraints since the contribution by Fazzari Hubbard and Petersen (1988). It is worth noting that a large number of empirical studies about financial constraints and investment included a proxy for marginal Tobin's q among the regressors. However, our final sample includes a very small percentage of companies that are traded on the Italian stock markets. For this reason, we have been forced to drop this class of models. The rationale behind the inclusion of Tobin's q among regressors is that such a variable should capture changes in investment

propensity related to the future expected profitability of the company. Following Himmelberg and Petersen (1994) and Bond et al. (1997), we adopted an accelerator model replacing Tobin's q with lagged values of growth rate in sales on the assumption that this latter variable can actually be a reliable measure of expectations about future profitability for the company. Hence, the growth rate of sales should disentangle the variance in investment propensity due to expected profitability while the cash flow coefficient should capture only the sensitivity of investments to internal available resources[9]. A second control is introduced through the contemporaneous incidence of debt to capital. Such a variable should account for limited access to new debt because of the previous presence of high financial leverage. We expect that the premium on external finance grows with the degree of leverage and therefore expect to find a negative correlation between leverage and investment. Summing up, our baseline model can be represented by the following equation:

$$I_{it} = \beta_1 I_{it-1} + \beta_2 CF_{it} + \beta_3 S_{it} + \beta_4 S_{it-1} + \beta_5 D_{it-1} + \alpha_i + \gamma_t + \varepsilon_{it} \qquad (1)$$

Where,

I: ratio of investment to beginning of the period capital stock for year t;

CF: ratio of cash flow to beginning of the period capital stock for year t;

S: sales growth rate for year t;

D: ratio of debt to beginning of the period capital stock for year t;

α_i : firm specific effect;

ε_{it} : error term;

γ_t : yearly time dummies;

In Table 2 we report summary statistics for the variables which are used in our models. Investment for year t was computed as the variation in the stock of physical capital. Cash flow for year t was computed as after-tax earnings plus amortisation and other allocations to internal funds. Variables have been deflated by a two-digit price index provided by the

[9] See Bertero and Rondi (2002) for a presentation of the analytic derivation of the model. Alternative models for estimating investment dynamics without referring to stock market data include the Euler equation model (Bond and Meghir, 1994), which is based on firm's inter temporal optimisation of capital stock under the assumption of perfect capital markets. This approach, beside imposing very strict assumptions, can lead to high sensitivity of results to the specification, due also to poor small sample properties (Hubbard, 1998).

national statistical agency (ISTAT). For the computation of the variable capital stock, we used a replacement value methodology[10].

Table 2 – Summary statistics

Variable	Median	Mean	Std. Dev.
I	0.167	0.359	0.772
CF	0.273	0.497	0.996
S	0.028	0.022	0.292
D	0.127	0.198	0.222

We start by estimating our baseline model (Eq. 1) with a fixed effect estimator in order to check for firm, specific characteristics (Table 3)[11]. As shown in Column 1 of Table 3, the coefficient associated with cash flow is positive and significant confirming a generalized sensitivity of investment to cash flow for the companies included in our sample. Expected growth opportunities are also found to exert a significant positive effect in shaping investment decision as well as the degree of leverage which, as expected, enters our estimated equation with a significant negative sign.

However, our baseline model poses a problem caused by the potential endogeneity of the regressors. In particular, cash flow and sales growth are likely to be correlated with the error term. To allow for the endogeneity of the regressors, we adopted the procedure developed by Arellano and Bond (1991) which is designed to correct biases in estimates arising from the abovementioned problems. They suggest estimating the equations in first-difference form and then use the entire set of lagged values of the dependent and the other covariates as instruments in a GMM procedure. The dynamic version of equation (1) is then:

$$I_{it} - I_{it-1} = \beta_1(I_{it-1} - I_{it-2}) + \beta_2(CF_{it} - CF_{it-1}) + \beta_3(S_{it} - S_{it-1}) + \beta_4(S_{it-1} - S_{it-2}) + \beta_5(D_{it-1} - D_{it-2}) + \gamma_t - \gamma_{t-1} + \varepsilon_{it} - \varepsilon_{it-1} \quad (2)$$

[10] Two different approaches were implemented to track the values of investment over the years. The first was a pure account based approach: $I_t = K_t - K_{t-1} - AM_t$. The second was based on a perpetual inventory approach in which only the first observation of balance sheet data capital stock is intended as a real replacement value. All subsequent values of K_t are computed according to a fix depreciation rate equal to 8%: $K_t = K_{t-1}(0.92) + It(P95/Pt)$, where $I_t = K_t - K_{t-1}$. The results presented here refer to the first approach. The implementation of the second type of approach substantially confirms the results.

