BANCA D'ITALIA

EUROSISTEMA

Temi di discussione

(Working papers)

The financing of small innovative firms: The Italian case

by Silvia Magri

September 2007

Number 640

The purpose of the Temi di discussione *series is to promote the circulation of working papers prepared within the Bank of Italy or presented in Bank seminars by outside economists with the aim of stimulating comments and suggestions.*

The views expressed in the articles are those of the authors and do not involve the responsibility of the Bank.

THE FINANCING OF SMALL INNOVATIVE FIRMS: THE ITALIAN CASE

Silvia Magri *

Abstract

Small firms encounter difficulties in raising external finance owing to greater information problems. For small innovative firms, whose activity is more difficult to evaluate, the cost of external finance could be even higher. This paper examines special features of the financial structure of small innovative firms, compared with firms of similar size that do not innovate. The evidence shows that small innovators rely less on financial debt and more on internal financial resources; no important differences appear for large firms. This is consistent with the view that informational problems mainly affect small firms; large firms, even when they innovate, continue to rely on their traditional set of financial instruments. Another finding is that in small innovative firms investment is less sensitive to cash flow than in small non-innovative firms, probably because the high incidence of internal financial resources allows them more flexibility in deciding their investments. No comparable difference is found between innovative and non-innovative large firms.

JEL classification: D92, G32, O31.

Keywords: corporate finance, innovative firms, investment dynamics.

Contents

* Bank of Italy, Economics and International Relations, E-mail: silvia.magri@bancaditalia.it

1. Introduction[1]

Asymmetric information problems between firms and external financiers strongly affect their relationship and shape the nature of the contract between them, such as the choice of debt versus equity, and for debt, the presence of collateral, covenants and the maturity of the loan. Innovative firms are distinctively plagued by the problem of information opaqueness. Due to novelty and the higher return variability of their projects, external financiers may be less able to evaluate their activity, and the cost of external finance could therefore be higher for innovative firms. The asymmetric information problem is also emphasised as innovative firms frequently prefer to maintain secrecy about what they are doing to prevent other firms from using their ideas. As knowledge is non-rival, when revealed it can be used by other firms (Arrow, 1962). Lenders know that it can be costly for innovative firms to reveal their projects to the market and this reduces the quality of the signal the firm tries to send to the external lender (Bhattacharya and Ritter, 1983; Anton and Yao, 2002).

The theoretical literature therefore states that innovative firms should find it more difficult to obtain external finance. Further, essentially due to moral hazard problems and the higher risk of their activity, innovative firms should rely more on equity than on debt. Empirical research has recently found that this is the case: Blass and Yosha (2003) and Aghion et al.(2004) show that large listed innovative companies, respectively in Israel and in the UK, are more likely to finance their activity by issuing shares. However, many firms involved in innovative activities are small firms (Acs and Audretsch, 1990). For small innovative firms, the typical asymmetric information problems of being a small company, a proxy for information opacity largely used in empirical research (Berger and Udell, 1998), compound with those of performing innovations. Small innovative firms, which are generally non-publicly traded, could encounter more problems in raising outside equity, specifically in financial markets where venture capital is not well developed. It is therefore highly likely that small innovators rely much more on internally-generated funds (Hall, 2002). However, on this specific point, i.e. the financing of small and innovative firms, the empirical evidence is scant, mainly owing to

[1] I would like to thank Riccardo De Bonis, Luigi Federico Signorini, participants at the Bank of Italy's seminars and two anonymous referees for their suggestions. The views expressed in this article are those of the

the limitations of the available data. Most of the information concerning innovation is collected only for large and publicly-traded firms. The few previous studies analysing this topic either deal with "small" firms that are publicly-traded (Himmelberg and Petersen, 1994) or that are actually quite large (Harhoff, 1998); moreover, they are more concerned with an analysis of investment sensitivity to cash flow rather than with studying differences in financial structures.

The first contribution of this paper is precisely to analyse the financing of small and innovative firms in Italy to understand whether there are some specific features in this type of firm. This involves combining two distinct analyses that were previously implemented in isolation. Because they are small, these firms should find it more difficult to collect external funds; when they need them, due to their information problems, bank loans are the most frequent choice (Myers and Majluf, 1984; Berger and Udell, 1998). However, because they are innovative, debt is not the most suitable form of financing and these firms would need more equity rather than debt. The question therefore is: "Do financial constraints on innovation depend on the firm's size?" Italy is an interesting country for this analysis as it is rich in very small firms, bank loans are the prevailing form of external finance and venture capital is not very widespread. In this paper, a company is classified as small if it has a maximum of 20 employees, the 1st quartile of the size distribution in our initial sample of firms; Berger and Udell (1998) rely on the same threshold to define "smaller" companies in the US.

A second contribution relates to the definition of innovative firms used in this paper. In empirical research, innovative firms are often identified either as carrying on some research and development (R&D) activity or as belonging to high-tech industries. In this paper, we consider innovative those firms that declare they are innovative either in their process or in their product *and* that also have some revenues from selling new products; this information is available in the Survey of Manufacturing Firms (SMF). This indicator has been widely used in studies on the determinants of innovation (Mairesse and Mohen, 2002), but not in empirical research on the financing of innovative firms.[2] Compared with the identification based on R&D expenditure, this indicator identifies firms that have obtained an output from the innovation

---

author and do not involve the responsibility of the Bank of Italy. Any errors or omissions are my own.

[2] A recent study on German firms (von Kalckreuth, 2004) uses a similar indicator based on a survey where the firms were asked whether they introduce new products on the market and whether the innovation is a fundamental innovation for the level of technology.

black-box and have not just put in an input; therefore, these firms have somehow succeeded in their innovation activity. The identification based on high-tech industries has the drawback that not all the firms in these industries are truly innovators.

As a preview of the results, small innovative firms have lower leverage than non-innovative firms of similar size. They also try to rely more on equity: when they issue new equities, the incidence with respect to total sources is higher compared with small non-innovative firms. However, they face more problems in raising outside equity: they are less likely to issue new equities compared with large innovative firms. As a consequence, small innovative firms rely strongly on an increase in their cash flow on total sources to finance their activity compared with non-innovative firms of similar size. Less important differences appear in the group of large firms when comparing innovators and non-innovators: overall, they seem to use a similar set of financial instruments. Finally, we consider the impact of these different financial structures on firms' investment policy by analysing their sensitivity to cash flow. As in Bond et al (2003b), who study a sample of UK and German firms, innovative firms unexpectedly have lower investment sensitivity to cash flow. Interestingly, we are able to elicit that the reduction in this sensitivity, at least in the case of Italy, is entirely explained by small innovative firms compared with non-innovative firms of the same size. In the group of large firms no statistical significant difference arises. Bond et al (2003b) explain their result by arguing that innovative firms do not apparently face financial constraints as they are "deep pocket" firms, i.e. they engage in innovation activity when they have plenty of internal financial resources to do so. This is certainly the case for small innovative firms in Italy. They are able to finance their investments because they have plenty of cash flow. It is not entirely clear whether it is reasonable to argue that these firms do not really face any financial constraints.

The paper proceeds as follows. Section 2 describes the theoretical framework and the empirical literature. Section 3 focuses on the data used. Section 4 analyses the financial structures in detail in order to identify any significant difference between innovative and non-innovative firms, in particular according to the firm size. Section 5 contains the results of the estimations of investment sensitivity to cash flow, while Section 6 includes some extensions and sensitivity analysis. Section 7 discusses the results and concludes.

2. Theoretical framework and previous empirical evidence

A strand of the theoretical literature on innovation has focused on the appropriability problems that this activity entails. Knowledge is embodied in the human capital of the researcher, who can easily walk away. Further, the allocation of property rights over the output of innovation is not a feasible solution as knowledge is not verifiable. This influences the way the research can be conducted, either in corporations or through a venture capitalist directly financing the researcher (Anand and Galetovic, 2000; Aghion and Tirole, 1994). In these studies, the financial sector is typically very stylised. Another strand of the literature has tried to characterise more accurately the optimal capital structure for firms that are perceived to be riskier, such as innovative firms. As mentioned earlier, it is widely acknowledged that, due to greater asymmetric information problems between firms and outside financiers, one of the major financial sources for innovative firms is internal finance (Hall, 2002). This idea can be traced back to Schumpeter (1942), who argued that firms with monopoly power, which can rely more on profits as a source of finance, are more likely to innovate.[3] When innovators need to use external finance, it has been argued, on the basis of the pecking order theory (Myers and Majluf, 1984), that debt should be preferred to new equity. As asymmetric information problems are at the heart of innovative activity, especially for small innovators, new equity could turn out to be a very expensive source of finance.

Nonetheless, more recent approaches emphasise the importance of equity, compared with debt, as an external source of finance for innovative firms. First, there are agency problems. Debt increases moral hazard problems: firms can substitute high-risk projects for low-risk investments (Jensen and Meckling, 1976); high-risk projects increase the probability of bankruptcy, but offer no offsetting gain to debt-holders if success is achieved. This problem could be particularly serious for innovative firms, whose managers have more opportunities to substitute high-risk projects for low-risk investments. Hence, moral hazard problems are likely to increase quickly with leverage (Carpenter and Petersen, 2002a). Second, it has been stressed that upside returns are not bounded for investors who buy equity. On the contrary, debt-holders do not share in firms' returns in a good state of nature; hence they are only concerned with the bottom part of the tail of the distribution of returns (Stiglitz, 1985). Third, according to the

bankruptcy costs theory, the marginal cost of financial debt could increase very quickly for innovative firms because fewer tangible assets can be used to secure loans (Carpenter and Petersen, 2002b); this is particularly true for small innovative companies with few assets already in place. Unlike debt, equity finance does not increase the probability of bankruptcy. Another approach is based on control rights (Aghion and Bolton, 1992; Aghion et al. 2004). The lower the amount of tangible wealth, the more outside investors want to have control rights over the firm's decisions to satisfy their ex-ante participation constraint. Firms will try to use retained earnings first to alleviate the participation constraint of outside financiers. When more funds are required, firms will initially use debt to retain some control, which they lose only in the case of default. Only when the size of the project becomes sufficiently large or when assets are increasingly intangible, will firms give more control rights to outside investors by issuing new equity. As innovative firms have more investment opportunities and intangible assets, they are more likely to issue new equity. Finally, it is also worth mentioning the results obtained by Bolton and Freixas (2000): in their model, the riskiest firms do not obtain bank loans, but issue new equity; these firms would like to rely on debt financing, following the pecking order theory in Myers and Majluf (1984), but they are too risky to obtain bank loans or issue bonds; the only option available is equity financing, even if the costs are high.

On the empirical side, there is an increasing evidence confirming the theoretical prediction that innovative firms rely more on internal finance (Hall, 2002) and less on leverage (Bradley, Jarrel and Kim 1984; Titman and Wessels, 1988). It also seems clear that outside equity is a valuable source of funds for innovative firms, at least in some countries. Carpenter and Petersen (2002a), using a panel of publicly-traded US high-tech companies, find that most small firms obtain little debt financing. On the contrary, new equity is very important and allows a large increase in firm size; they argue that small companies may face financing constraints on investments that could be relaxed by new equity finance. Blass and Yosha (2003) find that R&D intensive firms in Israel do not rely more on cash flow, unlike firms in several OECD countries, probably because they were able to raise inexpensive external equity financing on a booming stock exchange. Aghion et al. (2004), analysing an unbalanced panel of 900 UK listed firms, find that R&D firms first prefer debt, as it involves giving up fewer

[3] Strong market power also increases innovation by improving the appropriability of returns for entrepreneurs.

control rights than new equity; however, more highly innovative firms are more likely to issue new equity. As for Italian firms, the previous evidence shows no major differences in the financial structure of innovative firms (Pozzolo, 2003).[4] However, Nucci et al (2004) show that there is a negative relationship between leverage and intangible assets, which they interpret as evidence that less leveraged firms tend to be more innovative. In a different direction, Benfratello et al (2006) show that banking development influences the probability of process innovation, in particular for small firms.

Overall, the problem associated with financial debt for high-tech firms could be even greater for small firms, as large companies suffer less from asymmetric information and the connected adverse selection and moral hazard problems; they also have more collateral to secure their loans. Moreover, small firms can find it difficult to collect external equity. Therefore, small innovative firms can have more trouble in financing their innovative activity, as clearly stated in Hall (2002). When they need external finance, they are more likely to obtain debt from lenders at worse conditions (higher interest rate or shorter maturity) due to their asymmetric information problems, whereas outside equity seems to be the most suitable financial source for innovation. It is possible therefore to observe for small innovative firms either a large increase in internal finance or a pronounced funding gap, with firms investing less than they would be if debt were a perfect substitute for internal finance. Notwithstanding the importance of this point, due to data limitation there is not much evidence on the financing problems of small innovators. The aim of this paper is to carefully analyse the financial structures of small innovative firms compared with other types of firms, building on previous studies on this issue. Finally, we want to assess the impact of different financial structures on firms' investment policies. Some previous studies on this final issue do not generally split the sample by firm size, such as Bond et al (2003b), who find that in the UK the investments of innovative firms are less sensitive to cash flow, and Brown (1997), who finds the opposite. Himmelberg and Petersen (1994), who uncover that both R&D and physical investments are sensitive to cash flow for US small firms in high-tech industries, actually work with small firms that are publicly-traded and face fewer difficulties in collecting external finance.

