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R&D and Capital Structure: evidence from Italian microdata

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Abstract

The article investigates the effects of R&D investment on the financing choices of Italian manufacturing joint stock companies, focusing on private loans and equity as financial instruments.
The ability of attracting external capital depends on the level of imperfect information, between capital providers and managers (Agency Theory), and on the fact that investments by transacting parties are subject to hazards (Transaction Cost Economics).
We therefore provide a novel contribution to this literature by focusing on firms characteristics that may influence these two channels: the different level of transparency in firms ownership, which contrasts listed and unlisted companies, and the diverse degree of asset specificity and opaqueness, which distinguishes internal from external R&D activities.
In a panel data framework, we find that common equity is an ideal financial instrument for R&D intensive firms, whereas the amount of risk associated with the increase in R&D becomes a deterrent for debt financing. Interestingly, these results apply only to those R&D activities promoted within the firm (internal R&D). In addition, the importance of common equity in financing R&D is only relevant for listed firms.

Jelcodes:G32,O32

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JEL Classification: G32, O31, D21

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1 Introduction

'*The average cost of capital to any firm is completely independent of its capital structure and is equal to the capitalization rate of a pure equity stream of its class*' (Modigliani and Miller 1958).

Since the time of MM famous proposition, financial economists have started to question its basic result. Two 'complementary perspectives' (Williamson, 1988) have been adopted in order to rationalize how to finance a new investment project: agency theory (AT) on one hand and transaction cost economics (TCE) on the other.

The first translates the project financing issue as a problem on the separation between ownership and control (Berle and Means, 1932), the second instead puts emphasis on the firms' transaction cost differences between producing internally through hierarchical governance (equity), or using the markets (debt) as a source of funding (Coase, 1937).

According to AT debt is used only when it permits the market to make inference on firms' investment (Ross, 1977), when it avoids dilution (Stiglitz, 1974, Jensen and Meckling, 1976), and when it excludes managerial discretion (Grossman and Hart, 1982, Jensen, 1983).

In other words, the asymmetric information between managers and shareholders about the firm's financial prospects, which is central in AT, may induce managers to signal, when selling equity, that the future prospects of the firm are less than excellent. In addition, the conflict of interests between the two parties may induce managers to be skeptical in sharing their control rights with shareholders.

At the same time interest payments on debt are generally tax-deductible, debt implies keeping the control within the firm, as long as the obligations are met, but it increases leverage and the risk profile of the company.

The firm will thus choose its financial structure by weighing the marginal costs of diluting its control-rights to new shareholders against the marginal costs of debt and default.

Along this line of reasoning, different theories on capital structure have pointed out different outcomes in terms of financing decisions. Myers and Majluf (1984) 'pecking order'

theory suggests that when the firm has to raise funds externally, safe securities are better than risky ones implying that external financing using debt is better than financing by equity. The firm should carry sufficient financial slack to undertake good investment opportunities as they arise and issue stock only when managers' information advantage is small. On the other hand Aghion and Bolton (1992) control rights theory underline, together with the bankruptcies costs of debt, the shareholder's interest in acquiring control rights over firm's decisions to satisfy their ex ante participation constraint.

The TCE approach to corporate finance, instead, examines individual investment projects and distinguishes among them in terms of their asset-specificity characteristics.

'*Debt and equity are treated not mainly as alternative financial instruments, but rather as alternative governance structures. Debt governance works mainly out of rules, while equity governance allows much greater discretion...transaction cost reasoning supports the use of debt (rules) to finance redeployable assets, while non-redeployable assets are financed by equity (discretion).*' (Williamson, 1988).

R&D investment projects, differently from other forms of investment, are specific and at the same time opaque strategic resources, given that they *elude their imitation by impeding the leakage of any related information to outsiders*.

Specific and opaque resources can be a source of above normal returns, as long as the firm continues the activities in which these resources are valuable. Unfortunately, the uncertainty related to markets and technologies make specific investment riskier and hence more expensive to finance (Vincente-Lorente, 2001).