[11] The Hausman test for the hypothesis of no difference between the Random Effects and Fixed Effects estimators always rejects the null. Since the FE estimator is consistent when the unobserved effects and the covariates are correlated whereas RE is inconsistent, we conclude that the Random Effect estimator is inappropriate.

The Arellano and Bond (1991) method assumes that the error term has a moving average structure of order 1 in the equations in differences. To check the validity of this assumption, we performed tests on both first and second order serial correlations on the residuals (M1 and M2 in the Tables) along with the Sargan test of over-identifying restrictions for the models.

Column 2 of Table 3 reports results for the dynamic panel model specification confirming the robustness of previous figures. While the lagged level of investments does not appear to be statistically significant, the sensitivity of investment decisions to cash flow is strongly confirmed as well as the role of growth potential (significant only for lagged values) and the (negative) effect of the degree of leverage. The Sargan test does not reject the over-identification hypothesis confirming the validity of our instruments. Moreover, the tests on serial correlation state the presence of a first-order serial correlation but the absence of significant serial dependence of a higher order confirming the validity of the hypotheses underlying our model.

Table 3 – Fixed effect and GMM panel estimates. Basic specification (1, 2) and test for the effect of ownership concentration on investment cash flow sensitivity (3,4).

Model	(1)	(2)	(3)	(4)
$I_{(t-1)}$		0.012	0.006	0.005
		(0.70)	(0.35)	(0.32)
CF_t	0.456***	0.514***	0.562***	0.067
	(7.30)	(17.13)	(16.92)	(0.59)
S_t	0.074**	0.083	0.114	0.121
	(2.13)	(1.03)	(1.42)	(1.51)
$S_{(t-1)}$	0.084	0.130**	0.140**	0.142**
	(1.35)	(1.95)	(2.1)	(2.14)
$D_{(t-1)}$	-0.258***	-0.425**	-0.423**	-0.419***
	(-2.69)	(-2.38)	(-2.39)	(-2.37)
CF_t * (LC)			-0.251***	
			(-2.87)	
CF_t * (HC)			-0.234***	
			(-2.96)	
CF_t * (Conc)				1.874***
				(4.26)
CF_t * $(Conc)^2$				-1.663***
				(-4.24)
Constant	0.169***	-0.041***	-0.041***	-0.041***
	(4.83)	(-3.95)	(-3.94)	(-3.94)
M1		-6.15***	-6.17***	-6.23***
M2		-1.56	-1.75*	-1.59
Sargan Test		39.47	57.35	52.65
Wald Chi-Sq		336.18	361.60	373.22
R-sq	0.19			

Robust t and z-statistics in parentheses ***: significant at the 95% level; **: significant at the 90% level

We then proceed to analyse the interaction between ownership concentration, cash flow and investment. LC (low concentration) and HC (high concentration) are two dummy variables which are equal to one if Conc is lower than 0.2 or higher than 0.8 respectively. Column (3) includes terms interacting cash flow with these dummies. Both the coefficients relative to the interaction terms are negative and significant suggesting an inverted U relationship between the degree of sensitivity of investment to cash flow and the rate of concentration in the ownership. Given that the latter result might be driven to some extent by the arbitrary selection of a threshold for the identification of low and high concentration companies, we also test for the presence of a quadratic relationship (see column 4). The

non-linear relationship between the level of ownership concentration and the cash flow sensitivity of investment turns out to be significant for this specification too while the control variables (previous leverage and growth rates of turnover) are still significant[12].