[4] This is true both for firms belonging to industries connected to the new economy and for firms with a higher share of information and technology capital.

3. The sources of data used in the analysis

The first dataset used in this paper is the Survey of Manufacturing Firms (SMF), which is carried out every three years and covers a wide range of topics.[5] The sample consists of about 4,500 manufacturing firms (4,600 in the wave 1998-2000) and is stratified by geographical area, industry and firm size; all the firms with more than 500 employees are included. Data on financial structures are also available for a sub-sample of firms and span a longer period. This dataset is useful for our purposes because it allows us to single out firms that are innovative according to the definition specified in the Introduction, i.e. firms that declare they are innovative and have some sales of new products.[6] Further, the SMF also contains separate information on R&D expenditures, whereas in the other dataset used in the analysis, the Company Accounts Database (CADS, *Centrale dei Bilanci*), which collects firms' balance sheets, R&D expenditures are often included in other items and could not be elicited. The drawback of the SMF is that financial indicators often have several missing values and are much less detailed than those in the CADS. Specifically, in the CADS there are data on the sources and uses of funds, which are very useful for the type of analysis we aim at in this paper.

For these reasons, we also use the CADS dataset.[7] The CADS has been gathering data on firms' balance sheets since 1982 from a consortium of banks; balance sheets are reclassified to ensure cross-sectional comparability. The dataset is not randomly drawn, since firms enter only if they borrow from one of the banks in the consortium and is tilted towards medium and large firms. In order to have a long period of consecutive observations for the analysis, we merge the

---

[5] The SMF Survey is conducted by the "Ossevatorio sulle Piccole and Medie Imprese" (Centre of Study on Small and Medium Firms), an institution associated with Capitalia, an Italian bank. More detailed information can be found on the website www.capitalia.it

[6] The wording of the questions is "During the past three years, did the firm introduce product or process innovations?" and "What share of revenue is accounted for by products that have not changed in the last three years?"; we use the complement of this share. Actually *new* products are not exactly *innovative* products, which is the word used in the Community Innovation Survey carried out by Eurostat. In this paper, however, we also condition the definition of innovative firms on the fact that the firm has introduced either product or process innovations.

[7] CADS is a private company set up in 1983 by the Bank of Italy and the leading Italian commercial banks. The sample covers around 40,000 non-financial firms per year and in 2002 accounted for 40 per cent of the value added of the sector of non-financial firms, based on the institutional accounts prepared by the National Statistics Institute. For further information on the data, see the Centrale dei Bilanci website (www.centraledeibilanci.com).

last wave of the SMF (1998-2000) with the CADS from 1993 to 2000.[8] After the merge, we come up with a dataset made up of around 15,500 firm-year observations (roughly 1800-2000 firms for 8 years).

In this way, it is possible to identify innovative firms on the basis of the last SMF survey and to have continuous data on the firms' financial structures and physical investments spanning the period 1993 to 2000.[9] An important assumption in the paper is that a firm declaring itself to be innovative in the last wave of the SMF (1998-2000) is considered innovative for the whole period spanning 1993 to 2000, on the grounds of the high persistence in R&D and innovation activity. This is essentially due to the high adjustment costs associated with the fact that this activity is mainly embedded in human capital. However, in order to verify the results obtained, we also carry out an analysis that identifies innovative firms on the basis of the last two SMF waves (1995-1997 and 1998-2000) subsequently merged with the CADS; this allows firms to enter and exit the innovative status. The SMF has a small panel component and this results in a lower number of firm-year observations, roughly 6,000 (more than 700 firms for 8 years).

Table 1 reports some general firm characteristics for the whole sample obtained through merging the last SMF wave (1998-2000) and the CADS (1993-2000). Statistics are also split by firm's innovative attitude: 29 per cent of the firms in the sample are innovative on the basis of the definition used in this paper. Innovative firms are on average larger, more profitable, grow at a faster rate, have a higher share of intangible assets on fixed assets (tangible plus intangible) and are more likely to be located in the northern regions; all these differences are statistically significant. Regarding financial structure, innovative firms seem to rely on slightly higher leverage and the maturity of their financial debts is longer; the flow of funds' indicators highlight that innovative firms have a much higher ratio of cash flow to total financial sources and a lower ratio of trade debt.

---

[8] We choose to draw data from the 1993 CADS because since that year the CADS has included some smaller firms covered by the Chambers of Commerce (Cerved), a database containing balance sheets of all incorporated companies, which is therefore less tilted towards medium and large firms.

[9] Our final sample of firms has a similar composition, according to industry and geographical area, to the whole samples in the CADS and the SMF. However, it is more tilted towards medium and large firms than the SFM sample: after the merging, the median (mean) size increases from 24 (87) in the SMF to 39 (155) in our sample. However, the median size (39) is still quite small compared with other analyses on this topic.

4. The analysis of financial structures

In this section, we turn to a more detailed analysis of the differences in firms' financial structures by both innovative attitude and size. A firm is classified as small if its average size during the period of analysis (1993-2000) is less than or equal to 20 employees, the 1st quartile of the sample distribution.

In the upper panel of Table 2, statistics split by firm innovative attitude and size are reported on four financial structure indicators: equity and financial debts on total liabilities, leverage (financial debts normalised to equity plus financial debts) and the share of short-term debts on total financial debts. Focusing on statistics by innovative attitude for the two size groups, small and large firms (columns 4 and 5), the main evidence is that leverage is lower for small innovative firms compared with firms of the same size that do not innovate (39.1 compared to 44.3), whereas for large innovative firms leverage tends to increase slightly compared with non-innovative firms of similar size (49.4 compared to 47.6).[10] Further, the share of short-term debt is very high (around 77) for small innovative firms and shows no difference compared with small non-innovative firms; on the contrary, debt maturity is increasing in the group of large firms that have an innovative attitude. The most important point is that small innovative firms rely less on financial debts, which are made up mainly of bank loans in this sample. This is probably explained by the reasons outlined in Section 2: small innovative firms are particularly difficult to evaluate, have a lower share of tangible assets on total assets and a higher share of intangible assets on fixed assets, compared with firms of similar size that do not innovate (Table 3); they could therefore be considered particularly risky by lenders. Nothing similar appears in the group of large firms. This also explains why the share of short-term debt does not decrease with their innovative attitude, as happens in the group of large firms; banks rely on short-term debt as a monitoring device for small firms. However, short-term debt does not suit innovative firms, which are likely to be involved in long-term investment projects.

[10] More precisely, this is due to a reduction in financial debts for small innovative firms and to a decrease in equity for large innovative firms. Bank debts account for the most important part of financial debts: the median value of their ratio is 97 per cent, while the average value is 81 per cent.

In the lower panel of Table 2, we turn to the financial ratios based on the sources and uses of funds; the ratios are measured as cash flow, new debt, new equity and new trade debt, normalised by total financial sources. The average ratios by firm size and innovative attitude are calculated first by averaging the ratio by firm over years and then over firms.[11] The most remarkable result in the lower panel of Table 2 is that the share of cash flow on total financial sources is far higher for small innovative firms compared with small non-innovative firms (55.8 versus 32.6); the increase is much less important for the group of large firms (51.1 versus 45.8). Further, the incidence of new debt is higher for innovative firms only in the group of large size. No statistical significant differences emerge either for the frequency of issuing equities or for the incidence of new equities to total sources on the basis of innovative attitude. Finally, small innovative firms have a high share of trade debt to total sources (more than 40), which does not decrease with their innovative attitude, unlike large firms. Table 3 contains some statistics on cash flow and physical investments normalised to the replacement value of the firm capital: as before, the ratio of cash flow appears to be much higher for small innovative firms compared with small non-innovative firms (66.1 versus 46.0); as a consequence, cash flow net of investments is also higher for small innovative firms. However, when R&D investments are also considered, net cash flow becomes negative exclusively for small innovative firms (-9.7).

On the grounds that different firm characteristics may have an impact on firms' financial structures, in order to verify the robustness of the differences in financial indicators observed in Table 2, we rely on an econometric analysis whose results are reported in Tables 4a and 4b. We focus on the indicators that show the most remarkable differences in previous descriptive statistics: leverage and the share of cash flow on total sources. Moreover, we also report estimations for new equity, as the multivariate analysis elicits some new evidence. For leverage, which is censored between 0 and 1, we report a Tobit panel random effect estimation; for the share of cash flow on total sources, we rely on OLS estimations (between and fixed

[11] The alternative approach of using each firm-year observation as a data point for calculating the overall average would understate the importance of some external finance if it is "lumpy" because of fixed issue costs, as for equity (Carpenter and Petersen 2002a). On the whole, there is a huge variability of these flow of funds indicators *within* the firm, which is likely to introduce some noise rather than information. When calculating the average ratio by using the firm-year observations, no statistical significant differences emerge between the groups of firms analysed. However, in the subsequent econometric analysis, we also try to exploit the within variability of these indicators to get as much information as possible.

effect panel estimations); for the incidence of new equity on total sources, the results obtained with a pooled Heckman estimation are reported. We consider to be explanatory variables the firm's characteristics that should mainly influence firm financing choices: Blass and Yosha (2003) and Aghion et al (2004) use similar explanatory variables in running such a type of regression. In detail, we use the firm's size (the number of employees) and age, the share of tangible assets (net equipment and gross plant) on total assets, a profitability measure (ROA, i.e. the ratio of earnings before interest and taxes to total assets), a dummy for firms belonging to a group, as well as 3 area and 15 industry dummies. Finally, a dummy for innovative firms is included to verify whether the differences in financial indicators previously commented hold after controlling for some other important firm characteristics. It is worth clarifying that we do not aim to find any causal relationship between innovative attitude and financing policy; our purpose is more modest, as we would like to uncover some systematic differences in financing attitudes between innovative and non-innovative firms of different sizes, after controlling for other variables that could affect financing decisions. Firms need to be in the sample for at least two years. Finally, to tackle simultaneity problems, one-period lagged explanatory variables are used. The final sample is made up of roughly 12,000 observations for more than 2,000 firms.

The econometric evidence confirms that leverage is higher for innovative firms (Table 4a, column 2). However, as in the descriptive statistics, this is true only in the group of large firms (column 4). For small firms, the presence of an innovative attitude reduces leverage by 4 percentage points (column 3): this is the marginal effect calculated at the mean value of the other independent variables, around 10 per cent of the average value of leverage. This result also arises in a pooled Tobit estimation and in a panel Tobit estimation which uses interaction terms rather than split. More importantly, it is also confirmed in an unreported Tobit panel random effects estimation based on a smaller sample, in which we consider the panel component of the last two waves of the SMF (1995-1997 and 1998-2000) and merge it with the CADS. This estimation allows a more precise identification of innovative firms as it permits a firm either to enter or exit the innovative status.[12] As for the cash-flow indicator, a panel

[12] Some other unreported Tobit estimations confirm that leverage is always increasing with firm size, though more strongly in the group of innovative firms. Econometric estimations therefore confirm that small innovative

between estimation is presented (Table 4a, last three columns): this estimation exploits only cross-section variability and is more in line with statistics calculated first by averaging data by firm over years and then over firms. The evidence shows that cash-flow on total sources is far higher for small innovative firms compared with non-innovative firms of the same size; when controlling for other firm characteristics, this is no longer true in the group of large firms. A similar result is obtained with a pooled OLS regression. More interestingly, we also run a regression on the sample obtained merging the panel component of the last two waves of the SMF with the CADS. In an unreported panel fixed effects estimation exploiting only time series variability, which is possible in this case as the innovative dummy is varying over time, the previous evidence of an increase in cash flow for small innovative firms is confirmed, even after controlling for the unobserved firm heterogeneity. Though not reported, the econometric evidence also confirms that debt maturity increases with innovative attitude, but only for large firms.

