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FINANCIAL CONSTRAINTS AND RELATIONSHIP LENDING IN THE GROWTH OF ITALIAN SMEs

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ABSTRACT

Our study confirms that the financial constraints to SME's growth tend to appear as an excess of sensibility of the investment expenditures on firm's cash flow. Through the application of dynamic panel data techniques to an extended version of Eulero's investment equation of a sample of Italian SMEs, the analysis shows that the growth of the subsample of the small firms in backward regions of Italy is more constrained by inside finance than that of firms in more developed regions. This is because the typical information opacity of SMEs is worsened here by the unsatisfactory development of financial markets. Moreover, our analysis ascertains that the small firms can significantly relax the constraints if they are able to establish a close relationship with the banks making easier the access of bank to firm's information.

Keywords: firm growth, financial constraints, relationship lending

JEL Classification: E22, G31, G32

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1. INTRODUCTION

It is generally accepted that the availability of finance is one of the main factors affecting the ability of firms to grow. Especially in small and young firms, growth appears constrained by the quantity of internally generated resources. Furthermore, where financial markets are poorly developed, the gap between outside and inside finance widens since firms find it more difficult to access outside finance. The obstacles to firms tapping outside finance can be partly overcome by improving bank access to company information, hence establishing a close relationship.

Our study aims not only to ascertain that the growth of small firms in backward regions is more financially constrained by inside finance than that of firms in more developed regions, but also that close relationships between firms and banks raise the ability of firms to finance their growth with outside resources. Our analysis falls within the field of investment literature which is known to deal with problems related the financing of firm growth and the effects of financial constraints as measured by the investment/cash flow relationship. Excess sensitivity of investment expenditures to cash flow means that a firm's growth is financially constrained because it is strictly dependent on the ability to generate internal resources for its own financing.

For our investigation we apply dynamic panel data techniques to an extended Euler investment equation. We are interested to analyze the issues related to sensitivity of the investment expenditures to cash flow with reference to the first half of the last decade. Nevertheless, our analysis goes back to the previous years in order to introduce some cyclical evaluations and to capture some dynamics. Therefore, our dataset is formed by two distinct samples of Italian small and medium sized enterprises obtained from surveys of Italian manufacturing firms published by Italian private banks in accordance to the Italian Ministry of Industry. The *dataset* for the period 1998-2006 is divided into two balanced samples referring to the six-year periods 1998-2003 and 2001-2006. In this period the Italian banking system emerged from major reorganization managed by the monetary authority. This process aimed explicitly to make it possible for the national banks to face the increasing competition by the European banks following the integration of EU financial markets.

The consolidation of the national banking system occurred through an upsizing process and M&A operations to the detriment of regional banks in southern Italy. This caused the full disappearance of the large regional banks which had previously played a key role in supporting the growth of the backward regions in southern Italy. This reorganization led to an improvement in efficiency but it ended up with the financial requirements for regional growth depending on smaller local banks.

This period coincided with the end of the positive trend of sustained export-driven growth. There is an inversion of the cycle, leading to a sharp fall in exports and production. This is when the real financial difficulties started for the Italian SMEs, prior to the explosion of the financial crisis in the years to come.

The remainder of the paper is organized as follows. In section 2 we review the main questions about the nexus between financial constraints, relationship lending and firm growth. Section 3 is devoted to explaining the methodological approach and the empirical data. In section 4 after discussing some features both of the capital structure and of relationship banking of the sample firms, we then present the findings of the econometric exercises. Some concluding remarks are contained in the final section. Finally, there is an appendix showing Euler's investment equation.

2. FINANCIAL CONSTRAINTS, RELATIONSHIP LENDING AND FIRM GROWTH

The literature on the capital structure-growth nexus deals with the problems about the sources of financing of production and the financial constraints to the growth of the firm. Our analysis is concerned not only with the framework of the Modigliani-Miller propositions according to which

capital structure does not matter for a firm's growth but also with the hierarchy hypothesis according to which external finance is not a perfect substitute for internal finance and inside resources are preferred in order to finance firm growth.

Starting with the seminal work by Fazzari et al. (1988), this literature has sought to ascertain whether there is a positive relationship between a firm's investment expenditures and its cash flow. According to this approach, great sensitivity of a firm's investment to inside finance indicates that there are financial constraints to the firm's growth. Much was later written to confirm this relationship, estimating empirical models where the investment function is adjusted by proxies of the capital structure, especially by cash flow variables[1]. Since a positive relationship between investment spending and cash flow can prove the existence both of financial constraints or of good opportunities for firm's growth, most analyses have confirmed this relationship, showing that the investment spending in the sample of the firms classified as *ex-ante* "financially constrained" is more sensitive to cash flow (amongst others, Devereux, Schiantarelli, 1989; Hoshi et al., 1991, Oliner, Rudebusch, 1992; Schaller, 1993; Himmelberg, Petersen, 1994; Gilchrist, Himmelberg, 1995; Fazzari et al., 2000)[2].