Even if we are using fixed effect and first-difference GMM estimators, one might still argue that the observed effects of ownership concentration are eventually due to some systematic unobserved difference among the sub groups of companies. Specifically, the summary evidence reported in Table 1 showed a significant difference between low and high concentration firms with respect to the variable group membership. For this reason, following the approach proposed in Hadlock (1998), we augmented the above model by introducing a set of additional controls. In particular, we interacted the time varying cashflow regressor with the dummy group membership (GROUP), with the age of the company in 2001 and with the dummy HITECH which equals one if the company operates in a sector classified as science based according to Pavitt's taxonomy. This augmented model (see Table 4) was tested with the GMM procedure for both the specification including dummy variables for concentration (column 1) and the specification with the direct quadratic form (column 2). The results reported in Table 4 highlight the robustness of the quadratic relationship between ownership concentration and cash flow elasticity of investments. Specifically, firms which belong to industrial groups show, as expected, lower elasticity but this does not rule out the impact of ownership concentration[13].

[12] For all the models presented, we successfully tested the joint significance of interacted regressors by means of an F-test.

[13] An analogous result on the effect of group membership is identified for Italian companies in Sembenelli and Schiantarelli (2000). Being part of an industrial group allows the company to access an internal capital market, eventually lowering the dependence of investment on internally generated resources (Hoshi et al., 1991)

Table 4 –GMM panel estimates. Testing the impact of additional control variables on the interaction between investment cash flow elasticity and ownership concentration

Model	(1)	(2)
$I_{(t-1)}$	0.0014	0.002
	(0.09)	(0.18)
CF_t	0.221**	-0.176
	(2.34)	(-1.24)
S_t	0.107	0.116
	(1.33)	(1.44)
$S_{(t-1)}$	0.139**	0.146**
	(2.08)	(2.18)
$D_{(t-1)}$	-0.475***	-0.480***
	(-2.69)	(-2.72)
CF_t * (LC)	-0.270***	
	(-3.15)	
CF_t * (HC)	-0.157**	
	(-1.92)	
CF_t * (Conc)		1.699***
		(3.70)
CF_t * $(Conc)^2$		-1.417***
		(-3.35)
CF_t * Group	-0.215**	-0.167
	(-2.21)	(-1.63)
CF_t * Age	0.129***	0.103***
	(4.04)	(3.29)
CF_t * HITECH	0.011	-0.035
	(0.12)	(-0.36)
Constant	-0.040***	-0.406***
	(-3.92)	(-3.91)
M1	-6.05***	-6.09**
M2	-1.65	-1.53
Sargan Test	87.46*	82.65
Wald Chi-Sq	451.64	457.90

z-statistics in parentheses (***, **, *: significant at the 99%, 95%, 90% level)

Given the above results, in the second part of our analysis we test the relevance of other factors that, by interacting with the level of concentration, can influence the sensitivity of investment to cash flow. The significance of these factors can provide useful hints to the actual drivers of the observed relation between ownership concentration and investment cash flow elasticity.

Specifically, we concentrate on three aspects that have been addressed by previous literature on cash constraints: innovative activities, the presence of banks in the ownership structure of companies and the practice of multiple lending relationships. While the

intensity of innovation activities is used as a proxy for asymmetric information on capital markets, the impact of banks attains the standard analysis of corporate governance. In particular, we want to investigate if the presence of banks as large shareholders, or the feature of having a lending relationship with a limited number of banks, have a disciplining effect on managerial practises. According to this hypothesis, we expect the presence of a bank as shareholders to have a negative impact on cashflow elasticity. At the same time, an increase in the number of banks linked to the company by lending relationships is expected to be associated with an increase in elasticity, given the reduced monitoring, for free riding problems.

We start with a set of model specifications (Table 5) which include terms that interact cash flow with the level of concentration and the dummy variables for product and process innovation for the two subsamples with high and low ownership concentration. When observing the whole sample of firms (model 1), we cannot find a significant impact of the dummy for product innovation. On the contrary, companies introducing process innovation have lower investment cash flow elasticities. Moving to an analysis of the interactions with the ownership structure (model 2-3), the estimates show that while the presence of innovation activities (directed either to the introduction of new products or processes) has no effect on the sensitivity of investment to cash flow for the high level of concentration, the patterns are opposite in the subsample of low concentrated firms. The evidence on process innovation is fully in line with theoretical predictions. The higher dependence of investment on internal resources for companies performing product innovation with a more dispersed ownership structure can be the result of credit rationing by banks which do not fully trust management investment plans. Interestingly, the incidence of companies that state that they have performed product or process innovation is not significantly different among the subsamples (see Table 1).

Table 5 –GMM panel estimates. Testing for the effect of innovation activities.