Compared with descriptive statistics, the econometric analysis uncovers some new evidence about outside equity. We run a Heckman estimation on the pooled sample, as the errors in the probability model of issuing equities and in the equation concerning the amount of issued equities are correlated. The identification strategy is based on the fact that age and the share of tangible assets appear not to be significant in the select equation for issuing equities and are therefore omitted. As for the probability of issuing new equity (at least once in the period under analysis), no difference emerges according to firm innovative attitude (Table 4b, columns 2-4). On the contrary, an interesting feature emerges when focusing on the incidence of new equity on total sources, conditional on issuing (Table 4b, columns 5-7): this incidence is higher for small innovative than for small non-innovative firms; no significant differences arise in the group of large firms. Apparently, when small firms have the possibility to collect outside equity, they try to exploit this form of financing in an important way. [13]

---

firms have lower leverage than large innovative firms: the marginal effect is around -14 percentage points, compared with - 6 points in the group of non-innovative firms.

[13] For the sake of clarity, this evidence is based on the incidence of new equity on total sources varying for each firm in each year. With a Heckman estimation on the sample made by merging the last two waves of the SMF with the CADS, the result does not hold; this is probably due to the drop in the number of observations of small innovative firms issuing equities (only 80 small firms issue equities, of which 11 are innovative).

Summing up, the evidence in this section shows that small innovative firms use less financial debts and significantly more cash flow compared with non-innovative firms of the same size; further, they rely on equities more than small non-innovative firms. Fewer differences appear for large innovative firms compared with companies of similar size that do not innovate. In general, large innovative firms continue to rely on their usual financial instruments and, more specifically, they do not seem to find any difficulties in gathering more funds from banks, notwithstanding their innovation activity, probably because they are less affected by information problems. In the next section, we turn to an analysis aimed at verifying the impact of such different financial structures on the firm's investment policies, as before by splitting the sample according to firm size and innovation status.

5. The firms' investment sensitivity to cash flow

5.1 The estimation method

In order to verify the implications of different firms' financial structures on their investment policy, this section is devoted to carrying out an estimation on the physical capital investment sensitivity to cash flow, following a wide empirical literature that started with the seminal paper by Fazzari, Hubbard and Petersen (1988). This literature has been the object of some major criticisms (Kaplan and Zingales, 1997 and 2000). However, a recent paper (Clementi and Hopenhayn, 2006) has shown that in a model in which borrowing constraints arise as part of the optimal design of a lending contract, investment is sensitive to cash flow innovations; further, this sensitivity decreases with age and size, some typical proxies of information asymmetries.

The focus is on the estimation of an error correction model (ECM).[14] In the neo-classical model of investments, for a profit-maximising firm with a constant elasticity of substitution production function, the desired level of the capital stock (k_{it}) is a log-linear function of the ouput (y_{it}), measured by sales, and the user cost of capital (c_{it}), while a_t is a time varying parameter capturing technical change and σ is the elasticity of substitution:

[14] In this part of the paper we follow Mulkay et al (2001) and Bond et al (2003a).

$$(1) \qquad k_{it} = a_t + \beta y_{it} - \sigma c_{it}$$

This is true if adjustment costs are negligible. If there are adjustment costs, the previous formulation may be nested with an autoregressive-distributed lag (ADL) dynamic regression model. For the sake of simplifying the notation, we show the derivation of the equation with an ADL (2,2):

$$(2)\ k_{it} = a_0 + a_1 k_{i,t-1} + a_2 k_{i,t-2} + \beta_0 y_{it} + \beta_1 y_{i,t-1} + \beta_2 y_{i,t-2} + \gamma_0 c_{it} + \gamma_1 c_{i,t-1} + \gamma_2 c_{i,t-2} + \varepsilon_{it}$$

If we re-parameterise the model in an error correction form, short-run and long-run effects (in levels) can be separated out.

$$(3)\ \begin{aligned} \Delta k_{it} &= a_0 + (a_1 - 1)\Delta k_{i,t-1} + \beta_0 \Delta y_{it} + (\beta_0 + \beta_1)\Delta y_{i,t-1} + \gamma_0 \Delta c_{it} + (\gamma_0 + \gamma_1)\Delta c_{i,t-1} \\ &- (1 - a_1 - a_2)(k - y)_{i,t-2} + [\beta_0 + \beta_1 + \beta_2 - (1 - a_1 - a_2)]y_{i,t-2} + (\gamma_0 + \gamma_1 + \gamma_2)c_{i,t-2} + \varepsilon_{it} \end{aligned}$$

In order to estimate this model some assumptions are required. First, we assume that the user cost of capital (c_{it}) can be captured by additive firm specific effects (η_i) and year-specific effects (μ_t). Then, the approximation $\Delta k_{i,y} \approx I_{it} / K_{i,t-1} - \delta_i$ is used for the growth rate of capital, where δ_i, the depreciation rate, is captured by the firm specific effect. Finally, in order to analyse the importance of internal finance, we include the current ratio of the cash flow to the beginning-of-period capital stock ($CF_{i.t} / K_{i,t-1}$).[15]

Summing up, the model to be estimated in this section is (4):

$$I_{i,t} / K_{i,t-1}) = \rho_1 (I_{i,t-1} / K_{i.t-2}) + \omega_0 \Delta y_{it} + \omega_1 \Delta y_{i,t-1} + \theta (k - y)_{i,t-2} + \phi y_{i,t-2} + \psi_0 (CF_{it} / K_{i,t-1}) + \eta_i + \mu_t + \varepsilon_{it}$$

With GMM one can estimate the model in differences, using the lagged levels of the variables as instruments. However, a well-known problem of the original difference GMM estimator, developed by Arellano and Bond (1991), is that the lagged levels of variables are often poor instruments for their first differences, especially for variables that are close to a random walk (Bond, 2002). Arellano and Bover (1995) and Blundell and Bond (1998) suggest that if the original equations in levels are added to the system, additional moment conditions

[15] We do not include lagged levels of cash flow in the estimation as they turn out to be not significant. They

can be brought in: they require stronger assumptions, but can be highly informative and increase efficiency. This is the one-step system GMM estimator used in this paper.

5.2 The estimation results

The results of the GMM estimation of equation 4 are reported in Table 5. The sample used after trimming, lagging variables and considering firms that are present for at least five years is made up of 4,640 observations for 928 firms: 300 are innovative firms (282 large size and 18 small size) and 628 are non-innovative firms (549 large size and 79 small size).

Model 1 of Table 5 reports the estimation with cash flow (CF) interacted with a dummy equal to one when the firm is innovative. The interaction term has a negative and significant coefficient: this clearly shows that physical investments of innovative firms are less sensitive to cash flow compared with non-innovative firms. This result is similar to the findings of Bond et al (2003b) for UK firms: they argue that innovative firms, knowing that they could have financing problems at some time in the future, are "deep pocket" firms; for this reason their physical investments show a lower sensitivity to cash flow. In model 2 we dwell in more detail on this point by letting the coefficient of CF be different for 4 types of firms; cash flow is interacted with four dummies: d1 is a dummy equal to one for large innovative firms, d2 for small innovative, d4 for large non-innovative and d5 for small non-innovative. The evidence is that the strong reduction in investment sensitivity to cash flow for innovative firms in model 1 is exclusively explained by small innovative compared with small non-innovative firms (d2 versus d5). The difference in CF coefficients is significant in the group of small firms (see tests in the medium panel of the table), with small non-innovative firms characterised by a high and significant sensitivity to CF and small innovative firms unaffected by CF. On the contrary, the difference in the CF coefficients is not statistically significant in the group of large firms (d1 versus d4), whose investments turn out to be always broadly unaffected by CF. This result is quite interesting and we think it is likely to be linked to the fact that, as seen in Section 4, small firms rely significantly more on cash flow when they are innovative than non-innovators of the same size. Therefore, their demand function of funds for investment is likely to cross the

---

are therefore used in the estimation as instruments for the current level of cash flow.

supply function in the flat section of the curve of internal finance, where changes in CF have no impact on investment policy (Carpenter and Petersen, 2002b).

In model 3 we report the same evidence as in model 2 referring to the smaller sample of just 399 firms, obtained with the panel component of the last two waves of the SMF (1995-1997 and 1998-2000) merged with the CADS (1993-2000). As in the previous section, the aim is to verify the estimation results with a more precise definition of innovative firms, i.e. letting firms enter and exit the innovative status. Similarly to model 2, we can see that the reduction in CF sensitivity for innovative firms is entirely explained by small innovative compared with small non-innovative firms, whereas the difference in the group of large firms is not statistically significant. It is also worth noting that with this sample of firms we are able to perform an analysis of R&D expenditure sensitivity to CF, given that for some firms we have six consecutive years of R&D expenditure; we impute R&D equal to zero for firms that have missing R&D. We can perform this type of analysis both for innovative and non-innovative firms, because both types of firms are actually engaged in R&D activity (Table 1). The evidence in model 4 of Table 5, which should be interpreted as suggestive given the modest size of the sample, is that only small innovative firms present a significant CF sensitivity for R&D expenditure; this clearly differentiates them from large innovative firms, whose R&D expenditure is not influenced by CF innovation. A possible interpretation of this result is that small innovative firms, which rely strongly on internal funds, face no particular problems in financing their physical investments. However, on average, cash flow might not be sufficient to cover also R&D investments, which therefore show a tendency to increase with positive innovations in cash flow. This evidence is consistent with descriptive statistics in Table 3: cash flow net of physical investments, normalised on capital, is significantly higher for small innovative firms than for small non-innovative and also large innovative firms; however, when R&D investments are also considered in netting cash flow, small innovative firms are the only group of firms showing a negative net cash flow. They could therefore face some specific problems in financing R&D investments.

6. Extensions and sensitivity analysis

The aim of this section is to extend the analysis and to verify that the previous findings are not determined by the particular choices of the sample and variables.

In model 5 of Table 5, we report the evidence on the physical investment sensitivity to cash flow for six different types of firms. In this case, as before small firms have 20 employees or less, medium firms have between 20 and 50 employees, and large firms have more than 50 employees (d3 is the dummy for medium innovative firms and d6 for medium non-innovative firms).[16] The evidence is similar to that presented in model 2, i.e. the reduction in the investment sensitivity to CF for innovative firms is largely explained by small innovative firms (d2 versus d5), although in this case the difference is also statistically significant for large firms with more than 50 employees (d1 versus d4). No difference emerges in the group of medium firms (d3 versus d6). More interestingly, in model 6 we report the evidence obtained with an estimation in which the CF is considered a predetermined variable, i.e. a variable which is correlated with the current error term, but not with the past error term; in this case, we can use as an instrument for the current CF also the CF lagged at t-1.[17] We do not dwell on this point before, because for the estimation with 4 different types of firms, reported in model 2, the evidence with the predetermined CF does not change too much: aside from the fact that CF is significant for all types of firms, because it is probably better instrumented, innovative firms are less sensitive to cash flow than non-innovative firms and this difference is still entirely accounted for by small firms. We prefer to present and comment the evidence obtained with the more conservative assumption that CF is endogenous and therefore we use lagged values starting from t-2 as instruments. However, the estimation with predetermined CF for 6 types of firms is quite interesting because in this case new evidence arises. In model 6 of Table 5, medium innovative firms appear to have a higher sensitivity to CF than the other two groups of innovative firms (0.49 compared with roughly 0.14) and the differences are statistically significant (d1 versus d3 and d2 versus d3). As in all other previous estimations, only small innovative firms explain the reduction in sensitivity to CF in the group of innovative firms (d2 versus d5). We find the results concerning medium-size firms particularly meaningful given that, through similar estimations to those reported in Table 4a, we are able to verify that medium innovative firms rely on much more leverage than medium non-innovative firms (the

[16] The number of firms in different groups is the following: there are 300 innovative firms, 216 large, 66 medium and 18 small; among the 628 non-innovative firms, 354 are large, 195 medium and 79 small. Actually, according to European Union legislation, firms with less than 50 employees are still considered small firms; we call them medium size firms in order to distinguish them from the group of very small firms analysed before.

[17] As already said, the lagged value of CF at t-1 is not significant in the equation and therefore can be

marginal effect is 7 p.p. at the mean values); actually, all the increase in leverage in the previous group of large firms is explained by medium firms; companies with more than 50 employees do not have any increase in leverage. Further, medium innovative firms do not show any increase in the incidence of cash flow on total sources compared with firms of similar size that do not innovate. Given that financial debt is not the most suitable instrument to finance innovation, it could be that medium innovative firms find themselves facing a marginal cost of debt that is rapidly increasing with the amount of funds required; in this case, a change in internal CF can have a strong impact on investments (Carpenter and Petersen, 2002b).

Secondly, we consider what happens to the investment estimation when the whole sample is split on the basis of the firm belonging to a high-tech sector.[18] The evidence shows that in the high-tech sectors (307 firms) no firms show a significant sensitivity to cash flow (model 1, Table 6); in non high-tech sectors (632 firms; model 2 of Table 6), the evidence is similar to that reported in model 2 of Table 5: small firms explain entirely the reduction in the investment sensitivity for innovative firms. Apparently, the results for the whole sample are mainly driven by what happens in the non high-tech sectors, whereas the investments in firms belonging to high-tech sectors are never affected by internal financial resources.