Titman and Wessels (1988), Balakrishnan and Fox (1993), Vincente-Lorente (2001), Bah and Dumontier (2001), emphasize the difficulty of R&D firms in raising debt and the fact they should prefer equity as a source of finance. The latter is due to the fact that debt investors may not have access to the firm's proprietary information and thus they will not be able to monitor risky activities such as the ones that involve R&D. As a result they might ration credit to firms with more specific assets, or require higher interest rates. In addition, R&D does not serve as collateral, even if the firms are willing to pay high

interest rates (Stiglitz and Weiss, 1981).

Wang and Thornhill (2010) partially embrace transaction cost theory and provide a more comprehensive and modern view to examine the effects of R&D investment on financing choices. They find that transaction cost economics fails in distinguishing between the different financial instruments that characterize debt and equity. Proprietary information does not necessarily coincide with the full control of the firm in the case of equity and the information asymmetry between debt providers and firms is questionable if we consider private loan providers that have often access to the firm's proprietary information and are able to monitor the use of funds. Finally transaction cost economics does not consider the positive role of R&D investment in developing firm specific assets and capabilities.

Previous studies on the R&D investment capital structure relationship have examined only large firms. We extend the analysis also to small firms, as in Jõeveer (2013) and Chen et al. (2010), considering not only large publicly listed firms, but also small unlisted companies. In particular, we investigate the effects of R&D investment on the financing choices of Italian manufacturing joint stock companies, focusing on the two most common financial instruments: private loans or 'relational debt' and 'common equity'. The main drivers of the difference between firms, in terms of financial choice, are imperfect information between capital providers and managers (AT) and the fact that investments by transacting parties are subject to hazards (TCE). We therefore provide a novel contribution to this literature by focusing on two firms' characteristics that may increase imperfect information and transaction 'hazards' driven by bounded rationality and opportunism (David et al., 2008). The first is the different level of transparency, which characterizes listed firms compared to the unlisted (Brav, 2009), the second is the degree of asset specificity and opaqueness that characterizes the different types of R&D activities (internal versus external R&D, see Vincente-Lorente, 2001).

We base our analysis on a unique company-level integrated data set of Italian companies, in which we combine the information coming from balance sheet data and the Community Innovation Survey (CIS). We use the two most recent CIS waves, CIS 6 (2006-2008) and

CIS 7 (2008-2010), to construct a panel data set in order to exploit both the times series and the cross section information, through the use of an econometric model.

Our main results suggest that common equity is an ideal financial instrument for R&D intensive firms, whereas debt providers are less prone to finance firms as R&D activities increase. This result is highly influenced by the degree of firm's transparency in terms of legal form (listed vs unlisted) and of R&D characteristics (internal vs external R&D).

The rest of the paper is structured as follows. Section 2 defines the hypothesis we would like to test in this article. Section 3 describes the data and the methodology. Section 4 summarizes the results and section 5 concludes.

2 Theory and Hypothesis

Transaction Cost Economics suggests that equity should be preferred to debt as a source of funding for R&D investment projects. The first reason lies on the fact that these investments lose considerable value if bankruptcy forces redeployment outside the firm, thus they do not serve as good collateral for lenders (Long and Melitz, 1985), moreover, the necessity of meeting payment terms, which is typical of debt, can reduce financial flexibility and it can induce managers to curtail ongoing R&D projects (O'Brien, 2003). Secondly, the evaluation of R&D projects is uncertain, given the considerable time lag between investment and payoff (Laverty, 1996) and many external factors may arise and influence ultimate payoffs (Hill and Snel, 1988). Finally the returns to investments in R&D are subject to weak appropriation as the leakage of information about a firms' R&D project can lead to imitation by competitors (Teece, 1986).

As David et al. (2008) point out, though, debt is heterogeneous. In particular, what we consider in this article is the debt provided by banks, which are defined in the literature as relationship lenders (Boot, 2000). Banks have the peculiarity, differently form other lenders, of developing close relationships with borrowers over time and such proximity has been shown to facilitate monitoring and screening and can overcome problems related

to asymmetric information.