This approach has been strongly questioned by the latest empirical research beginning with that of Kaplan and Zingales (1997). According to this analysis, the relationship between investment and cash flow does not necessarily prove that financial constraints are binding. On the contrary, capital expenditure will be systematically sensitive to cash flow because the user cost of outside finance is always higher. Therefore, sensitivity to cash flow will be higher for "financially non-constrained" firms than for the financially constrained because the former hold larger internal resources. Other works have confirmed this conclusion (amongst others, Kadapakkam et al. 1998; Cleary, 1999; Kaplan, Zingales, 2000; Gomes, 2001; Ati, 2003; Moyen, 2004).

The matter of the "linearity" of the investment-cash flow relationship is largely unresolved[3]. Nevertheless there are many reasons suggesting that small firms face higher financial constraints because the opacity of the relationship of the firm with the financial markets raises difficulties to access outside resources. Many empirical studies have confirmed this thesis, showing that the growth of small firms is more sensitive to inside finance compared to larger firms (amongst others, Oliner Rudebusch, 1992; Westhead, Storey, 1997; Cress, Olofsson, 1997; Audresch, Elston, 2002). By the same token it can be said that the bottlenecks of the resource flows devoted to finance growth are highly likely both if the firm's performance is negative and if the financial markets are not fully developed. Consequently, the dependence of a firm's growth upon inside finance becomes even stronger (Bagella et al., 2001; Becchetti, Trovato, 2002; Bond et al., 2003; Sarno, 2005, 2008; Oliveira, Fortunato, 2006; Becchetti et al., 2009).

There appears to be a broad consensus that relationship lending is the best practice to relax financial constraints. Since the work of Diamond (1984), greater benefits which mitigate the information asymmetries have been assigned to the relationship lending approach as opposed to transaction-based lending. Through relationship lending the bank establishes a long-term

[1] The paper by Hubbard (1998) reviews this literature.

[2] In order to distinguish between ex-ante constrained and non-constrained firms several dummies for financial decisions have been used. In the initial works involving samples of larger firms the criterion discriminating between constrained and unconstrained firms lies in the dividend policy. The choice is inspired by finance theory according to which dividend payments are subordinated to investment policy; consequently firms with good opportunities distribute low dividends in order to finance their investments if they are financially constrained compared to firms with large funds and paying higher dividends.

[3] The controversy continues. In the last work by Fazzari et al. (2000) the conclusions proposed by Kaplan and Zingales are contested; they say that the sample used in the analysis by Kaplan and Zingales is too small. In reply the latter (Kaplan, Zingales, 2000) restate their arguments and recall that the results of Cleary's work (1999) are obtained using a larger sample and are consistent with their theory.

relationship with the firm: the bank now gains access to information about the firm while the firm enjoys better access to outside financial resources.

A large flow of information about the firm arises from its utilizing a wide range of financial services offered by the bank. This information cannot be observed by, or transferred to, other banks, and the bank granting exclusive loans to the firm becomes the exclusive owner of such information. The free rider problems deriving from the public nature of the information are avoided and it follows that the bank will bear all the risks and at the same time will gain the benefits arising from its financial decisions. The close relationship enables the bank to support the growth of the firm with regard to its financial needs while, for the firm, benefits arising from the relationship generally consist in an increase in credit availability (Petersen, Rajan, 1994; Berger, Udell, 1995; Cole, 1998; Boot, 2000) or a decrease in the interest rates and the collateral (Petersen, Rajan, 1994, Berger, Udell, 1998). Furthermore, the relationship ensures greater flexibility in the bank's function as an intermediary that can subsidize the firm in adverse events and can be reimbursed in favorable years (Greenbaum et al., 1989; Boot, Thakor, 1994).

From relationship lending there may also arise some disadvantages. The firm can be informationally "captured" by the bank (the so-called hold-up problem)[4]. The exclusive relationship involves monopolistic power by the bank. It can exploit this power by charging increasing interest rates on new loans or rationing additional borrowing. In this regard it can be shown that relationships with more than one bank can reduce its monopoly power (Von Thadden, 1995; Ongena, Smith, 2000) and also ensure greater availability of outside financial resources when there is a credit squeeze (Detragiache et al., 2000).