In another estimation, we check the sensitivity of the results in the investment estimation to a different measure of cash flow. The one used in the paper is taken directly from the flow of funds indicators. In the estimation reported in model 3 of Table 6, we use a different measure of cash flow calculated from the balance sheet. The same results hold. We also try a similar unreported estimation with the book value of capital, rather than its replacement value: it turns out that still the only significant difference in the investment sensitivity to CF is between small innovative and small non-innovative firms. As a more general sensitivity analysis, we run the estimations in Tables 4a and 4b and the baseline estimation in Table 5 excluding firms with more than 500 employees, which are all considered in the SMF survey, while the others firms are included according to a stratification survey design. All the previous results are confirmed; model 4 in Table 6 reports the result for the estimation on investments. The final sensitivity

considered a valid instrument.

[18] On the grounds of the classification used in other empirical papers (Benfratello et al 2006, Carpenter and Petersen, 2002a), high-tech sectors are defined as the following: chemicals, non-electrical machinery, office

analysis concerns the size classification: in the paper, we classify firms on the basis of the average number of employees during the period (1993-2000) and therefore the classification is fixed over time. When we let firms exit and enter the two different size groups, results are similar for the estimation on investments (Table 6, model 5); for the estimations concerning financial structures, the evidence is along the same lines, though less clear-cut.

Finally, in order to show that our definition of innovative firms adds some value to the analysis, we run the baseline estimation in Table 5 after changing it. We first consider as innovative those firms that have R&D activity on the basis of what they stated in the last SMF survey. There are more firms that do R&D activity in the sample (50 per cent)[19] compared with those that can be defined innovative on the basis of the previous definition (29 per cent). The evidence is that there is no clear-cut difference between innovative and non-innovative firms in their investment sensitivity to cash flow: small firms appear to have a higher sensitivity, which is similar for innovative and non-innovative companies. On the whole, the picture is more blurred and no clear-cut evidence emerges. Further, leverage does not decrease and cash flow does not increase for small innovative firms, compared with small non-innovative firms. We also try another definition of innovative firms: firms are considered innovative if they belong to a high-tech sector defined as before (32 per cent of the sample). As in the previous case, no statistical significant difference arises between different groups of firms, specifically between small innovative and non-innovative firms, either in their financial structure or in their investment sensitivity to cash flow. Therefore, the evidence that we uncover in this paper, by using the specific definition of innovative firms mentioned above, does not emerge when considering alternative definitions. We argue that focusing on firms that have already obtained an output from their innovative activity allows us to capture the neatest differences between different types of firms.

---

equipment and computers, electric machinery equipment, electronic material, medical equipment, vehicles and other transports.

[19] It is worth clarifying that, in the last wave of the SFM Survey (1998-2000), the share of R&D performing firms is lower (38 per cent). The higher share of R&D performing in the sample used in the analysis (50) is due to the positive relationship between R&D and firm size.

7. Concluding remarks and discussion

In this paper we uncover some new evidence about the financing of small innovative firms in Italy. We do not have definitive explanations, but we highlight some patterns that suggest future research on the very small innovative firms in other countries.

Small innovative Italian firms have noticeably different financial structures compared with small non-innovative firms: they rely more on internal resources and less on bank loans. For large firms this is not true: their financial structures do not differ very much according to innovative attitude; information problems connected with the innovation activity do not appear to affect their financing decisions. We also verify how these different financial structures impact on the firms' investment policies. It turns out that innovative firms have lower physical investment sensitivity to cash flow. Interestingly, we also find that this result is explained exclusively by small innovative firms compared with non-innovative firms of similar size. The investments of large firms are always broadly unaffected by cash flow innovations; more in general, there is no difference in their sensitivity according to innovative status. Therefore, small innovative firms seem to avoid the financing constraints faced by small non-innovative firms by relying on a strong increase in cash flow. However, there is mild evidence that they could face difficulties in financing R&D expenditure compared with large innovative firms.

Overall, it seems that the possibility to collect more external financial resources could be particularly useful for small innovative firms in order to reduce their need for internal funds. As financial debt has specific problems in financing innovation, at least for small firms as mentioned in Section 2, outside equity could be particularly valuable. This paper contains evidence in this direction: when small innovative firms rely on outside equity, the incidence of new equity on total financial sources is higher compared with non-innovative firms of the same size. Nothing similar appears in the group of large firms. Hence, small innovative firms seem to be interested in collecting funds through outside equity. This finding is consistent with Del Colle et al (2006): their analysis shows that venture capital in Italy, as in the United States, is more likely to finance small and riskier firms.

The policy implication is clear. Equity finance should be more widespread as it is particularly suited to small innovative firms. Unlike financial debt, it does not require collateral, does not raise the probability of financial distress and allows unbounded investor

returns. Venture capital is the form of equity finance that could be best suited to address financing problems of small innovative firms. Venture capitalists monitor firms and can at least partially overcome information and agency problems. In the United States, the majority of venture capital is indeed invested in high-tech sectors and is highly focused on early-stage investments, where asymmetric information problems are the greatest (Gompers, 1995).

Tables and Figures

Table 1

SOME CHARACTERISTICS OF INNOVATIVE FIRMS
(mean and median values over 1993-2000, ratios are in percentage)

	Whole sample	Non-innovative firms	Innovative firms	T-test p-value
General characteristics				
Size (No. employees)	110 (39)	99 (35)	136 (53)	0.00
Age	21 (18)	21 (18)	21 (18)	0.99
Profits	8.0 (6.6)	7.7 (6.5)	8.5 (7.0)	0.00
Sales growth	6.2 (5.6)	5.8 (5.1)	7.3 (6.5)	0.00
Tangible assets/total assets	21.5 (19.4)	21.6 (19.4)	21.4 (19.5)	0.30
Intangible assets /fixed assets	8.7 (3.0)	8.6 (2.7)	9.2 (3.5)	0.01
North	67.3	64.5	74.1	0.00
Centre	20.8	21.6	18.8	0.00
South	11.9	13.9	7.1	0.00
Financial structure				
Equity/total liabilities	24.9 (22.2)	25.1 (22.3)	24.6 (21.8)	0.04
Financial debts/total liabilities	26.2 (26.1)	26.1 (26.0)	26.4 (26.2)	0.37
Leverage	47.1 (51.6)	46.8 (51.1)	47.9 (53.0)	0.02
Short-term debts/total financial debts	69.7 (76.2)	70.9 (78.1)	66.9 (72.2)	0.00
Cash flow/total sources	45.2 (42.2)	42.4 (39.6)	51.8 (45.9)	0.00
New debt/total sources	22.3 (21.3)	21.8 (21.3)	23.5 (21.3)	0.37
New equity/total sources	3.1 (0.0)	3.2 (0.0)	2.9 (0.0)	0.09
New trade debt/total sources	26.6 (17.1)	28.0 (17.4)	23.2 (15.2)	0.02
Investment attitude				
Physical investments/capital (t-1)	22.3 (13.3)	22.2 (12.8)	22.5 (14.2)	0.59
Cash flow/capital (t-1)	36.4 (22.3)	35.7 (21.6)	38.2 (24.0)	0.02
(Cash flow-Investments)/capital (t-1)	12.7 (7.1)	12.0 (6.8)	14.1 (8.0)	0.02
R&D expenditures /capital (t-1)	8.9 (3.0)	7.2 (2.4)	10.7 (3.7)	0.00
(Cash flow- Inv-R&D)/capital (t-1)	2.0 (2.3)	2.7 (2.6)	1.3 (2.0)	0.39
No. observations with R&D in 98-00	2,107	1,118	989	
No. Observations	15,528	10,972 (71%)	4,556 (29%)	

The sample is made up of firms answering the SMF Survey 1998-2000 and having corresponding balance sheets in the CADS 1993-2000; observations belonging to the 1st and the 99th percentiles are dropped. T-test for equal means in the two sub-groups (innovative and non-innovative firms) under the assumption of unequal variances is reported in the last column. The number of observations refers to the dataset before any cleaning. Innovative firms declare they are innovative and have a share of sales that can be imputed to new products. Financial ratios based on total sources are first averaged by firm and then over firms. R&D expenditures are from the SMF survey (1998-2000) and therefore refer only to the period 1998-2000 and to firms with positive R&D, which can be either innovative or not. See the Appendix for further details on the variables.

Table 2

FINANCIAL INDICATORS BY FIRM INNOVATIVE ATTITUDE AND SIZE
(mean and median values over 1993-2000, ratios are in percentage)

	Non-innovative firms		Innovative firms		Small firms		Large firms	
	by size		by size		by innovative attitude		by innovative attitude	
	Small	Large	Small	Large	Non - innovative	Innovative	Non - innovative	Innovative
Equity / total liabilities	21.3 (17.8)	26.4 (23.8)	22.3 (19.1)	24.9 (22.1)	21.3 (17.8)	22.3 (19.1)	26.4 (23.8)	24.9 (22.2)
T-test p-value	0.000		0.000		0.159		0.000	
Financial debts / total liabilities	23.7 (22.7)	27.0 (27.0)	20.8 (16.6)	27.4 (27.2)	23.7 (22.7)	20.8 (16.6)	27.0 (27.0)	27.4 (27.2)
T-test p-value	0.000		0.000		0.001		0.303	
Leverage	44.3 (50.4)	47.6 (51.1)	39.1 (37.6)	49.4 (54.2)	44.3 (50.4)	39.1 (37.6)	47.6 (51.2)	49.4 (54.2)
T-test p-value	0.000		0.000		0.000		0.001	
Short-term financial debts/financial debts	77.3 (89.2)	69.0 (75.2)	77.4 (94.4)	65.7 (70.7)	77.3 (89.2)	77.4 (94.4)	69.0 (75.2)	65.7 (70.7)
T-test p-value	0.000		0.000		0.930		0.000	

THE SOURCES OF FINANCE BY FIRM INNOVATIVE ATTITUDE AND SIZE
(mean and median values, ratios are in percentage)

Cash flow /total sources	32.6 (25.1)	45.8 (43.7)	55.8 (41.1)	51.1 (46.3)	32.6 (25.1)	55.8 (41.1)	45.8 (43.7)	51.1 (46.3)
T-test p-value	0.000		0.425		0.000		0.009	
New debt / Total sources	26.2 (21.2)	20.3 (21.4)	21.0 (18.0)	24.0 (22.0)	26.2 (21.2)	21.0 (18.0)	20.3 (21.4)	24.0 (22.0)
T-test p-value	0.020		0.560		0.327		0.068	
New equity / Total sources	2.7 (0.0)	3.4 (0.0)	2.0 (0.0)	3.0 (0.0)	2.7 (0.0)	2.0 (0.0)	3.4 (0.0)	3.0 (0.0)
T-test p-value	0.002		0.018		0.129		0.093	
New equity / total sources for firms issuing equities	9.7 (4.5)	8.3 (3.9)	9.2 (6.4)	7.8 (2.8)	9.7 (4.5)	9.2 (6.4)	8.3 (3.9)	7.8 (2.8)
T-test p-value	0.004		0.004		0.486		0.167	
Frequency of issuing equities	12.4	17.5	12.9	16.9	12.4	12.9	17.5	16.9
T-test p-value	0.000		0.006		0.710		0.379	
New trade debt/ Total sources	41.3 (39.2)	23.4 (15.0)	45.8 (40.3)	19.4 (14.1)	41.3 (39.2)	45.8 (40.3)	23.4 (15.0)	19.4 (14.1)
T-test p-value	0.000		0.000		0.466		0.065	
No. of observations	2,883	8,089	650	3,906	2,883	650	8.089	3,906

The sample is made up of firms answering the SMF Survey 1998-2000 and having corresponding balance sheets in the CADS 1993-2000; observations belonging to the 1st and the 99th percentiles are dropped. T-test for equal means in the two sub-groups are under the assumption of unequal variances. Financial ratios based on total sources are first averaged by firm and then over firms. A firm is classified as small if it has 20 employees or less; innovative firms declare they are innovative and have a share of sales that can be imputed to new products.