Relational Debt providers (Banks) may prefer investing in firms that have a certain level of R&D investment and avoid firms that do not innovate at all. This happens because returns of relational debt providers depend on continuous lending to successful firms. However, a very high level of R&D investment is risky and could potentially imply a greater chance of fatal losses for the firm. Even though private loans providers may have access to the firms' proprietary information (Boot, 2000; David et al., 2008; Degryse and Ongena, 2001) they are still outsiders of the firm and might not be able to fully monitor their use of funds. When R&D investment is high, transaction cost theory applies, suggesting a negative relation between relational debt and R&D. In addition, relational debts are often secured with collateral, which is not something that belongs to R&D expenditure. Control rights theory, Aghion and Bolton (1992) and Aghion et al. (2004), also predicts that more innovative firms are likely to be more reliant on external funds, and suggests that they may favor new equity rather than debt among these external resources.

Hypothesis 1. There is an inverted U-shaped relationship between R&D investment and financing through relational debt.

Firms with high levels of R&D expose their business to risk coming from technology and market uncertainty. Reduced financial obligations, achieved by financing through common equity, may help such firms buffer their failures in R&D projects. Furthermore, reduced financial obligations from common equity financing increase discretionary slack, which may be supportive of R&D investment. Although risks involved in R&D may expose holders of common stock to losses, they are able to mitigate this unsystematic risk through portfolio selection (Bettis, 1983). Moreover, when the size or scope of the investment project becomes sufficiently large and when assets become sufficiently intangible, firms will allocate fuller control rights to outside investors by issuing equity (Aghion et al., 2004). Common Equity is ideal for both the R&D intensive firm and its common stock investors.

Hypothesis 2. There is a positive relationship between R&D investment and financing

through common equity.

The above hypothesis, though, tends to be different if we distinguish between listed and unlisted companies. The different ownership structure, more concentrated in the case of the latter, and the different level of asymmetric information, which is stronger for the unlisted, makes unlisted companies rely almost exclusively on debt financing and make them avoid external capital markets, leading to a greater sensitivity of their capital structure to fluctuations in performance. This implies that only the most profitable unlisted firms have the possibility of financing R&D expenditure, given that they cannot rely on equity.

Hypothesis 3. There should be a weak relation between R&D investment and financing through common equity for unlisted firms differently from the listed.

Finally, according to transaction costs economics (TCE), raising debt is harder for firms characterized by firm specific assets such as R&D. Firm specific assets have lower resale value than general assets, because, by definition, general assets can be more easily redeployed (Williamson, 1988). If we make the distinction between Internal and External R&D, the specificity of Internal R&D is higher than that of External R&D implying higher restriction to debt financing (see Vincente-Lorente, 2001).

Hypothesis 4. The inverted U-shaped relationship between R&D investment and financing through relational debt should be stronger for firms that invest in Internal R&D.

3 Data and Methodology

3.1 Data Sources

We construct a panel data set of Italian manufacturing Joint Stock Companies, using balance sheet data and survey data on innovation (Community Innovation Survey). The source of both data sets is the Italian National Statistic Office (ISTAT).

Balance sheet data provides information, on an annual basis, mainly on firms' structural characteristics related to size, capital structure, profitability, but also reports the R&D expenditure of the firm. The Community Innovation Survey (CIS), on the other hand, takes place every four years in all countries of The European Union to investigate companies' innovation activities. Innovation is gathered by national statistical offices through a survey that covers a representative sample of companies (innovative and not) stratified along the region, sector and size dimension. The CIS is directed to manufacturing and services firms with more than 10 employees. It comprises the universe of firms with more than 250 employees and a stratified sample of firms with fewer than 250 employees. It collects data on product and process innovation, on the resources allocated to the innovation activities (namely R&D expenditure), but also information on public support to innovation, cooperation activities and the obstacles to innovation.

The first data set allows a connection with the previous literature (Bah Dumontier, 2001, and Aghion et al., 2004), which is totally based on balance sheet data, and permits to extend the analysis also to listed firms, which are only marginally considered in the CIS sample. The second data set, on the other hand, enables us to exploit the greater detail on the different types of R&D activities. The integration of both data sets has the great advantage of combining firms' structural characteristics and innovation.