The conclusions of the empirical analysis are ambiguous. The net gain of relationship lending seems to arise for the firm when the benefits of the informational advantage are not completely balanced by the costs of exploiting monopoly power. Recent theoretical developments suggest that the efficiency of the relationship is strictly dependent on bank competition as well (Boot, Thakor, 2000; Dinç, 2000). According to this analysis, competitive pressure in the local credit market drives the bank to use financing relationships strategically to exploit information advantages. By contrast, the incumbent banks are unable to preserve their position when this informational advantage is unimportant and the profitability of the incumbents is diminishing (Hauswald, Marquez, 2006; Zarutskie, 2006).

3. DATA AND METHODOLOGICAL APPROACH

The data for the empirical analysis were obtained from the surveys of Italian manufacturing SMEs. In the past such surveys were carried out every three years and conducted through both interviews and balance sheet data. The surveys contain information related to several sections with regard to company employment, R&D expenditures, innovations and investment, internationalization, markets and finance; balance sheet data comprise both reclassified revenue statements and asset and liability statements.

The firm sample for the survey is representative of the size and geographical composition of the universe of manufacturing firms. It consists of firms with more than 10 employees and is stratified by the productivity index (value added per employee). The total sample is defined according to the Neyman formula with reference to the individual strata, and the cross-industry composition is determined in proportion to the universe[5].

[4] For the purpose of this analysis the opposite case in which the bank is captured by the firm (so-called *soft budget constraint problem*) does not appear relevant to us.

[5] The surveys were carried out by the research centers of various public and private banks and supported by the Italian Ministry of Industry. The first surveys were conducted by the public bank Mediocredito Centrale, the last survey by the

We defined two balanced firm samples related to the two six-year periods 2001-2006 and 1998-2003. They contain the observations referring to the same firms in the adjacent surveys, that is the 1998-2000 and 2001-2003 surveys and 2001-2003 and 2004-2006 surveys, respectively. Next, we dropped the large firms with more than 250 employees. Consequently, the two closed samples were formed by SMEs with 10-250 employees and include 1134 observations for 1998-2003 and 823 observations for 2001-2006[6].

We then identified the firms belonging to the backward regions of Italy, on the one hand, and the firms with a close relationship with the main bank, on the other. In the former case, we established that firms operating in backward regions were those with plants in southern Italy, the so-called *Mezzogiorno* (MEZ)[7]. This area is known to have significantly lower overall development conditions compared with the more advanced developed regions in northern and central Italy. There were 135 such firms (11.9% of total observations) in the 1998-2003 sample, and 99 (12.0% of total observations) in the 2001-2006 sample.

Next, we identified the firms with a stable relationship (STAB) with the main bank. In this regard, we utilized information from the "Finance" section of the surveys. We consider firms with a close banking relationship those that show with reference to both surveys:

a) a debt share with the main bank equal to or greater than 30% of total debt;
b) a relationship with the main bank dating back 15 years or more[8].

According to these criteria, 188 firms had a stable relationship with the main bank (16.6% of total observations) among the former sample, and 141 (17.1% of total observations) among the latter. Thus the information from the surveys as much as the balance sheet data was used to create the dataset for econometric analysis.

We provided estimates in accordance with Arellano-Bond's Dynamic Panel Data method (DPD) which is able to ensure a satisfactory solution to the endogeneity problem arising from the correlation between the fixed effects and the independent variables. This method involves the transformation of all the variables into first order differences in order to drop the fixed effects. Next, it suggests application of the Generalized Method of Moment (GMM) and inclusion of valid instruments for every moment. Therefore the transformed variables are not generally correlated with the fixed effect starting at time t=2 (if the start time is t=0). From this time the lagged values can be used as instrumental variables for the GMM estimate.

The choice of the empirical model with which to verify the investment-cash flow relationship characterizes the different approaches. Since a positive relationship can be interpreted as evidence of good opportunities for the firm, initial analyses resort to Tobin's Q theory. These empirical specifications suggest controlling for the opportunities through the Q ratio and hence estimating the standard relationship between capital expenditures and the Q measure augmented by cash flow variables. Thus excess sensitivity of investment spending to cash flow indicates that more funds from inside resources are made available for investment when the firm is unlikely to make provision for its own needs from outside finance. Many objections can be raised against this approach; for example, if Tobin's Q is not a good proxy of a firm's opportunities, then excess

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private Unicredit Bank. Although some changes were made, the surveys retained their usual structure. In the last survey (2003-2006) the sample was extended to the service industry.

[6] The upper limit corresponds with the employment criterion fixed by the EU for SMEs. However, the definition of SME by European statistics is more complex because it also considers levels of sales.