Table 3

INVESTMENTS AND CASH FLOW BY FIRM INNOVATIVE ATTITUDE AND SIZE
(mean and median values over 1993-2000, ratios are in percentage)

	Non-innovative firms		Innovative firms		Small firms		Large firms	
	by size		by size		by innovative attitude		by innovative attitude	
	Small	Large	Small	Large	Non-innovative	Innovative	Non - innovative	Innovative
Physical Investment /capital (t-1)	27.0 (13.4)	20.9 (12.7)	31.0 (16.1)	21.5 (14.0)	27.0 (13.4)	31.0 (16.1)	20.9 (12.7)	21.5 (14.0)
T-test p-value	0.000		0.010		0.105		0.373	
Cash flow/capital (t-1)	46.0 (23.8)	32.9 (21.0)	66.1 (35.6)	34.7 (23.1)	46.0 (23.8)	66.1 (35.6)	32.9 (21.0)	34.7 (23.1)
T-test p-value	0.000		0.000		0.000		0.069	
Cash flow-Inv/capital (t-1)	16.6 (7.1)	10.8 (6.7)	31.1 (16.6)	12.0 (7.5)	16.6 (7.1)	31.1 (16.6)	10.8 (6.7)	12.0 (7.5)
T-test p-value	0.000		0.000		0.000		0.177	
R&D expenditures /capital (t-1) (4)	14.8 (4.1)	6.2 (2.4)	24.5 (7.0)	9.2 (3.5)	14.8 (4.1)	24.5 (7.0)	6.2 (2.4)	9.2 (3.5)
T-test p-value	0.000		0.000		0.024		0.000	
Cash flow-R&D -Inv/capital (t-1)	4.8 (2.1)	2.4 (2.7)	-9.7 (-0.3)	2.5 (2.2)	4.8 (2.1)	-9.7 (-0.3)	2.4 (2.7)	2.5 (2.2)
T-test p-value	0.566		0.113		0.091		0.982	
Tangible assets/total assets	18.3 (15.3)	22.8 (21.0)	16.9 (11.6)	22.1 (20.2)	18.3 (15.3)	16.9 (11.6)	22.8 (20.9)	22.1 (20.2)
T-test p-value	0.000		0.000		0.036		0.010	
Intangible assets/fixed assets	9.3 (2.5)	8.3 (2.8)	12.6 (4.5)	8.7 (3.4)	9.3 (2.5)	12.6 (4.5)	8.3 (2.8)	8.7 (3.4)
T-test p-value	0.001		0.000		0.000		0.150	
No. of observations for cash-flow	1,472	5,520	346	2,811	1,472	346	5,520	2,811
No. of observations for cash-flow & R&D	135	983	95	894	135	95	983	894
No. of observations	2,883	8,089	650	3,906	2,883	650	8.089	3,906

The sample is made up of firms answering the SMF Survey 1998-2000 and having corresponding balance sheets in the CADS 1993-2000; observations belonging to the 1st and the 99th percentiles are dropped. T-test for equal means in the two sub-groups are under the assumption of unequal variances. R&D expenditures refer only to the period 1998-2000 and only to firms having R&D, i.e. they are missing for other firms. A firm is classified as small if it has 20 employees or less. Innovative firms declare they are innovative and have a share of sales that can be imputed to new products.

Table 4a

SELECTED FINANCIAL INDICATORS: ESTIMATIONS BY FIRM INNOVATIVE ATTITUDE AND SIZE

	Leverage	Leverage	Leverage	Cash flow/total sources	Cash flow/total sources	Cash flow/total sources
	Tobit panel random effect estimation	Tobit panel random effect estimation	Tobit panel random effect estimation	OLS panel between estimation	OLS panel between estimation	OLS panel between estimation
	All firms	Small firms	Large firms	All firms	Small firms	Large firms
Innovative firm (dummy)	0.044 (3.52)	-0.102 (-5.17)	0.027 (2.64)	0.061 (1.17)	0.248 (1.79)	0.022 (0.40)
Size (t-1)	0.000 (2.92)	0.013 (9.05)	0.000 (-0.39)	-0.000 (-0.41)	0.009 (0.62)	-0.000 (-0.51)
Tangible/tot. assets (t-1)	0.105 (4.65)	-0.014 (-0.26)	0.126 (4.90)	0.740 (4.21)	1.167 (2.90)	0.628 (3.13)
Age (t-1)	-0.000 (-2.46)	-0.000 (-1.62)	-0.000 (-5.68)	0.001 (0.63)	0.002 (0.50)	0.001 (0.38)
Profits (t-1)	-0.422 (-14.4)	-0.330 (-3.69)	-0.449(-15.1)	1.784 (5.02)	1.650 (1.92)	1.775 (4.52)
Firm in group (dummy)	0.036 (2.37)	-0.094 (-3.83)	0.045 (4.06)	0.049 (0.93)	0.081 (0.52)	0.039 (0.68)
Centre	-0.008 (-0.48)	0.053 (2.24)	0.031 (1.72)	-0.197 (-3.08)	-0.192 (-1.36)	-0.198 (-2.75)
South	-0.123 (-9.27)	0.009 (0.32)	-0.113 (-4.45)	-0.148 (-1.89)	-0.195 (-1.08)	-0.157 (-1.80)
Breusch-Pagan LM test panel variance=0 (p-value)	0.000	0.000	0.000			
R^2 between				0.04	0.08	0.04
No. observations	12,223	2,461	9,762	12,105	2,424	9,681
No. firms	2,189	525	1,664	2,153	511	1,642
No. uncensored obs.	10,885	1,850	9,035			
No. of censored obs.	1,338	611	727			
Period	1993-2000	1993-2000	1993-2000	1993-2000	1993-2000	1993-2000

The sample is made up of firms answering the SMF Survey 1998-2000 and having corresponding balance sheets in the CADS. The dependent variable is marked at the head of the column; test t are in parentheses. All the estimations contain time and industry dummies; one-period lagged explanatory variables are used. A firm is classified as small if it has 20 employees or less. Innovative firms declare they are innovative and have a share of sales that can be imputed to new products. Size is the number of employees. Profits is the ratio between earnings before interest and taxes to total assets (Return on assets). See the Appendix for further details on the variables used in the estimation.

Table 4b

SELECTED FINANCIAL INDICATORS:
ESTIMATIONS BY FIRM INNOVATIVE ATTITUDE AND SIZE

	Probability of issuing equities Heckman pooled estimation	Probability of issuing equities Heckman pooled estimation	Probability of issuing equities Heckman pooled estimation	New equity/ total sources Heckman pooled estimation	New equity/ total sources Heckman pooled estimation	New equity/ total sources Heckman pooled estimation
	All firms	Small firms	Large firms	All firms	Small firms	Large firms
Innovative firm (dummy)	0.033 (0.86)	0.088 (0.84)	-0.004 (-0.10)	0.002 (0.10)	0.061 (1.88)	-0.021 (-1.18)
Size (t-1)	0.000 (5.61)	-0.013 (-1.83)	0.000 (5.60)	0.000 (4.29)	0.002 (1.02)	0.000 (4.28)
Tangible/tot. assets (t-1)				0.072 (3.05)	0.141 (1.52)	0.062 (2.29)
Age (t-1)				-0.000 (-1.53)	-0.001 (-1.36)	-0.000 (-1.33)
Profits (t-1)	-2.782 (-9.75)	-2.536 (-2.97)	-2.877 (-9.52)	-1.120 (-9.03)	0.106 (0.67)	-1.150 (-8.68)
Firm in group (dummy)	0.207 (5.37)	0.199 (1.79)	0.182 (4.35)	0.094 (5.55)	0.073 (1.89)	0.080 (4.44)
Centre	0.081 (1.72)	0.232 (2.44)	0.045 (0.83)	0.007 (0.34)	-0.078 (-2.50)	-0.063 (-0.27)
South	0.369 (6.67)	0.499 (3.95)	0.324 (5.16)	0.143 (6.03)	0.007 (0.19)	0.122 (4.67)
Wald test ρ=0 –pvalue	0.00	0.16	0.00	0.00	0.16	0.00
No. observations	12,457	2,645	9,812	12,457	2,645	9,812
No. uncensored obs.	1,930	320	1,610	1,930	320	1,610
No. of censored obs.	10,527	2,325	8,202	10,527	2,325	8,202
Period	1993-2000	1993-2000	1993-2000	1993-2000	1993-2000	1993-2000

The sample is made up of firms answering the SMF Survey 1998-2000 and having corresponding balance sheets in the CADS. The dependent variable is marked at the head of the column; test t are in parentheses. All the estimations contain time and industry dummies; one-period lagged explanatory variables are used. The Wald test is a test for the null that the correlation of the errors in the probability and in the main equation is zero. Standard errors are robust to heteroskedaticity and clustered at firm level. A firm is classified as small if it has 20 employees or less. Innovative firms declare they are innovative and have a share of sales that can be imputed to new products. Size is the number of employees. Profits is the ratio between earnings before interest and taxes to total assets (Return on assets). See the Appendix for further details on the variables used in the estimation.

Table 5

INVESTMENT SENSITIVITY TO CASH FLOW BY FIRM INNOVATIVE ATTITUDE AND SIZE
(System GMM estimation)

	Innovative firms (1)	Innovative firms & size (2)	Innovative firms & size (3)	R&D Innovative firms & size (4)	Innovative firms & size (5)	Innovative Firms & size (6)
CF(t)/capital (t-1)	0.192 (1.90)					
CF(t)/capital (t-1)*Inno	-0.157 (-1.96)					
CF(t)/capital (t-1)*d1		0.014 (0.10)	0.163 (1.50)	-0.013 (-0.61)	-0.061 (-0.36)	0.144 (1.56)
CF(t)/capital (t-1)*d2		0.082 (1.66)	-0.063 (-0.54)	0.040 (1.76)	0.064 (1.30)	0.135 (3.85)
CF(t)/capital (t-1)*d3					0.081 (0.55)	0.488 (3.35)
CF(t)/capital (t-1)*d4		0.150 (1.62)	0.249 (1.92)	-0.007 (-0.29)	0.132 (1.35)	0.239 (3.27)
CF(t)/capital (t-1)*d5		0.454 (2.70)	0.176 (1.25)	-0.007 (-0.51)	0.418 (2.50)	0.411 (4.42)
CF(t)/capital (t-1)*d6					0.086 (0.86)	0.341 (2.80)
Inv.(t-1)/capital (t-2)	0.094 (3.83)	0.102 (4.33)	0.088 (2.39)		0.098 (4.07)	0.102 (4.65)
R&D(t-1)/capital (t-2)				0.678 (12.7)		
Growth rate of sales(t)	-0.125 (-0.80)	-0.072 (-0.38)	0.155 (0.93)	-0.017 (-0.41)	-0.059 (-0.35)	0.006 (0.04)
Growth rate of sales(t-1)	0.034 (1.04)	0.026 (0.75)	0.065 (1.85)	0.007 (0.67)	0.039 (1.10)	0.010 (0.34)
Error correction term	-0.027 (-1.77)	-0.017 (-1.00)	-0.031 (-1.94)	-0.001 (-0.36)	-0.022 (-1.45)	-0.001 (-0.11)
Sales (t-2)	-0.004 (-1.47)	-0.000 (-0.05)	-0.010 (-2.14)	-0.000 (-0.66)	0.000 (0.06)	0.003 (0.47)
Tests						
CFd1=CFd4 p-value		0.247	0.184	0.611	0.009	0.241
CFd2=CFd5 p-value		0.010	0.061	0.071	0.016	0.001
CFd3=CFd6 p-value					0.975	0.397
CFd1=CFd2 p-value		0.591	0.034	0.006	0.400	0.909
CFd1=CFd3 p-value					0.300	0.023
CFd2=CFd3 p-value					0.897	0.011
Hansen p-value	0.978	0.917	0.946	0.237	0.854	0.522
Test for AR(1) in first difference p-value	0.000	0.000	0.000	0.002	0.000	0.000
Test for AR(2) in first difference p-value	0.664	0.533	0.825	0.472	0.625	0.361
No. observations	4,640	4,640	1,995	2,020	4,640	4,640
Observation per firms	5	5	5	5	5	5
No.firms	928	928	399	404	928	928
Period	1993-2000	1993-2000	1993-2000	1993-2000	1993-2000	1993-2000

The sample is made up of firms answering to the SMF Survey 1998-2000 and having corresponding balance sheets in the CADS for 1993-2000. The dependent variable is the investment ratio, Investment (t)/Capital (t-1), excluding model 4 where R&D investments are considered. Constant, time, industries and area dummies are included in the estimation. Inno is a dummy=1 for innovative firms. d1 is a dummy=1 for large innovative firms; d2=1 for small innovative; d3=1 for medium innovative; d4=1 for large non-innovative; d5=1 for small non-innovative; d6=1 for medium non-innovative. Estimation is one-step system GMM using Stata user-written command xtabond2 by David Roodman. Asymptotically robust standard errors are used for t-test reported in brackets. Hansen is a test of over-identifying restrictions. Tests for AR(1) and AR(2) are for the presence of 1st order and 2nd order serial correlation in the first-difference residuals. The instruments are Investment(t-2)/capital (t-3) and Investment(t-3)/capital (t-4); growth rate of sales (t-2) and (t-3); CF(t-2)/capital(t-3) and CF(t-3)/capital(t-4) in the difference equations; for the level equations the first difference dated t-1 and t-2 are used as instruments. Models 1 to 6 are described in the text.