The analysis that relates listed and unlisted firms is based only on balance sheet data. We construct an unbalanced panel of 745 manufacturing unlisted joint stock companies[4]

[4]It comprises the universe of manufacturing unlisted joint stock companies with more than 250 employees and a stratified sample of firms with fewer than 250 employees.

and an unbalanced panel of 90 manufacturing listed joint stock companies[5] from 2005 to 2010.

We then consider the integrated data set made of balance sheet data and innovation survey data on the same unbalanced panel of 775 unlisted joint stock companies[6] over the period 2006 to 2010 to exploit the difference in terms of type of R&D. In particular we concentrate on the difference between opaque and transparent R&D expenditure (see section 3.2).

An important contribution of this article to the existing literature consists in linking two CIS waves (CIS 6 2006-2008 and CIS 7 2008-2010), in order to exploit together with the cross section also the times series dimension. Given that the CIS asks to report the expenditure in R&D activity only in the last year of the reference period (2008 and 2010 respectively), in order to make the variable continuous, we attribute to the missing years the average between the values in 2008 and 2010.

3.2 Variables

Italy is a bank oriented economy that relies mainly on relational debt (bank loans) as a source of funding. Debentures and convertible debt and lease liabilities are almost in all cases not present in Italian balance sheets. The other form of financing is common equity given that preferred stock is absent. As dependent variable we consider 'relational debt', i.e. bank loans, commercial loans and other long term debt, to test hypothesis 1, and 'common stock' to test hypothesis 2. We construct the ratio of both variables with respect to the sum of total long term debt and book value equity.

Our main independent variable is R&D intensity, measured as R&D expenditure divided by net sales. We consider two different kind of measures of R&D expenditure. The first is taken from balance sheet data and the second from the CIS Survey.

The Survey reports on whether the firm has invested in innovation in at least one of the

[5] It comprises the universe of the manufacturing listed joint stock companies.

[6] We do not extend the analysis to listed companies given that the number of listed firms surveyed varies from wave to wave and is too small to perform a significant analysis

last three years, also asking to report the expenditure in that activity in the last year. The various innovation activities are divided into: i) research and development conducted within the firm; ii) acquisition of R&D services from outside;iii) acquisition of other technology from outside; iv) marketing; v) formation.

In order to address Hypothesis 3 we divide R&D activities into two groups. We call the first group 'opaque R&D', which comprises only R&D activities conducted internally, which are likely to be highly firm specific and opaque (Vincente-Lorente, 2001). The second group, 'transparent R&D', incorporates, on the other hand, all the R&D activities acquired by contracting with other parties (firms, universities or research institutions) and other activities, such as marketing of innovative products and formation, which have clearly the aim of transmitting information about the firm and its products to current and potential customers or to employees.

We include a set of commonly used controls related to firms' characteristics: size, growth opportunities, profitability, non debt tax shields, collateral, current debt ratio and internal funds.

Firm size, measured as the natural logarithm of net sales, as a control for the fact that firms have a different power in finding financial resources according to their size. The growth rate of a firm, that we measure as the real growth rate of sales in the case of unlisted firms and as the ratio of market price value to book price value to measure the actual growth opportunities of listed firms, is an indicator of the firm's investment flexibility. Firms with high profitability, measured as the ratio of operating income before depreciation to total sales, might be less dependent on external finance.

We also introduce controls linked to the firm's choice of financing with debt. A firm might have an incentive to use debt as a source of finance given that debt can be used to avoid tax, on the other hand the information asymmetry between firms and capital providers might force the firm to use internal funds over external funds (pecking-order theory). We thus consider non debt tax shields, proxied by the ratio of depreciation and amortization to total assets, to control for the first aspect and internal funds, measured as the ratio of

retained earnings to total assets, to control for the second.

Finally, collateral, measured by the ratio of net plants, property and equipment to total assets, may influence the firms' access to debt capital, and the level of current debt, measured by the ratio of total long term debt to total assets, can determine the firms' future indebtedness.

We also introduce sector and time dummies to control for industrial, macro and organizational factors that might affect financing decisions on one hand and time varying macro conditions such as changes in financial markets, interest rates and business laws on the other.