[7] The Mezzogiorno comprises the southern area of Italy and is formed by eight administrative regions: Abruzzo, Molise, Campania, Calabria, Puglia, Basilicata, Sicily and Sardinia.

[8] We alternatively proved a higher share of the main bank's debt equal to or greater than 50% of total debt, but the econometric results are unchanged.

sensitivity of capital expenditure to cash flow does not necessarily indicate that financial constraints are binding[9].

The alternative approach is proposed by the Euler equation, that is the first order condition of the optimization problem of the inter-temporal income flows of the firm. This approach is able to prevent many questions arising from the Q approach because it is founded on the hypothesis of perfect functioning of the capital market. When this hypothesis fails to hold, then the imperfections in the capital markets arise and the firms face financial constraints. Many of the cited works choose the approach of the Euler equation[10].

4. EMPIRICAL MODEL

For the empirical analysis we follow the Bond-Meghir model (Bond, Meghir, 1994). This model involves Euler's investment function arising from the dynamic optimization of the present value of the expected net earnings function with the symmetric squared adjustment cost. The net earnings function is constrained by the capital accumulation function. If the condition of perfect competition holds, the constrained optimization function means that we can write Euler's investment equation without financial constraints. Empirical estimation of the investment function makes it possible to test the *ex ante* conditions in order to ascertain whether there are constraints; if the ex-ante conditions do not hold, then it cannot be excluded that financial constraints are binding (see the APPENDIX).

From Euler's investment equation the following empirical version of the investment equation can be derived:

$$(I/K)_{t,i} = \beta_1(I/K)_{t-1,i} + \beta_2(I/K)^2_{t-1,i} + \beta_3(CF/K)_{t-1,i} + \beta_4(Y/K)_{t-1,i} + \beta_5(D/K)^2_{t-1,i} + d_t + \eta_i + u_{t,i}$$

where I is the investment expenditure, K the capital stock, CF the cash flow, Y the sales, D the total debt, d and η the time and individual effects, respectively, and u the stochastic term.

We use this version of the empirical equation to investigate two different questions. First, we are interested in mapping the regional differences concerning the financing of investment expenditures. In this regard we assume that between the investment functions of firms in the various regions there are no technological differences except for the financing composition of their expenditure. We will test our hypothesis that the contribution of inside finance for firms in backward southern regions is greater compared to firms based in other Italian regions. In order to capture this effect we introduce in the previous empirical model an interaction variable between the cash flow and the dummy MEZZ; this latter variable has a value of 1 for southern Italian firms and is equal to 0 otherwise.

Second, we will verify the hypothesis according to which the presence of close relationships of the firm with the main bank significantly relaxes financially binding constraints. In order to test the difference with regard to the sensibility of investment spending to cash flow, we introduce into the previous empirical model an interaction variable between the cash flow variable and the dummy

[9] According to Gilchrist and Himmelberg (1995), there are three reasons giving rise to skepticism: a) Tobin's Q contains less information about the younger, smaller and fastest growing firms because the markets are unable to gather information; b) if Q is not varying among firms, then the investment-cash flow relationship can result in a higher sensitivity to firm's revenues rather than the existence of financial constraints; c) the relationship should result in a swifter reaction of the younger and smaller firms with regard to variations in investment opportunities (Gilchrist, Himmelberg, 1995; pp. 544-545).

[10] Many objections can also be raised against the Euler equation approach. For example, it is unable to compare results from different studies because it is a reduced form model. Moreover, the estimates are excessively sensitive to the empirical specification of the model, particularly for samples of smaller firms. Finally, it imposes restrictions for every period and fails to consider that financially unconstrained firms today can be constrained tomorrow.

STAB. The latter variable is able to distinguish the firms with relationship banking from other firms according to previously set criteria; it assumes a value of 1 when firms have close relationships with their main bank, and 0 otherwise.

Table 1 contains the main features of the sample firms with reference to size and profitability, capital structure and a number of key factors characterizing relationship banking. They are presented so as to outline the localization and the relationship with banks of the sample firms. With regard to the former (see columns [a] and [b]), it can be appreciated that firms in the *Mezzogiorno* are smaller and less profitable than those elsewhere in Italy. Moreover, they have higher debt both on sales and on assets, a higher share of short-term maturity, but debt share on equity is lower. Finally, they are younger and hence their relationship with the main bank is less old than other Italian firms in spite of the fact that both the debt share of the main bank and the multiple relationships are not different. With reference to the latter (see columns [c] and [d]), it can be seen that firms enjoying stable relationships with the main bank are smaller and older. Their ROE is no different compared to other firms besides the ROI is significantly lower while the weight of the debt in the capital structure is systematically greater. Finally, the scenario depicted for the two three-year periods confirms that the positive trend of export-driven production of Italian firms is close to an end and that this has reduced the weight of the debt, presumably raising the flows of inside resources available to finance both firms' current activities and investments.