Table 6

INVESTMENT SENSITIVITY TO CASH FLOW: SENSITIVITY ANALYSIS
(System GMM estimation)

	Innovative firms & size (1)	Innovative firms & size (2)	Innovative firms & size (3)	Innovative firms & size (4)	Innovative firms & size (5)
CF(t)/capital (t-1)*d1	0.324 (1.44)	0.067 (0.42)	0.081 (0.76)	0.023 (0.13)	-0.008 (-0.04)
CF(t)/capital (t-1)*d2	0.202 (1.62)	0.050 (0.93)	0.006 (0.10)	0.083 (1.50)	0.026 (0.38)
CF(t)/capital (t-1)*d4	0.227 (1.38)	0.174 (2.06)	0.171 (2.24)	0.159 (1.44)	0.083 (0.78)
CF(t)/capital (t-1)*d5	0.508 (1.40)	0.390 (2.46)	0.372 (3.59)	0.440 (2.47)	0.446 (2.79)
Inv.(t-1)/capital (t-2)	0.118 (2.77)	0.077 (3.02)	0.087 (3.62)	0.094 (4.05)	0.097 (4.18)
Growth rate of sales(t)	-0.012 (-0.10)	0.009 (0.05)	-0.053 (-0.24)	-0.113 (-0.67)	-0.067 (-0.40)
Growth rate of sales(t-1)	-0.003 (-0.04)	0.016 (0.41)	0.034 (0.91)	0.013 (0.33)	0.034 (0.84)
Error correction term	0.013 (0.33)	-0.025 (-1.70)	-0.017 (-1.19)	-0.016 (-0.85)	-0.024 (-1.27)
Sales (t-2)	-0.005 (-0.90)	-0.002 (-0.53)	-0.003 (-0.67)	-0.002 (-0.29)	0.001 (0.25)
Test					
CFd1=CFd4 p-value	0.504	0.477	0.296	0.319	0.447
CFd2=CFd5 p-value	0.378	0.014	0.000	0.017	0.003
CFd1=CFd2 p-value	0.573	0.901	0.409	0.694	0.829
Hansen p-value	0.989	0.519	0.722	0.971	0.938
Test for AR(1) in first difference p-value	0.000	0.000	0.000	0.000	0.000
Test for AR(2) in first difference p-value	0.593	0.554	0.983	0.661	0.636
No. observations	1,514	3,126	4,655	4,190	4,640
Observation per firms	5	5	5	5	5
No.firms	307	632	931	838	928
Period	1993-2000	1993-2000	1993-2000	1993-2000	1993-2000

The same footnote as in Table 5 applies. (1) Including only firms in high-tech sectors; (2) including only firms in non high-tech sectors; (3) using another definition of cash flow drawn from balance sheet rather than from flows of funds accounts; (4) excluding firms with more than 500 employees; (5) allowing firms to enter/exit the classification of size.

Appendix

The variables used

Equity: capital and reserves. Source CADS.

Financial debts: bank and other financial debts. Source CADS.

Leverage: financial debts/(financial debts plus equity). Source CADS.

Short term financial debts: financial debts expiring in less than 1 year. Source CADS.

Size: the number of firms' employees. If this number is missing, we estimate it using labour costs and average labour cost per head in the firm industry (four-digit figures). Source CADS.

Tangible assets: net equipment and gross plants. *Intangible assets*: immaterial assets. *Fixed assets*: the sum of tangible and intangible assets. Source CADS

Age: the age of the firm, equal to the difference between the year to which the data refer and the date of birth. Source CADS.

Profits: the ratio between earnings before interest and taxes to total assets (Return on assets). We use earnings before interest in order to have a profitability indicator that is the least influenced by financial indicators. Source CADS.

Firm in a group (dummy): the dummy is equal to 1 if the firm belongs to group. Source: SMF

Innovation firm (dummy): the dummy is equal to 1 if the firm declares it innovates and has a share of sales of new products greater than zero. Source: SMF

R&D expenditures: as in other countries, this item is normally not capitalised under Italian accounting rules. We obtain R&D expenditures from the SMF survey as in the CADS often R&D is equal to zero for the same firm because they are included in other more general item. They are deflated (1995 prices) by an industrial (2-digit) price index for the value added. Source: SMF

Physical investments: this item is directly drawn from the flow of funds data in the CADS. They are deflated using a sector (2 digit) price index for investments (1995 prices). Source CADS.

Cash flow: this variable (net profits plus depreciation allowances) is directly drawn from the flow of funds data in the CADS. They are deflated using a sector (2 digit) price index for the value added (1995 prices). Source CADS.

Sales: net sales in the CADS. They are deflated using a sector (2 digit) price index for the value added (1995 prices).

Capital stock: the value of the net capital stock (property, plant and equipment) is taken from the CADS and is measured at replacement value the first year the observation is available. Specifically, in the first year, the book value of capital is expressed at the price of that year, using an estimation of the average age of the firm's capital (life). This is computed using the sector useful life of capital (slife) and the share of goods already depreciated in the first year. The formula is:

$$life = slife * (DEPR_{i,t0} / p_k K_{i,t0}) * 0.5$$

and it allows for the fact that depreciation for tax purposes is faster than economic depreciation; DEPR is equal to total book value accumulated depreciation. Subsequently, this first value of the capital is deflated, i.e. is expressed at 1995 prices. In this way, every amount is expressed at the prices of the same year.

Then, the following values of capital are calculated using the perpetual inventory method:

$$K_{i,t} = K_{i,t-1}(1-\delta) + I_{i,t}$$

In this formula, δ is the depreciation rate, assumed equal to 0.05, and $I_{i,t}$ are the investments deflated at 1995 prices.

References

Acs, Z.J. and D.B. Audretsch (1990), *Innovation and Small Firms,* Cambridge, MIT Press

Aghion, P. and P. Bolton (1992), "An Incomplete Contracts Approach to Financial Contracting", *Review of Economics Studies,* Vol. 59, pp. 473-494

Aghion, P. and J. Tirole (1994), "The Management of Innovation", *The Quarterly Journal of Economics,* Vol. 109, pp. 1185-1209

Aghion, P., S. Bond, A. Klemm and I. Marinescu (2004), "Technology and Financial Structure: Are Innovative Firms Different?", *Journal of the European Economic Association,* Vol. 4, pp. 277-288

Anand, B.N. and A. Galetovic (2000), "Weak Property Rights and Holdup in R&D", *Journal of Economics and Management Strategy,* Vol. 9, No. 4, pp. 615-642

Anton, J.J. and D.A. Yao (2002), "The Sale of Ideas: Strategic Disclosure, Property Rights, and Contracting", *Review of Economic Studies,* Vol. 69, pp. 513-531

Arellano, M. and S. Bond (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", *Review of Economic Studies,* Vol. 58, pp. 277-297

Arellano, M. and O. Bover (1995), "Another Look at the Instrumental Variable Estimation of Error-components models", *Journal of Econometrics,* Vol. 68, pp. 29-51

Arrow, K. (1962), "Economic Welfare and the Allocation of Resources for Invention", in Nelson R. (ed), *The Rate and Direction of Inventive Activity,* Princeton, N.J., Princeton University Press

Benfratello, L., F. Schiantarelli and A. Sembenelli (2006), "Banks and Innovation: Microeconometric Evidence on Italian Firms" mimeo

Berger, A. and G. Udell (1998), "The Economics of Small Business Finance: the Roles of Private Equity and Debt Markets in the Financial Growth Cycle", *Journal of Banking and Finance,* Vol. 22, pp. 613-673

Bhattacharya, S. and J.R. Ritter (1983), "Innovation and Communication: Signalling with Partial Disclosure", *Review of Economic Studies,* Vol. 50, pp. 331-346

Blass, A. A. and O. Yosha (2003), "Financing R&D in Mature Companies: An Empirical Analysis ", *Economics of Innovation and New Technology,* Vol. 12, No. 5, pp. 425-447

Blundell, R. and S. Bond (1998), "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models", *Journal of Econometrics,* Vol. 85, pp. 115-143

Bolton, P. and X. Freixas (2000), "Equity, Bonds, and Bank Debt: Capital Structure and Financial Market Equilibrium under Asymmetric Information", *Journal of Political Economy,* Vol. 108, pp. 324-351

Bond, S. (2002), "Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice", *The Institute for Fiscal Studies,* Working Paper, No. CWP09/02

Bond, S., J.A. Elston, J. Mairesse and B. Mulkay (2003a), "Financial Factors and Investment in Belgium, France, Germany and the Uk: a Comparison Using Company Panel Data", *The Review of Economics and Statistics,* Vol. 85, No.1 pp.153-165

Bond, S., D. Harhoff and J. Van Reenen (2003b), "Investment, R&D and Financial Constraints in Britain and Germany", mimeo.

Bradley, M., G.A. Jarrel and E.H. Kim (1984), "On the Existence of An Optimal Capital Structure: Theory and Evidence", *The Journal of Finance,* Vol. 39, No. 3, pp. 857-881

Brown, W. (1997), "R&D Intensity and Finance: Are Innovative Firms Financially Constrained?", *Financial Market Group LSE,* Working Paper, No271

Carpenter, R. and B. Petersen (2002a), "Capital Market Imperfections, High-Tech Investments and New Equity Financing, *The Economic Journal,* Vol. 112, No.1, pp-54-72

Carpenter, R. and B. Petersen (2002b), "Is the Growth of Small Firms Constrained by Internal Finance?, *The Review of Economics and Statistics,* Vol. 84, No.2, pp-298-309

Clementi, G.L. and H.A. Hopenhayn (2006), "A Theory of Financing Constraints and Firm Dynamics", *Quarterly Journal of Economics,* Vol. 121, No.1, pp.229-265

Del Colle, D.M., P. Finaldi Russo and A. Generale (2006), "The Causes and Consequences of Venture Capital Financing. An Analysis Based on a Sample of Italian Firms", Banca d'Italia*, Tema di Discussione* No. 584

Fazzari, S., R.G. Hubbard and B. Petersen (1988), "Financing Constraints and Corporate Investments", *Booking Papers on Economic Activity,* pp. 141-95

Gompers, P.A. (1995), "Optimal Investment, Monitoring, and the Staging of Venture Capital", *The Journal of Finance,* Vol.50, No. 5, pp. 1461-1489

Hall, B. (2002), "The Financing of Research and Development", *Oxford Review of Economic Policy,* Vol. 18, No. 1, pp. 35-51

Harhoff, D. (1998), "Are There Financing Constraints for R&D and Investment in German Manufacturing Firms?", *Annales d'Économie et de Statistique,* No. 49/50, pp. 421-456

Himmelberg, C. and B. C. Petersen (1994), "R&D and Internal Finance: A Panel Study of Small Firms in High-Tech Industries", *The Review of Economics and Statistics,* Vol. 76, No. 1, pp. 38-51

Jensen, M.C. and W. H. Meckling (1976), "Theory of the Firm: Managerial Behaviour, Agency Costs and Ownership Structure", *Journal of Financial Economics,* Vol. 3, No. 4, pp. 305-360

Kaplan, S. and L. Zingales (1997), "Do Investments-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints", *Quarterly Journal of Economics*, Vol. 112, No.1, pp. 169-215

Kaplan, S. and L. Zingales (2000), "Investment-Cash Flow Sensitivities Are Not Valid Measures of Financing Constraints", *Quarterly Journal of Economics*, Vol. 115, No.2, pp. 707-13

Mairesse, J. and P. Mohen (2002), "The Economics of Technology and Innovation", *American Economic Review*, vol. 92, No.2, pp. 226-230

Myers, S.C. and N.S. Majluf (1984), "Corporate financing and investment decisions when firms have information that investors do not have", *Journal of Financial Economics,* Vol. 13, pp. 187-221

Mulkay, B., B. Hall and J. Mairesse (2001), "Firm Level Investment and R&D in France and the United States: A Comparison", in Deutsche Bundesbank (ed), *Investing Today for the World Tomorrow,* Springer Verlag

Nucci, F., A. Pozzolo and F. Schivardi (2004), "Is Firm Productivity Related to its Financial Structure? Evidence From Microeconomic Data", mimeo

Pozzolo, A. F. (2003), "Il ruolo della finanza nello sviluppo della nuova economia", in S. Rossi (ed), *La Nuova Economia. I fatti dietro il mito*, ed), il Mulino, Bologna

Schumpeter, J.A. (1942), *Capitalism, Socialism and Democracy,* New York, Harper and Row

Stiglitz, J. (1985), "Credit Markets and Capital Controls", *Journal of Money, Credit and banking,* Vol. 17, pp. 133-52

Titman, S. and R. Wessels (1988), "The Determinants of Capital Structure Choice", *The Journal of Finance*, Vol. 43, No. 1, pp. 1-19

von Kalckreuth, U. (2004), "Financial Constraints for Investors and the Speed of Adaptation: are Innovators Special", Deutsche Bundesbank, *Discussion Paper* No.20

N. 616 – *Entry barriers in italian retail trade,* by Fabiano Schivardi and Eliana Viviano (February 2007).

N. 617 – *A politicy-sensible core-inflation measure for the euro area,* by Stefano Siviero and Giovanni Veronese (February 2007).