4 Empirical Evidence on Innovation activity in Italy

Table 1 reports the percentage of R&D firms and the average of R&D intensity (the ratio of R&D Expenditure to sales) for Italian listed and unlisted companies. Results are comparable with other studies on Europe (i.e. Bah Dumontier, 2001, and Aghion et al., 2004). We notice how listed firms, which rely extensively on both types of sources of funding, debt and equity, have a higher percentage of innovative firms and also a higher intensity of R&D.

Table 1: *R&D for listed and unlisted*

	N firms	**R&D % firms**	**R&D intensity**
Listed	90	28.9*	4.2
Unlisted	745	16.0*	2.2

Source: Balance Sheet data. ASIA-Istat. Data are referred to 2010.
*The percentages on R&D might be underestimated given that reporting R&D expenditure on balance sheets is voluntary.

Table 2 reports some statistics on the characteristics of innovation in the Italian manufacturing sector. In line with Evangelista et al. (1997), only approximately one third of Italian firm spend on opaque R&D, whereas the percentage of firms that report some kind of transparent R&D is much higher (around 70%). The percentage increases with the

size of the firm. Moreover, in the case of opaque R&D, the smaller percentage of small companies that do innovate, do not emerge less innovative than the large ones. There is, in fact, a non linear relationship that involves a higher R&D intensity for small and large firm and a lower intensity for middle sized companies. The more transparent form of R&D intensity, on the other hand, tends to decrease with firm size.

Table 2: *Opaque and Transparent R&D*

		Opaque R&D		**Transparent R&D**	
Classes of Employees	**N firms**	**% firms**	**intensity**	**% firms**	**intensity**
11-49	56	10.7	3.7	51.8	4.0
50-99	140	35.0	3.9	59.3	3.0
100-199	116	29.3	2.5	63.8	2.4
200-499	201	49.2	3.1	70.6	1.9
500-999	143	39.8	3.9	79.0	1.8
1000	89	42.7	5.2	88.9	2.2
Total	745	35.3	3.7	69.8	2.3

Source: CIS-ISTAT. Data are referred to 2010.

5 The Model

We use general least squares for panel data, with robust standard errors, to test our hypotheses. In the GLS model we lagged all the control variables and R&D intensity by one year to address causality.

In order to test Hypothesis 1, we consider the following specification:

$$y_t = \alpha + \beta X_{t-1} + \gamma X_{t-1}^2 + \delta C_{t-1} + \epsilon_{t-1}, \tag{1}$$

where y is 'relational debt', X is R&D intensity, also reported squared in order to test the non linear relationship, and C the set of control variables.

For testing Hypothesis 2, we consider the following specification:

$$y_t = \alpha + \beta X_{t-1} + \delta C_{t-1} + \epsilon_{t-1}, \tag{2}$$

where y is 'common stock', X is R&D intensity and C the set of control variables.

6 Results

The first set of results, summarized in tables 3 and 4, investigates the effects of R&D investments on the financing choices of Italian firms, emphasizing the different level of transparency that characterizes listed and unlisted firms.

In Table 3 the ratio of 'relational debt' is the dependent variable of the GLS model. We notice that there is a non linear relation between relational debt and balance sheet R&D intensity. The simple term exhibits positive coefficients, whereas the squared term is characterized by negative coefficients, supporting Hypothesis 1 which suggests an inverted U-shaped relation between R&D investment and debt financing. Coefficients are very similar between the two groups of firms.

In Table 4, the ratio of common stock is the dependent variable of the GLS model. R&D has a positive effect providing supporting evidence for Hypothesis 2, but only in the case

Table 3: *Dependent variable: Relational Debt. Listed and Unlisted Italian firms*

	Listed		**Unlisted**	
	Coefficient	**(STD.Error)**	**Coefficient**	**(STD.Error)**
R&D intensity	3.669*	(1.923)	4.292***	(0.886)
R&D intensitysquared	-30.795*	(16.948)	-23.489***	(5.416)
Current Debt Ratio	0.487***	(0.184)	0.679***	(0.058)
Firm Size	0.060***	(0.015)	-0.002	(0.012)
Profitability	-0.005	(0.003)	-0.360***	(0.094)
Firm Growth Opportunities	0.021*	(0.012)	-0.010	(0.014)
Collateral	0.397**	(0.155)	0.082***	(0.026)
Internal Funds	-0.114	(0.159)	-0.454***	(0.052)
Non Debt Tax Shields	-0.687	(0.897)	-0.807**	(0.284)
Intercept	-0.308**	(0.150)	0.362*	(0.212)
Observations	109		698	
Wald test	134.94	(0.0000)	554.88	(0.0000)