Hence the estimating equation can be represented as follows:

$$(I/K)_{t,i} = \beta_1(I/K)_{t-1,i} + \beta_2(I/K)^2_{t-1,i} + \beta_3(CF/K)_{t-1,i} + \beta_4(Y/K)_{t-1,i} + \beta_5(D/K)^2_{t-1,i} + \delta MEZZ*(CF/K)_{t-1,i} + \gamma STAB*(CF/K)_{t-1,i} + d_t + \eta_i + u_{t,i}$$

The variables are expressed as logarithms and are determined as follows: gross fixed investment (*I*) is obtained directly from the surveys[11]; capital stock (*K*) is equal to annual net fixed assets; cash flow (*CF*) is calculated as the sum of gross earnings and the depreciation of the fixed assets; net sales (*Y*) is equal to net revenue; total debt (*D*) is equal to the sum of annual short-term liabilities and medium-long term liabilities.

The estimates are obtained following the Arellano-Bond method for dynamic panels according to the first difference variables are involved as instrument of the GMM estimates[12]. In the empirical model dummy variables are introduced for temporal effects.

In Table 2 statistics and correlation matrices of both six-year samples are shown. Estimates of the investment equations are contained in Table 3. Besides the F test, for each equation the Sargan test and the AR tests are reported. The former test of overidentification verifies that the instrument number is not excessive. The latter tests investigate the autocorrelation between the independent variable and the fixed effects; in this regard it may be expected that the AR[1] test does not exclude the presence of autocorrelation, while the contrary should hold for the AR[2] test. These tests always meet expectations.

Columns [1] and [3] show the estimates of the investment equations related to overall firms for the periods 1998-2003 and 2001-2006, respectively. The conditions of the models generally hold, but the former equation performs better than the latter. The coefficients of the lagged dependent variable are positive, whereas the coefficients of its lagged value are negative and lower than

[11] In most studies the investment data are obtained as "library value"; instead, we use data on the fixed investment obtained directly from the inquiries. The interviews indicate the amount of net fixed investment (plant and equipment, hardware and software, information and innovation technology) in the years of the survey.

[12] For the estimate we use the STATA 8.0 package that contains an apposite procedure for the dynamic panel estimate according to the Arellano-Bond method.

unity[13]. The coefficients related to the debt variables are negative and lower than unity; they are compatible with the hypothesis of the presence of taxes and distress costs in the former equation, but they are not significant in the latter equation. The coefficients of sales variables are positive; the accelerating effect is higher in the former equation and dramatically lower in the latter. Both these outcomes indicate the prevailing trend toward the deceleration of the debt weight and the rise of inside resource devoted to finance firm growth due to sustained performance of the previous years. At the same time, this improvement in the capital structure of the firm is counterbalanced by a negative trend of production caused by intensified competitive pressure on international markets and by a dramatic decrease in national exports.

Finally, the cash flow coefficients are negative with reference to all the sample firms, indicating that financial constraints are not important. Columns [2] and [5] report the estimates of the investment equations including the interaction cash flow variable MEZZ*(CF/K) devoted to capturing the impact of internal finance on capital expenditures in southern Italian firms. The estimates confirm the previous results because the coefficient remains negative; it may be noted that while the variations of the other coefficients are not significant, the cash flow value is significantly higher. Furthermore, the cash–flow coefficient becomes positive and higher when it refers to the interaction variable of southern firm observations. Since this variable measures the difference of the impact of inside finance on investment in southern firms, it may be stated that while the coefficients referring to the overall sample are negative, equal to -0.17 and -2.81 for the two six-year periods respectively, the one referring to the southern firms is positive and approximately equal to +0.21 and +2.54, respectively in 1998-2003 and 2001-2006. This indicates excess sensitivity of investment expenditures to cash flow for southern firms[14].

Finally, the estimates including the interaction variable related to the presence of relationship banking STAB*(CF/K) are reported in columns [3] and [6]. As can be seen, while the previous results are confirmed with reference to the remaining coefficients, the cash flow coefficients related to the overall firm become positive and they remain significant: the values are equal to +0.14 for the former six-year period coefficient and +0.12 for the latter six-year coefficient. However, this excess sensitivity of investment expenditure is mitigated by the effect of relationship banking. The coefficients related to the interaction variable are negative; the value in the former equation is -1.17, that of the latter equation -1.04. The net effect is approximately the same in both cases. Therefore, relationship lending appears to relax the pressure on inside resources, improving the liquidity conditions of the firms. According to our empirical outcomes it can be said that the benefits of the relationship tend to significantly overcome the effects of the financial constraints arising from the typical information opacity of the SMEs.