N. 618 – *Le opinioni degli italiani sull'evasione fiscale,* by Luigi Cannari and Giovanni D'Alessio (February 2007)

N. 619 – *Memory for prices and the euro cash changeover: An analysis for cinema prices in Italy*, by Vincenzo Cestari, Paolo Del Giovane and Clelia Rossi-Arnaud (February 2007).

N. 620 – *Intertemporal consumption choices, transaction costs and limited participation in financial markets: Reconciling data and theory*, by Orazio P. Attanasio and Monica Paiella (April 2007).

N. 621 – *Why demand uncertainty curbs investment: Evidence from a panel of Italian manufacturing firms*, by Maria Elena Bontempi, Roberto Golinelli and Giuseppe Parigi (April 2007).

N. 622 – *Employment, innovation and productivity: Evidence from Italian microdata*, by Bronwyn H. Hall, Francesca Lotti and Jacques Mairesse (April 2007).

N. 623 – *Measurement of income distribution in supranational entities: The case of the European Union*, by Andrea Brandolini (April 2007).

N. 624 – *Un nuovo metodo per misurare la dotazione territoriale di infrastrutture di trasporto*, by Giovanna Messina (April 2007).

N. 625 – *The forgone gains of incomplete portfolios,* by Monica Paiella (April 2007).

N. 626 – *University drop-out: The case of Italy,* by Federico Cingano and Piero Cipollone (April 2007).

N. 627 – *The sectoral distribution of money supply in the euro area,* by Giuseppe Ferrero, Andrea Nobili and Patrizia Passiglia (April 2007).

N. 628 – *Changes in transport and non-transport costs: Local vs global impacts in a spatial network*, by Kristian Behrens, Andrea R. Lamorgese, Gianmarco I.P. Ottaviano and Takatoshi Tabuchi (April 2007).

N. 629 – *Monetary policy shocks in the euro area and global liquidity spillovers*, by João Sousa and Andrea Zaghini (June 2007).

N. 630 – *Endogenous growth and trade liberalization between asymmetric countries*, by Daniela Marconi (June 2007).

N. 631 – *New Eurocoin: Tracking economic growth in real time*, by Filippo Altissimo, Riccardo Cristadoro, Mario Forni, Marco Lippi and Giovanni Veronese (June 2007).

N. 632 – *Oil supply news in a VAR: Information from financial markets*, by Alessio Anzuini, Patrizio Pagano and Massimiliano Pisani (June 2007).

N. 633 – *The reliability of EMU fiscal indicators: Risks and safeguards*, by Fabrizio Balassone, Daniele Franco and Stefania Zotteri (June 2007).

N. 634 – *Prezzi delle esportazioni, qualità dei prodotti e caratteristiche di impresa: un'analisi su un campione di imprese italiane*, by Matteo Bugamelli (June 2007).

N. 635 – *Openness to trade and industry cost dispersion: Evidence from a panel of Italian firms*, by Massimo Del Gatto, Gianmarco I.P. Ottaviano and Marcello Pagnini (June 2007).

N. 636 – *The weighting process in the SHIW*, by Ivan Faiella and Romina Gambacorta (June 2007).

N. 637 – *Emerging markets spreads and global financial conditions*, by Alessio Ciarlone, Paolo Piselli and Giorgio Trebeschi (June 2007).

N. 638 – *Comparative advantage patterns and domestic determinants in emerging countries: An analysis with a focus on technology*, by Daniela Marconi and Valeria Rolli (September 2007).

N. 639 – *The generation gap: Relative earnings of young and old workers in Italy*, by Alfonso Rosolia and Roberto Torrini (September 2007).

(*) Requests for copies should be sent to:
Banca d'Italia – Servizio Studi – Divisione Biblioteca e pubblicazioni – Via Nazionale, 91 – 00184 Rome (fax 0039 06 47922059). They are available on the Internet www.bancaditalia.it.

2004

P. ANGELINI and N. CETORELLI, *Gli effetti delle modifiche normative sulla concorrenza nel mercato creditizio*, in F. Panetta (eds.), Il sistema bancario negli anni novanta: gli effetti di una trasformazione, Bologna, il Mulino, **TD No. 380 (October 2000)**.

P. CHIADES and L. GAMBACORTA, *The Bernanke and Blinder model in an open economy: The Italian case*, German Economic Review, Vol. 5, 1, pp. 1-34, **TD No. 388 (December 2000)**.

M. BUGAMELLI and P. PAGANO, *Barriers to investment in ICT*, Applied Economics, Vol. 36 , 20, pp. 2275-2286, **TD No. 420 (October 2001)**.

F. BUSETTI, *Preliminary data and econometric forecasting: An application with the Bank of Italy quarterly model*, CEPR Discussion Paper, 4382, **TD No. 437 (December 2001)**.

A. BAFFIGI, R. GOLINELLI and G. PARIGI, *Bridge models to forecast the euro area GDP*, International Journal of Forecasting, Vol. 20, 3, pp. 447-460, **TD No. 456 (December 2002)**.

D. AMEL, C. BARNES, F. PANETTA and C. SALLEO, *Consolidation and efficiency in the financial sector: A review of the international evidence*, Journal of Banking and Finance, Vol. 28, 10, pp. 2493-2519, **TD No. 464 (December 2002)**.

M. PAIELLA, *Heterogeneity in financial market participation: Appraising its implications for the C-CAPM*, Review of Finance, Vol. 8, 3, pp. 445-480, **TD No. 473 (June 2003)**.

F. CINGANO and F. SCHIVARDI, *Identifying the sources of local productivity growth*, Journal of the European Economic Association, Vol. 2, 4, pp. 720-742, **TD No. 474 (June 2003)**.

E. BARUCCI, C. IMPENNA and R. RENÒ, *Monetary integration, markets and regulation*, Research in Banking and Finance, 4, pp. 319-360, **TD No. 475 (June 2003)**.

G. ARDIZZI, *Cost efficiency in the retail payment networks: first evidence from the Italian credit card system*, Rivista di Politica Economica, Vol. 94, 3, pp. 51-82, **TD No. 480 (June 2003)**.

E. BONACCORSI DI PATTI and G. DELL'ARICCIA, *Bank competition and firm creation*, Journal of Money Credit and Banking, Vol. 36, 2, pp. 225-251, **TD No. 481 (June 2003)**.

R. GOLINELLI and G. PARIGI, *Consumer sentiment and economic activity: a cross country comparison*, Journal of Business Cycle Measurement and Analysis, Vol. 1, 2, pp. 147-170, **TD No. 484 (September 2003)**.

L. GAMBACORTA and P. E. MISTRULLI, *Does bank capital affect lending behavior?*, Journal of Financial Intermediation, Vol. 13, 4, pp. 436-457, **TD No. 486 (September 2003)**.

F. SPADAFORA, *Il pilastro privato del sistema previdenziale: il caso del Regno Unito*, Economia Pubblica, 34, 5, pp. 75-114, **TD No. 503** (**June 2004**).

C. BENTIVOGLI and F. QUINTILIANI, *Tecnologia e dinamica dei vantaggi comparati: un confronto fra quattro regioni italiane*, in C. Conigliani (eds.), *Tra sviluppo e stagnazione: l'economia dell'Emilia-Romagna*, Bologna, Il Mulino, **TD No. 522 (October 2004)**.

G. GOBBI and F. LOTTI, *Entry decisions and adverse selection: An empirical analysis of local credit markets*, Journal of Financial Services Research, Vol. 26, 3, pp. 225-244, **TD No. 535 (December 2004)**.

E. GAIOTTI and F. LIPPI, *Pricing behavior and the introduction of the euro: Evidence from a panel of restaurants*, Giornale degli Economisti e Annali di Economia, 2004, Vol. 63, 3-4, pp. 491-526, **TD No. 541 (February 2005)**.

L. GAMBACORTA, *How do banks set interest rates?*, NBER Working Paper, 10295, **TD No. 542 (February 2005).**

A. CICCONE, F. CINGANO and P. CIPOLLONE, *The private and social return to schooling in Italy*, Giornale degli Economisti e Annali di Economia, Vol. 63, 3-4, pp. 413-444, **TD No. 569 (January 2006)**.

L. DEDOLA and F. LIPPI, *The monetary transmission mechanism: Evidence from the industries of 5 OECD countries*, European Economic Review, 2005, Vol. 49, 6, pp. 1543-1569, **TD No. 389 (December 2000)**.

D. Jr. MARCHETTI and F. NUCCI, *Price stickiness and the contractionary effects of technology shocks*. European Economic Review, Vol. 49, 5, pp. 1137-1164, **TD No. 392 (February 2001)**.

G. CORSETTI, M. PERICOLI and M. SBRACIA, *Some contagion, some interdependence: More pitfalls in tests of financial contagion*, Journal of International Money and Finance, Vol. 24, 8, pp. 1177-1199, **TD No. 408 (June 2001)**.

GUISO L., L. PISTAFERRI and F. SCHIVARDI, *Insurance within the firm*. Journal of Political Economy, Vol. 113, 5, pp. 1054-1087, **TD No. 414** (**August 2001**)

R. CRISTADORO, M. FORNI, L. REICHLIN and G. VERONESE, *A core inflation indicator for the euro area*, Journal of Money, Credit, and Banking, Vol. 37, 3, pp. 539-560, **TD No. 435 (December 2001)**.

F. ALTISSIMO, E. GAIOTTI and A. LOCARNO, *Is money informative? Evidence from a large model used for policy analysis*, Economic & Financial Modelling, Vol. 22, 2, pp. 285-304, **TD No. 445 (July 2002)**.

G. DE BLASIO and S. DI ADDARIO, *Do workers benefit from industrial agglomeration?* Journal of regional Science, Vol. 45, (4), pp. 797-827, **TD No. 453 (October 2002).**

G. DE BLASIO and S. DI ADDARIO, *Salari, imprenditorialità e mobilità nei distretti industriali italiani*, in L. F. Signorini, M. Omiccioli (eds.), *Economie locali e competizione globale: il localismo industriale italiano di fronte a nuove sfide*, Bologna, il Mulino, **TD No. 453 (October 2002).**

R. TORRINI, *Cross-country differences in self-employment rates: The role of institutions*, Labour Economics, Vol. 12, 5, pp. 661-683, **TD No. 459 (December 2002)**.

A. CUKIERMAN and F. LIPPI, *Endogenous monetary policy with unobserved potential output*, Journal of Economic Dynamics and Control, Vol. 29, 11, pp. 1951-1983, **TD No. 493 (June 2004)**.

M. OMICCIOLI, *Il credito commerciale: problemi e teorie*, in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 494 (June 2004)**.

L. CANNARI, S. CHIRI and M. OMICCIOLI, *Condizioni di pagamento e differenziazione della clientela*, in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 495 (June 2004)**.

P. FINALDI RUSSO and L. LEVA, *Il debito commerciale in Italia: quanto contano le motivazioni finanziarie?*, in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 496 (June 2004)**.

A. CARMIGNANI, *Funzionamento della giustizia civile e struttura finanziaria delle imprese: il ruolo del credito commerciale*, in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 497 (June 2004)**.

G. DE BLASIO, *Credito commerciale e politica monetaria: una verifica basata sull'investimento in scorte*, in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 498 (June 2004)**.

G. DE BLASIO, *Does trade credit substitute bank credit? Evidence from firm-level data.* Economic notes, Vol. 34, 1, pp. 85-112, **TD No. 498 (June 2004).**

A. DI CESARE, *Estimating expectations of shocks using option prices*, The ICFAI Journal of Derivatives Markets, Vol. 2, 1, pp. 42-53, **TD No. 506 (July 2004).**

M. BENVENUTI and M. GALLO, *Il ricorso al "factoring" da parte delle imprese italiane*, in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 518 (October 2004)**.

L. CASOLARO and L. GAMBACORTA, *Redditività bancaria e ciclo economico*, Bancaria, Vol. 61, 3, pp. 19-27, **TD No. 519 (October 2004)**.

F. PANETTA, F. SCHIVARDI and M. SHUM, *Do mergers improve information? Evidence from the loan market*, CEPR Discussion Paper, 4961, **TD No. 521 (October 2004)**.