Significance Levels : *p<0.10,p<**0.05,p<***0.01
Independent Variables : lagged one period.

of listed firms. For the unlisted the coefficient is not significant (Hypothesis 3).

Unlisted firms, in concordance with the existing literature (Brav, 2009 and Jõeveer, 2013), rely almost exclusively on debt financing and tend to avoid external capital markets, leading to a greater sensitivity of their capital structures to fluctuations in performance. This last statement is confirmed by the negative sign on firm's profitability in both regressions. More profitable firms have larger internal slack and therefore a smaller need for external finance. The negative relation between internal funds and common equity tends to support the pecking order theory as internal funds become substitutes of equity.

To summarize, the two groups of firms are similar in terms of debt financing (the U-shaped relation between R&D and relational debt is confirmed) even if the results on listed firms are barely significant probably due to sample size. The main difference between the two groups, though, relies on what substitutes debt when R&D intensity increases. In the case of listed firms the substitute is equity, in the case of unlisted the substitute for debt is internal funds (see Table 4).

This different capital structure helps explain the different percentage of R&D firms in the two sectors. Moreover, the fact that financial markets have more information avail-

Table 4: *Dependent variable: Common Equity. Listed and Unlisted Italian firms*

	Listed		**Unlisted**	
	Coefficient	**(STD.Error)**	**Coefficient**	**(STD.Error)**
R&D intensity	1.793*	(0.979)	-0.623	(0.675)
Current Debt Ratio	0.147	(0.182)	-0.428***	(0.089)
Firm Size	0.026	(0.025)	-0.020	(0.020)
Profitability	0.274	(0.227)	-0.576***	(0.141)
Firm Growth Opportunities	-0.013	(0.011)	-0.015	(0.020)
Collateral	-0.470**	(0.218)	-0.016	(0.041)
Internal Funds	-0.462***	(0.173)	-0.502***	(0.052)
Non Debt Tax Shields	2.255**	(0.969)	0.382	(0.445)
Intercept	-0.108	(0.237)	0.796**	(0.347)
Observations	109		698	
Wald test	45.62	(0.0003)	83.55	(0.0000)

Significance Levels : *p<0.10,p<**0.05,p<***0.01
Independent Variables : lagged one period.

able about listed firms, rewards only equity finance and not debt finance, differently from Jõeveer (2013), probably because the Italian banking system is strongly based on tight relations between lending banks and borrowing firms, independently of their size and ownership structure. The main outcome of our result in terms of policy implication, is that innovation activity in Italy could be stimulated by deepening financial system towards more developed financial markets, in accordance with Micucci and Rossi (2012) and Magri (2012).

The second set of results, summarized in Tables 5 and 6, focuses on the different degree of asset specificity and opaqueness that characterizes the different types of R&D activities and focuses only on unlisted firms.

From Table 5 and Table 6 we notice that the use of a more complete source for R&D expenditure confirms the results of the previous section and still supports evidence for hypothesis 1 and hypothesis 2. Moreover the possibility of distinguishing between the 'opaque' and 'transparent' R&D activities, which is a valuable information that only the CIS can provide, allows to confirm also Hypothesis 4.

Table 5 and Table 6 support the inverted U shape relation between relational debt and

R&D and the positive relation between common stock and R&D only if we consider the most opaque form of investment. Results are not significant for 'transparent' R&D, implying that only opaque and specific R&D activities prescribe a higher risk and cost of financing (see Vincente-Lorente, 2001 for similar results). Moreover, when assets become sufficiently intangible, as in the case of opaque R&D, firms will allocate fuller control rights by issuing equity (see Aghion et al., 2004 for similar results).