5. CONCLUSIONS

It is commonly believed that SMEs face greater obstacles in obtaining the necessary outside resources to finance their growth. This paper provided some further evidence in this regard with reference to a sample of Italian SMEs. We adopted the well-known approach according to which the sensitivity of the investment expenditures to inside finance may suggest that financial constraints to company growth are binding. We ascertained through the estimate of Euler's investment equation the sensitivity of investment on firm's cash flow variables and we also investigated two related questions: to what extent financial constraints are more binding for firms in backward regions and then whether relationship lending can significantly mitigate their effects.

[13] The coefficient of the lagged dependent variable in the first equation is no different from unity (Student's t is equal at -1,2), but the same coefficient in the second equation related to 2001-2006 years is significantly different from unity (Student's t is - 19.2).

[14] The southern firm coefficient is the overall sample coefficient and the interaction variable coefficient.

Our conclusions are as follows. First, with reference to our sample firms there is no confirmation from econometric analysis that investment expenditures show excess sensitivity to company cash flow. Second, we found sensitivity of investment to inside finance instead for firms in the backward regions of southern Italy. In this case there is no sound reason which justifies the ambiguity in the economic literature as regards interpretation of such sensitivity, namely that it can prove the existence of both financial constraints and good investment opportunities. In this regard we provided evidence that firms in backward regions perform less well, are financially weaker and therefore have fewer opportunities compared to firms in more developed regions. Our empirical analysis confirmed that in backward regions a firm's growth is constrained by inside financial resources, or that it is more dependent on inside finance than elsewhere. Finally, we proved that the information advantages arising from relationship lending considerably relax asymmetry effects and significantly mitigate financial constraints, reducing the sensitivity of investment expenditure to cash flow. This empirical outcome appears consistent with the events related to the latest financial crisis in which small local banks enjoying close relationships with firms played an important role in SME growth.

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7. APPENDIX

Bond-Meghir's model can be represented by an investment function derived from the dynamic optimization of the present value of the expected cash flow with symmetric squared adjustment cost function. The constrained optimization problem is

$$Max\ E_t\ [\sum_{j=0}^{\infty} \beta_{t+j}\ \Pi_t(\cdot)\ ]$$

where E is the conditional expectation on the information available at time t, β is the nominal discount factor between t and $t+j$ and Π is net earnings[15].

The constraint is represented by the capital accumulation function

$$K_{t+1} = (1-\delta)K_t + I_t.$$

where K is capital stock, δ depreciation rate and I investment.

The function of net earnings is

$$\Pi_t = p_t F(K_t,L_t) - p_t 1/2bK_t\ [(I/K)_t - c]^2 - w_t L_t - p^I_t I_t$$

where L is the labour input, p^I is the capital price, p is the output price, w is the labour price. $F(K_t,L_t)$ is the production function with constant returns to scale while $1/2bK_t[(I/K)_t-c]^2$ indicates the adjustment cost function that is linearly homogeneous in K and L variables. The hypothesis of perfect competition conditions holds; therefore p (the price of the firm's output) is dependent on the output through demand elasticity $(\varepsilon>1)$, that is constant.

The derivatives of the previous equation with respect to I and to K are, respectively,

$$(\partial\Pi_t/\partial I_t) = -\ bap_t\ (I/K)_t + bcap_t - p^I_t$$

and

$$(\partial\delta\Pi_t/\partial K_t) = \ ap_t\ (Y/K)_t - ap_t\ (\partial\Pi_t/\partial K_t)\ (L/K)_t + bap_t\ (I/K)_t^2 - bcap_t\ (I/K)_t$$

where $Y=F-G$ is the net sales of the firm while $a=[1-(1/\varepsilon)]>0$[16].