Model	(1)	(2)	(3)
$I_{(t-1)}$	0.006	0.006	0.006
	(0.36)	(0.37)	(0.36)
CF_t	0.641***	0.563***	0.565***
	(12.94)	(17.00)	(17.07)
S_t	0.082	0.130*	0.120
	(1.05)	(1.62)	(1.50)
$S_{(t-1)}$	0.121*	0.155**	0.146**
	(1.83)	(2.34)	(2.21)
$D_{(t-1)}$	-0.384**	-0.438***	-0.386**
	(-2.18)	(-2.49)	(-2.20)
CF_t *Product	0.013		
	(0.22)		
CF_t *Process	-0.258***		
	(-4.40)		
CF_t * (LC)		-0.349***	-0.007
		(-3.81)	(-0.06)
CF_t * (HC)		-0.252***	-0.149
		(-3.14)	(-1.47)
CF_t * (LC)*Product		0.571***	
		(3.00)	
CF_t * (HC)*Product		-0.225	
		(-1.38)	
CF_t * (LC)*Process			-0.463***
			(-2.94)
CF_t * (HC)*Process			-0.200
			(-1.41)
Constant	-0.039***	-0.041***	-0.040***
	(-3.76)	(-3.98)	(-3.86)
M1	-6.37***	-6.23***	-6.14***
M2	-1.78	-1.59	-1.79*
Sargan Test	58.86	70.81	73.24
Wald Chi-Sq	349.58	374.96	379.45

z-statistics in parentheses (***, **, *: significant at the 99%, 95%, 90% level)

The second set of hypotheses that we explore concerns the influence that the nature of the relationships between banks and companies has on the cash flow – investment link. The first hypothesis we tested is whether the presence of a bank in the ownership structure tends to reduce the asymmetric information problems and then reduce the sensitivity of investment to cash flow. According to the results reported in model 1 of Table 6, there is

clear evidence to support this hypothesis. However, the effect only appears to hold for companies with a less concentrated ownership structure (model 2). Interestingly, the effect of additional control variables again emerges as being more relevant for low concentrated firms. This might reveal that for companies characterised by a more diluted ownership, the presence of a bank among main investors has a significant monitoring effect reducing the possibility of managerial free cash flow behaviours.

The second test regards the possibility that the propensity of firms to have multiple lending relationships increases problems related to asymmetric information (Table 7). In order to perform this test, we introduce the interaction term between the cash flow variable and the variable NBANK in the model. The latter variable is defined for each company as the ratio between its number of bank relationships in 2001 and the maximum level identified in the sample (which is equal to 25). Hence, the variable NBANK is standardised in the interval [0,1]. The results reported in Table 6 strongly support the above hypothesis. As the number of banks providing credit to a single company increases, their sensitivity of investment to cash flow also rises, with an undifferentiated effect on both low and high concentrated firms. Note that we are controlling for the overall level of debt through the regressor on leverage (D). Again, this evidence can be interpreted as a signal of the actual presence of managerial sub optimal practises underlying investment cash flow elasticity. However, in this case, the data reported for model 2 in Table 7 suggest a weak diversification of the phenomenon for low and high concentration companies. This result confirms previous findings on the Italian economy which showed that when a large number of lenders are involved, monitoring of the borrower tends to be weaker and encourage fragility in the firm's balance sheets (Foglia et al.1998).

Table 6 –GMM panel estimates. Testing for the effect of banks as major shareholder.

Model	(3)	(4)
$I_{(t-1)}$	0.005	0.005
	(0.31)	(0.28)
CF_t	0.518***	0.562***
	(16.56)	(16.93)
S_t	0.078	0.112
	(0.98)	(1.40)
$S_{(t-1)}$	0.131**	0.136**
	(1.97)	(2.04)
$D_{(t-1)}$	-0.415**	-0.428**
	(-2.34)	(-2.42)
CF_t *Bank	-0.140*	
	(-1.69)	
CF_t * (LC)		-0.214**
		(-2.27)
CF_t * (HC)		-0.225***
		(-2.86)
CF_t * (LC)*Bank		-0.336*
		(-1.73)
CF_t * (HC)*Bank		-0.398
		(-0.55)
Constant	-0.042***	-0.041***
	(-4.03)	(-3.94)
M1	-6.18***	-6.23***
M2	-1.55	-1.66*
Sargan Test	46.21	67.71
Wald Chi-Sq	340.15	364.62

z-statistics in parentheses (***, **, *: significant at the 99%, 95%, 90% level)

Table 7 –GMM panel estimates. Testing for the effect of multiple lending relationship.