Table 5: *Dependent variable: Relational Debt. Opaque versus Transparent R&D. Unlisted firms.*

	Coefficient	**(STD.Error)**	**Coefficient**	**(STD.Error)**
Opaque R&D intensity	1.053*	(0.575)	1.017*	(0.581)
Opaque R&D intensitysquared	-3.586**	(1.605)	-3.539**	(1.610)
Transparent R&D intensity			0.243	(0.517)
Transparent R&D intensitysquared			-1.597	(2.467)
Current Debt Ratio	0.682***	(0.053)	0.679***	(0.054)
Firm Size	0.023*	(0.012)	0.022*	(0.012)
Profitability	-0.326***	(0.092)	-0.329***	(0.092)
Firm Growth	-0.013	(0.014)	-0.014	(0.014)
Collateral	0.066**	(0.026)	0.067**	(0.026)
Internal Funds	-0.434***	(0.050)	-0.434***	(0.050)
Non Debt Tax Shields	-0.644**	(0.278)	-0.634**	(0.283)
Intercept	-0.073	(0.205)	-0.070	(0.206)
Observations	738		738	
Wald test	478.85	(0.0000)	478.85	(0.0000)

Significance Levels : *p<0.10,p<**0.05,p<***0.01
Independent Variables : lagged one period.

Some control variables produced interesting results. Firm size turned out to be positively associated with 'relational debt', given that larger firms have more market power and better attract debt finance, and negatively associated with 'common stock' in accordance with Wang and Thornhill (2010), probably because larger firms may have relatively larger sales and consequently obtain more abundant internal funds.

We find a positive relation between debt and collateral, which makes sense given that loan providers often require collateral for lending. The negative relationship between retained earnings and common equity finance seems to support the pecking order theory, which

implies that firms prefer internal funds over external capital (Myers Majluf, 1984). Return on Sales are negatively associated both with 'relational debt' and 'common equity', probably because firms with a higher residual value might use it to finance its investment activities without having to rely on external finance.

Table 6: *Dependent variable: Common Equity. Opaque versus Transparent R&D. Unlisted firms.*

	Coefficient	**(STD.Error)**	**Coefficient**	**(STD.Error)**
Opaque R&D intensity	1.204***	(0.448)	1.162***	(0.438)
Transparent R&D intensity			-0.234	(0.387)
Current Debt Ratio	-0.421***	(0.078)	-0.410***	(0.079)
Firm Size	-0.035*	(0.020)	-0.034*	(0.019)
Profitability	-0.395***	(0.129)	-0.529***	(0.133)
Firm Growth	-0.013	(0.019)	-0.019	(0.020)
Collateral	-0.009	(0.040)	0.004	(0.039)
Internal Funds	-0.385***	(0.075)	-0.557***	(0.076)
Non Debt Tax Shields	0.090	(0.426)	0.007	(0.427)
Intercept	0.973***	(0.343)	1.054***	(0.324)
Observations	738		738	
Wald test	105.02	(0.0000)	105.31	(0.0000)

Significance Levels : *p<0.10,p<**0.05,p<***0.01
Independent Variables : lagged one period.

7 Concluding Remarks

Italian manufacturing joint stock companies, mainly small and unlisted, strongly rely on bank debt as a source of finance.

The ability of attracting external capital depends on the level of imperfect information between capital providers and managers (Agency Theory) and on the fact that investments by transacting parties are subject to hazards (Transaction Cost Economics). Our results prove that both channels are important in influencing the way firms finance innovative investments.

In accordance with the literature on this theme (Wang and Thornhill, 2010, Aghion et al. 2004), we find that common equity is an ideal financial instrument for R&D intensive firms, whereas debt providers are less prone to finance firms as R&D activities flourish. Interestingly these results apply only if we consider internal R&D activities, which are the most specific and opaque forms of investment (Vincente-Lorente, 2001). At the same time, we find that ownership is important in order to attract equity finance (whilst it does not influence debt).

Even though the relationship between banks and firms, in Italy, is of a long term lasting kind, and should, in principle, mitigate the asymmetric information between parties, our results suggest that the direct access to financial markets would help improving the propensity of Italian firms to promote an innovation led growth activity, such as internal R&D.

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