The Euler equation without financial constraints is

$$(I/K)_{t+1}=c(1-\varphi_{t+1})+(1+c)\varphi_{t+1}(I/K)_t-\varphi_{t+1}(I/K)_t^2-\varphi_{t+1}/ba(CF/K)_t+\varphi_{t+1}/baJ_t+\ \varphi_{t+1}/b(\varepsilon-1)\ (Y/K)_t - [(1+r_t)v_t/b(1-\delta)a]\ (D/K)_t^2 + v_{t+1}$$

where, $\varphi_{t+1}=(1+\rho_{t+1})/(1-\ \delta)$, $(1+\rho_{t+1})=(1+r_t)(p_t/p_{t+1})$, ρ_{t+1} is the real discount rate, $(CF/K)_t=(p_tY_t-w_tL_t)/(p_t\ K_t)$ is the ratio between the real *cash flow* and the capital stock, $J_t=(p^I_t/p_t)\ \{1-p^I_{t+1}(1-\delta)/[(1+r_t)\ p^I_t]\}$ is the user cost capital, $(D/K)_t^2=(p^I_t/p_{t+1})[(D_t/p^I_tK)_t^2$ is the debt ratio while v_{t+1} is the error term.

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[15] β is equal to $1/(1+r)$ where r is the expected yield. The operator E is the expectation conditional on the information available at initial period t; the expectation is related to the interest rate, the input and output prices and the technology.

[16] The derivative on K is based on the assumption that Y_t is homogeneous on (K_t,L_t). Moreover, the labor marginal productivity $(\partial F/\partial L)$ can be substituted by the first order condition (w/ap); this allows us to avoid specifying the parametric form of the production function.

We assume that the real discount rate $[\varphi_{t+1}]$, net sales and the debt ratio coefficients are constant over time and across firms, and are therefore parameters.

The hypothesis of the model is satisfied if it happens *ex post* that the forward investment rate coefficient $[(1+c)\varphi_{t+1}]$ is greater than or equal to 1, the forward squared investment rate coefficient $[-\varphi_{t+1}]$ is negative and lower than 1 in absolute value.

Moreover, it may happen that the coefficient $[\varphi_{t+1}/ba]$, that is the same for the forward *cash flow* rate and for the user cost of the capital, is negative; the forward net sales coefficient $[\varphi_{t+1} / b(\varepsilon -1)]$ is positive (or equal to 0 if the perfect competition hypothesis holds). The expectation about the sign of the debt variable coefficient $[v_t]$ is not certain: if the Modigliani-Miller propositions hold, then it is equal to 0, while in the opposite case, it is positive. However, if there are taxes and bankruptcy costs, then it is negative.

The empirical specification of the investment function is as follows

$$(I/K)_{t,i} = \beta_1(I/K)_{t-1,i}+\beta_2(I/K)^2_{t-1,i}+\beta_3(CF/K)_{t-1,i}+\beta_4(Y/K)_{t-1,i}+\beta_5(D/K)^2_{t-1,i}+d_t+\eta_i+u_{t,i}$$

where d_t are time effects, η_i individual effects and $u_{t,i}$ is a stochastic time term for individual observations.

TABLE 1 - MAIN FEATURES OF SAMPLE FIRMS (mean of median values)

	1998-2003 years				2001-2006 years			
	[a]	[b]	[c]	[d]	[a]	[b]	[c]	[d]
	ITALIAN FIRMS	MEZZOGIORNO FIRMS	FIRMS WITH RELATIONSHIP	FIRMS WITHOUT RELATIONSHIP	ITALIAN FIRMS	MEZZOGIORNO FIRMS	FIRMS WITH RELATIONSHIP	FIRMS WITHOUT RELATIONSHIP
FIRM SIZE								
sales ('000 €)	13,2	13,4	11,4	14,1	14,6	13,6	12,5	15,5
employment (units)	82,2	67,5	77,0	84,5	80,3	73,2	78,3	82,5
FIRM PROFITABILITY								
return on equity	15,6	5,7	12,6	16,2	11,2	3,8	6,4	13,0
return on investment	5,1	3,8	5,4	5,1	4,7	3,0	4,3	4,7
FIRM CAPITAL STRUCTURE								
total debt on sales (%)	24,2	31,1	25,8	23,8	19,9	29,5	24,9	18,3
bank debt on total debt (%)	77,9	81,2	81,4	77,4	83,6	83,5	86,3	82,6
short-term bank debt on total debt (%)	50,0	53,3	54,1	48,8	49,1	52,6	53,8	47,4
total debt on equity (%)	392,3	354,9	424,0	384,4	267,6	252,6	322,5	256,4
total debt on assets (%)	112,4	95,5	122,1	107,8	74,2	87,7	101,5	67,8
FIRM-BANK RELATIONSHIP								
age (years)	28	18	31	27	31	21	34	30
main bank debt on total debt (%)	20	20	40	10	20	20	40	10
number of banks (units)	5	5	6	5	5	5	6	5
age of main bank relationship (years)	20	15	25	20	20	15	25	20
lenght of branch from head main bank (KM)	5	9	6	4	5	9	6	4

Notes: Statistics are expressed as mean values of the individual median values related to two six years. In the column [a] there are the statistics of the firms of the whole sample; in the column [b] there are the statistics of Mezzogiorno's firms. In the column [c] there are the statistics related to the firm having a closed relationship with the main bank while in column [c] there are statistic of the firms having not a closed relationship with the banks.The Mezzogiorno is the area of South Italy formed by the administrative regions of Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia and Sardegna. All the regions with the exception of Abruzzo are in the area classified as Objective 1 and are benefiting of economic development and cohesion policies of the UE.