P. DEL GIOVANE and R. SABBATINI, *La divergenza tra inflazione rilevata e percepita in Italia*, in P. Del Giovane, F. Lippi e R. Sabbatini (eds.), *L'euro e l'inflazione: percezioni, fatti e analisi*, Bologna, Il Mulino, **TD No. 532 (December 2004).**

R. TORRINI, *Quota dei profitti e redditività del capitale in Italia: un tentativo di interpretazione*, Politica economica, Vol. 21, 1, pp. 7-41, **TD No. 551 (June 2005)**.

M. OMICCIOLI, *Il credito commerciale come "collateral"*, in L. Cannari, S. Chiri, M. Omiccioli (eds.), Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia, Bologna, il Mulino, **TD No. 553 (June 2005)**.

L. CASOLARO, L. GAMBACORTA and L. GUISO, *Regulation, formal and informal enforcement and the development of the household loan market. Lessons from Italy*, in Bertola G., Grant C. and Disney R. (eds.) The Economics of Consumer Credit: European Experience and Lessons from the US, Boston, MIT Press, **TD No. 560 (September 2005)**.

S. DI ADDARIO and E. PATACCHINI, *Lavorare in una grande città paga, ma poco*, in Brucchi Luchino (ed.), *Per un'analisi critica del mercato del lavoro*, Bologna , Il Mulino, **TD No. 570 (January 2006)**.

P. ANGELINI and F. LIPPI, *Did inflation really soar after the euro changeover? Indirect evidence from ATM withdrawals*, CEPR Discussion Paper, 4950, **TD No. 581 (March 2006)**.

S. FEDERICO, *Internazionalizzazione produttiva, distretti industriali e investimenti diretti all'estero*, in L. F. Signorini, M. Omiccioli (eds.), *Economie locali e competizione globale: il localismo industriale italiano di fronte a nuove sfide*, Bologna, il Mulino, **TD No. 592 (October 2002).**

S. DI ADDARIO, *Job search in thick markets: Evidence from Italy*, Oxford Discussion Paper 235, Department of Economics Series, **TD No. 605 (December 2006)**.

2006

F. BUSETTI, *Tests of seasonal integration and cointegration in multivariate unobserved component models*, Journal of Applied Econometrics, Vol. 21, 4, pp. 419-438, **TD No. 476 (June 2003).**

C. BIANCOTTI, *A polarization of inequality? The distribution of national Gini coefficients 1970-1996*, Journal of Economic Inequality, Vol. 4, 1, pp. 1-32, **TD No. 487 (March 2004)**.

L. CANNARI and S. CHIRI, *La bilancia dei pagamenti di parte corrente Nord-Sud (1998-2000)*, in L. Cannari, F. Panetta (a cura di), Il sistema finanziario e il Mezzogiorno: squilibri strutturali e divari finanziari, Bari, Cacucci, **TD No. 490 (March 2004).**

M. BOFONDI and G. GOBBI, *Information barriers to entry into credit markets*, Review of Finance, Vol. 10, 1, pp. 39-67, **TD No. 509 (July 2004).**

FUCHS W. and LIPPI F., *Monetary union with voluntary participation*, Review of Economic Studies, Vol. 73, pp. 437-457 **TD No. 512 (July 2004).**

GAIOTTI E. and A. SECCHI, *Is there a cost channel of monetary transmission? An investigation into the pricing behaviour of 2000 firms*, Journal of Money, Credit and Banking, Vol. 38, 8, pp. 2013-2038 **TD No. 525 (December 2004)**.

A. BRANDOLINI, P. CIPOLLONE and E. VIVIANO, *Does the ILO definition capture all unemployment?*, Journal of the European Economic Association, Vol. 4, 1, pp. 153-179, **TD No. 529 (December 2004)**.

A. BRANDOLINI, L. CANNARI, G. D'ALESSIO and I. FAIELLA, *Household wealth distribution in Italy in the 1990s*, in E. N. Wolff (ed.) International Perspectives on Household Wealth, Cheltenham, Edward Elgar, **TD No. 530 (December 2004)**.

P. DEL GIOVANE and R. SABBATINI, *Perceived and measured inflation after the launch of the Euro: Explaining the gap in Italy*, Giornale degli economisti e annali di economia, Vol. 65, 2 , pp. 155-192, **TD No. 532 (December 2004).**

M. CARUSO, *Monetary policy impulses, local output and the transmission mechanism*, Giornale degli economisti e annali di economia, Vol. 65, 1, pp. 1-30, **TD No. 537 (December 2004).**

L. GUISO and M. PAIELLA, *The role of risk aversion in predicting individual behavior, In P. A. Chiappori e C. Gollier (eds.) Competitive Failures in Insurance Markets: Theory and Policy Implications, Monaco, CESifo*, **TD No. 546 (February 2005).**

G. M. TOMAT, *Prices product differentiation and quality measurement: A comparison between hedonic and matched model methods*, Research in Economics, Vol. 60, 1, pp. 54-68, **TD No. 547 (February 2005)**.

F. LOTTI, E. SANTARELLI and M. VIVARELLI, *Gibrat's law in a medium-technology industry: Empirical evidence for Italy*, in E. Santarelli (ed.), Entrepreneurship, Growth, and Innovation: the Dynamics of Firms and Industries, New York, Springer, **TD No. 555 (June 2005).**

F. BUSETTI, S. FABIANI and A. HARVEY, *Convergence of prices and rates of inflation*, Oxford Bulletin of Economics and Statistics, Vol. 68, 1, pp. 863-878, **TD No. 575 (February 2006).**

M. CARUSO, *Stock market fluctuations and money demand in Italy, 1913 - 2003*, Economic Notes, Vol. 35, 1, pp. 1-47, **TD No. 576 (February 2006)**.

S. IRANZO, F. SCHIVARDI and E. TOSETTI, *Skill dispersion and productivity: An analysis with matched data*, CEPR Discussion Paper, 5539, **TD No. 577 (February 2006).**

R. BRONZINI and G. DE BLASIO, *Evaluating the impact of investment incentives: The case of Italy's Law 488/92*. Journal of Urban Economics, Vol. 60, 2, pp. 327-349, **TD No. 582 (March 2006).**

R. BRONZINI and G. DE BLASIO, *Una valutazione degli incentivi pubblici agli investimenti*, Rivista Italiana degli Economisti , Vol. 11, 3, pp. 331-362, **TD No. 582 (March 2006).**

A. DI CESARE, *Do market-based indicators anticipate rating agencies? Evidence for international banks*, Economic Notes, Vol. 35, pp. 121-150, **TD No. 593 (May 2006).**

L. DEDOLA and S. NERI, *What does a technology shock do? A VAR analysis with model-based sign restrictions*, Journal of Monetary Economics, Vol. 54, 2, pp. 512-549, **TD No. 607 (December 2006)**.

R. GOLINELLI and S. MOMIGLIANO, *Real-time determinants of fiscal policies in the euro area*, Journal of Policy Modeling, Vol. 28, 9, pp. 943-964, **TD No. 609 (December 2006).**

P. ANGELINI, S. GERLACH, G. GRANDE, A. LEVY, F. PANETTA, R. PERLI,S. RAMASWAMY, M. SCATIGNA and P. YESIN, *The recent behaviour of financial market volatility*, BIS Papers, 29, **QEF No. 2 (August 2006)**.

2007

L. CASOLARO. and G. GOBBI, *Information technology and productivity changes in the banking industry*, Economic Notes, Vol. 36, 1, pp. 43-76, **TD No. 489 (March 2004)**.

M. PAIELLA, *Does wealth affect consumption? Evidence for Italy*, Journal of Macroeconomics, Vol. 29, 1, pp. 189-205, **TD No. 510 (July 2004).**

F. LIPPI. and S. NERI, *Information variables for monetary policy in a small structural model of the euro area*, Journal of Monetary Economics, Vol. 54, 4, pp. 1256-1270, **TD No. 511 (July 2004)**.

A. ANZUINI and A. LEVY, *Monetary policy shocks in the new EU members: A VAR approach*, Applied Economics, Vol. 39, 9, pp. 1147-1161, **TD No. 514 (July 2004)**.

L. MONTEFORTE, *Aggregation bias in macro models: Does it matter for the euro area?*, Economic Modelling, 24, pp. 236-261, **TD No. 534 (December 2004)**.

A. DALMAZZO and G. DE BLASIO, *Production and consumption externalities of human capital: An empirical study for Italy*, Journal of Population Economics, Vol. 20, 2, pp. 359-382, **TD No. 554 (June 2005).**

S. DI ADDARIO and E. PATACCHINI, *Wages and the city. Evidence from Italy*, Development Studies Working Papers 231, Centro Studi Luca d'Agliano, **TD No. 570 (January 2006)**.

A. LOCARNO, *Imperfect knowledge, adaptive learning and the bias against activist monetary policies*, International Journal of Central Banking, v. 3, 3, pp. 47-85, **TD No. 590 (May 2006)**.

F. LOTTI and J. MARCUCCI, *Revisiting the empirical evidence on firms' money demand*, Journal of Economics and Business, Vol. 59, 1, pp. 51-73, **TD No. 595 (May 2006)**.

P. CIPOLLONE and A. ROSOLIA, *Social interactions in high school: Lessons from an earthquake*, American Economic Review, Vol. 97, 3, pp. 948-965, **TD No. 596 (September 2006).**

M. PAIELLA, *The foregone gains of incomplete portfolios*, Review of Financial Studies, Vol. 20, 5, pp. 1623-1646, **TD No. 625 (April 2007).**

FORTHCOMING

P. ANGELINI, *Liquidity and announcement effects in the euro area*, Giornale degli economisti e annali di economia, **TD No. 451 (October 2002).**

S. MAGRI, *Italian households' debt: The participation to the debt market and the size of the loan*, Empirical Economics, **TD No. 454 (October 2002)**.

L. GUISO and M. PAIELLA,, *Risk aversion, wealth and background risk*, Journal of the European Economic Association, **TD No. 483 (September 2003).**

G. FERRERO, *Monetary policy, learning and the speed of convergence*, Journal of Economic Dynamics and Control, **TD No. 499 (June 2004).**

S. MOMIGLIANO, J. Henry and P. Hernández de Cos, *The impact of government budget on prices: Evidence from macroeconometric models*, Journal of Policy Modelling, **TD No. 523 (October 2004).**

D. Jr. MARCHETTI and F. Nucci, *Pricing behavior and the response of hours to productivity shocks*, Journal of Money Credit and Banking, **TD No. 524 (December 2004).**

R. BRONZINI, FDI Inflows, *Agglomeration and host country firms' size: Evidence from Italy*, Regional Studies, **TD No. 526 (December 2004).**

L. GAMBACORTA, *How do banks set interest rates?*, European Economic Review, **TD No. 542 (February 2005).**

A. NOBILI, *Assessing the predictive power of financial spreads in the euro area: does parameters instability matter?*, Empirical Economics, Vol. 31, 4, pp. , **TD No. 544 (February 2005)**.

P. ANGELINI and A. Generale, *On the evolution of firm size distributions*, American Economic Review, **TD No. 549 (June 2005).**

R. FELICI and M. PAGNINI,, *Distance, bank heterogeneity and entry in local banking markets*, The Journal of Industrial Economics, **TD No. 557 (June 2005).**

M. BUGAMELLI and R. TEDESCHI, *Le strategie di prezzo delle imprese esportatrici italiane*, Politica Economica, **TD No. 563 (November 2005).**

L. GAMBACORTA and S. IANNOTTI, *Are there asymmetries in the response of bank interest rates to monetary shocks?*, Applied Economics, **TD No. 566 (November 2005).**

S. DI ADDARIO and E. PATACCHINI, *Wages and the city. Evidence from Italy*, Labour Economics, **TD No. 570 (January 2006)**.

M. BUGAMELLI and A. ROSOLIA, *Produttività e concorrenza estera*, Rivista di politica economica, **TD No. 578 (February 2006).**

P. ANGELINI and F. LIPPI, *Did prices really soar after the euro cash changeover? Evidence from ATM withdrawals*, International Journal of Central Banking, **TD No. 581 (March 2006)**.

S. FEDERICO and G. A. MINERVA, *Outward FDI and local employment growth in Italy*, Review of World Economics, **TD No. 613 (February 2007).**

F. BUSETTI and A. HARVEY, *Testing for trend*, Econometric Theory **TD No. 614 (February 2007).**

B. ROFFIA and A. ZAGHINI, *Excess money growth and inflation dynamics*, International Finance, **TD No. 629 (June 2007)**.

M. DEL GATTO, GIANMARCO I. P. OTTAVIANO and M. PAGNINI, *Openness to trade and industry cost dispersion: Evidence from a panel of Italian firms*, Journal of Regional Science, **TD No. 635 (June 2007)**.