Models	(1)	(2)
$I_{(t-1)}$	0.010	0.007
	(0.60)	(0.46)
CF_t	0.336***	0.565***
	(5.23)	(17.09)
S_t	0.067	0.128*
	(0.84)	(1.60)
$S_{(t-1)}$	0.125*	0.150**
	(1.88)	(2.26)
$D_{(t-1)}$	-0.364**	-0.481***
	(-2.07)	(-2.75)
CF_t *NBANK	1.121***	
	(3.02)	
CF_t * (LC)		-0.551***
		(-3.94)
CF_t * (HC)		-0.536***
		(-4.01)
CF_t * (LC)*NBANK		2.106***
		(3.30)
CF_t * (HC)*NBANK		1.609***
		(2.67)
Constant	-0.042***	-0.041***
	(-3.96)	(-3.94)
M1	-6.08	-6.05
M2	-1.52	-1.41
Sargan Test	45.78	66.71
Wald Chi-Sq	349.93	398.82

z-statistics in parentheses (***, **, *: significant at the 99%, 95%, 90% level)

4. Conclusions

In this paper we have attempted to analyse the presence of significant correlations between ownership characteristics and investment dynamics for a sample of Italian companies. In particular, we have explored whether the sensitivity of investment to internal financial resources shows particular patterns with respect to the level of ownership concentration and the different typologies of main firm shareholders.

Our contribution builds on a set of recent contributions which have tried to evaluate the actual nature of the determinants underlying the observed positive elasticity of investment to cash flow at firm level. As discussed above, the two main hypotheses regard the presence of asymmetric information on the credit market or the presence of managerial opportunism leading to free cash flow phenomena. Assuming that the concentration of ownership is a reliable proxy of the capability of shareholders to threaten managers who do not maximise corporate value, we have proceeded by estimating cashflow elasticities for different subsamples of companies characterised by different ownership structure.

We have found robust econometric evidence of an inverted U relationship between ownership concentration and cashflow elasticity. Even after controlling for a number firm-level dimensions previously investigated in contributions on financial constraints to investment (including size, capital structure, group membership, hi-tech sectoral affiliation, age), the ownership structure still turns out to exert a significant and non-linear effect on the observed elasticity of investment to cash flow. Such a relationship can be hardly reconciled, in an univocal way, with either the capital market imperfection theory or with the managerial free cash flow theory. In fact, if cash flow elasticity were only driven by managerial moral hazard, a liner decreasing shape should have been estimated.

The second part of our analysis specifically addressed the introduction of potential controls which could provide hints to the reasons underlying the observed shape. As a matter of fact, following Hadlock (1998), it is possible to interpret the increasing side of the inverted U relationship as evidence of capital market imperfections. In this case, the marginal improvement in the alignment between managers and shareholders following an increase in the ownership concentration should lead the management to internalise the excess premium on external financial resources better. Hence, we should observe a marginal increase in cash flow elasticity. The higher sensitivity of low concentrated companies to credit market conditions is witnessed by the results reported in Table 5 (model 1 and 2).

However, such an increase in elasticities cannot allow us to exclude the contemporaneous presence of non-maximising behaviours by managers. When moving to very high levels of concentration of ownership, any potential free cash flow effect by the management is virtually ruled out. This is clearly reflected in our estimates which show a significant contraction in the investment cashflow elasticity.

Given our data, it is impossible to assess clearly what the actual threshold is in terms of ownership concentration above which managerial opportunistic effect disappears. The

additional analysis carried out to take the role of banks as monitoring institutions into account gives support to the theory under which managerial moral hazard is present. In fact, the presence of a bank among the shareholders which is typically assumed to have higher monitoring capabilities, is linked to a significant decrease in cash flow elasticities for the sub sample of companies with a relatively lower concentration of ownership only.

A joint interpretation of the above results leads to the following observation. First, our estimates cannot exclude that for the Italian economy too, a non-negligible component of the sensitivity of investment to internal cashflow (nearly 87% of R&D investment is self financed) is indeed linked to managerial sub optimal behaviour and not only to credit market imperfections. Secondly, institutional investors seem to exert a significant effect on monitoring company activities.

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