TABLE 2 - STATISTICS AND CORRELATION MATRICES

2003-1998 YEARS

STATISTICS

	Average	S.D.	Min.	Max.
(I_K)	0,9	1,3	0,0	4,6
$(I\_K)^2$	2,5	4,8	0,0	21,2
(CF_K)	3,6	1,5	0,0	17,0
(Y_K)	6,5	1,1	0,0	11,5
$(D\_K)^2$	37,0	13,0	0,0	121,0

CORRELATION MATRIX

	(I_K)	$(I\_K)^2$	(CF_K)	(Y_K)	$(D\_K)^2$
(I_K)	1,000				
$(I\_K)^2$	0,968	1,000			
(CF_K)	0,047	0,074	1,000		
(Y_K)	0,005	0,042	0,544	1,000	
$(D\_K)^2$	-0,030	0,006	0,414	0,901	1,000

2006-2001 YEARS

STATISTICS

	Average	S.D.	Min.	Max.
(I_K)	9,3	11,2	0,0	32,9
$(I\_K)^2$	211,4	353,8	0,0	1085,7
(CF_K)	42,9	41,7	0,0	133,3
(Y_K)	611,2	446,5	163,3	1549,2
$(D\_K)^2$	142424,4	182044,7	9569,4	577864,8

CORRELATION MATRIX

	(I_K)	$(I\_K)^2$	(CF_K)	(Y_K)	$(D\_K)^2$
(I_K)	1,000				
$(I\_K)^2$	0,959	1,000			
(CF_K)	0,204	0,215	1,000		
(Y_K)	0,147	0,182	0,620	1,000	
$(D\_K)^2$	0,067	0,102	0,397	0,826	1,000

TABLE 3 – INVESTIMENTS-*CASH FLOW* RELATIONSHIP ESTIMATES

	1998-2003 years			2001-2006 years		
	[1]	[2]	[3]	[4]	[5]	[6]
$(I / K)_{-1}$	0,755	0,778	0,781	0,316	0,326	0,289
	[.191]***	[.193]***	[.205]***	[.060]***	[.073]***	[.088]***
$(I / K)^2_{-1}$	-0,128	-0,136	-0,134	-0,006	-0,007	-0,006
	[.047]***	[.048]***	[.051]***	[.002]***	[-.002]***	[.003]**
$(CF / K)_{-1}$	-0,063	-0,145	0,141	-0,018	-0,071	0,121
	[.032]**	[.048]***	[.072]**	[.008]**	[-.017]***	[.039]***
$(Y / K)_{-1}$	0,469	0,486	0,483	0,003	0,005	0,006
	[.212]**	[.214]**	[.227]**	[.001]**	[.002]***	[.002]**
$(D / K)^2_{-1}$	-0,048	-0,048	-0,050	-0,000	-0,000	-0,000
	[.019]**	[.019]**	[.020]**	[.000]	[.000]	[.000]
$MEZZ*(CF / K)_{-1}$		0,327			1,116	
		[.140]**			[.178]***	
$STAB*(CF / K)_{-1}$			-1,169			-1,044
			[.366]***			[.173]***
F	262,4***	301,2***	267,2***	22,7***	18,3***	12.5***
Sargan Test	191,4***	183,2***	156,8***	2924,9***	1940,7***	1029,3***
AR(1)	-15,9***	-15,6***	-14,7***	-18,4***	-9,36***	-6.8***
AR(2)	1,4	0,7	-1,3	-1,3	-0,9	-1.4
n° Obs	4188	4188	4188	2868	2868	2868

Notes: Variables are: I=Investment, K=Capital Stock, CF=*cash flow*, Y=sales and D=Total Financial Debt; MEZZ is dummy with unity value if the firm is belonging in Mezzogiorno's regions and zero value otherwise; STAB is the dummy with unity value if the firm is involving a closed relationship with main bank and zero value otherwise. The estimates are obtained through the GMM method; standard errors are in brackets; *,**,*** are indicating statistical significance of the coefficients at 90%, 95% and 99%, respectively.