

Italian public support to NTBFs: an empirical investigation

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PRELIMINARY VERSION: PLEASE DO NOT QUOTE

1. Introduction

A large body of empirical literature on entrepreneurship has pointed to the presence of important financial constraints suffered from new firms (Meyer 1990, Blanchflower and Oswald 1990, Evans and Jovanovic 1989, Evans and Leighton 1989, Black *et al.* 1996, Holtz-Eakin *et al.* 1994a and 1994b). The access to credit market is felt quite problematic especially for New Technology-Based Firms (NTBFs) (Westhead and Storey, 1997, Storey and Tether, 1998, Carpenter and Petersen, 2002). In fact, as Carpenter and Petersen (2002) clearly put on evidence, many obstacles to the credit access by this typology of enterprises can stem from the inability of banks and other financial institutions of discerning good projects from “lemons” in sectors usually characterised by highly skewed returns, asymmetric information and often a lack of collateral. A market failure typically calls for public intervention, especially in a such strategic sector which supplies much of that new knowledge which usually fuels economic growth. However, recent contributions (Holtz-Eakin 2000, Santarelli and Vivarelli 2002) have questioned the rationale for public support to new firms. In fact, as they assert, failure rates are naturally high among such firms. Hence, public support may disturb and delay the competitive selection process, subsidising inefficiencies. But since most of the industrialised countries adopt policies that assist in the creation and growth of firms, it is clearly of fundamental importance to analyse the effective role played by such implemented government measures. In particular, as Siegel *et al.* (2003) point out, the assessment of the effectiveness of public policy measures designed to promote innovation in the NTBFs and to solve market inefficiencies has become a key policy issue, given the potential crucial role of high-tech enterprises in terms of economic growth and job creation.

This paper focuses on Italian public support to the NTBF sector. In particular, it analyses the access of Italian NTBFs to those direct financial measures implemented by national administration

to support the productive system. In fact Italy, as many other EU countries, has never had any financial support scheme targeted exclusively upon NTBFs, but these latter have benefited from public assistance only through access to measures also available to other types of enterprises. The empirical analysis is based on a sample of Italian firms that were established in the '80s and '90s and operate in high-tech manufacturing and service industries. Data are provided by the RITA database developed at Politecnico di Milano.

The objective of the paper is twofold. First, we analyse which are the characteristics of NTBFs which have received public direct financial support at national level and we investigate if there are significant differences between supported and non-supported firms. Second, we aim at verifying which are the national policy measures that have been most utilised by NTBFs.

The paper proceeds as follows. In the next section, we provide a taxonomy of all direct public support measures covering NTBFs and implemented by the national authority. In Section 3 we present the data set. Section 4 addresses more directly the purpose of the present work: we analyse the characteristics of subsidized firms and identify the national policy measures that have been most used by NTBFs. Then, Section 5 presents an econometric exercise which aims at highlighting those firm-specific characteristics which enable NTBFs to gain access to national public support schemes. Finally, summarising remarks in Section 6 conclude the paper.

2. Taxonomy of the national government financing schemes

This section describes the Italian government financing policies covering NTBFs. We provide a taxonomy of the national laws under which our sample firms could potentially benefit of some type of support. As we said before, in Italy there are no public support measures targeting specifically the NTBF sector. In spite of this, national government direct financial schemes explicitly designed to support technology innovation in the country are 5 (L. 46/82, L. 317/91, L. 451/94, 140/97, 196/97) and the number of laws which could potentially provide some type of facilitation to NTBFs is 24. We proceed to distinguish these various schemes under the following criteria:

- *number of the law*;
- *year of the law*;
- *function*¹: (a) to support R&D; (b) to stimulate the purchase of innovative machinery; (c) to stimulate the investment in tangible assets; (d) to support learning activities; (e) to provide incentives to hire new personnel; (f) to assist depressed or other specific limited areas;

¹ Note that a scheme may be available to all firms, but it may provide preferential access or special measures to firms located in depressed or other specific limited areas.

- *evaluation of applicants*: (a) automatic (i.e. once a firm fulfils the requirements of the law, it is sure to get the support); (b) discretionary (to some extent the support is conditional to the approval of the policy maker);
- *instrument*: (a) tax credit; (b) capital account contributions; (c) interest account contributions; (d) tax relief; (e) equity capital contributions; (f) guarantees; (g) technical assistance;
- *recipients*²: (a) all firms; (b) Small Medium Enterprises (SMEs); (c) new entrepreneurship; (d) female entrepreneurship.

The taxonomy, presented in Table 1, offers us the opportunity to draw some interesting considerations. First of all, most of the schemes are designed not only to support innovative efforts (R&D activities and the purchase of innovative machinery) but also to assist more wide-ranging tangible investments. Half of the laws provide incentives to stimulate employment and especially in the last period there is a tendency to favour this function. Most of the policies explicitly focus on depressed areas and in particular on the South of Italy. Secondly, it is not possible to derive a strong emphasis of the regulator on an evaluation method against the other: both automatic and discretionary modes of granting the support are equally used (with a tendency in the last period to favour the automatic one). Thirdly, the most used instruments appeared to be the capital and interest account contributions and more recently the tax credit. On the other hand, there are few laws that favour guarantees and technical assistance. Finally, it is important to note that almost all schemes provide special measures to the SME sector and very few policy measures have been implemented with the purpose of stimulating the creation of new entrepreneurship.

3. Data

In this paper we consider a sample composed of Italian NTBFs. Sample firms were established in 1980 or later, were independent at start-up time (i.e. they were not controlled by another business organization even though other organizations may have held minority shareholdings in the new firm) and operated in high-tech sectors, in both manufacturing and services.

The sample of NTBFs was extracted from the RITA database, developed at Politecnico di Milano. The RITA database was created in 1999 and contains detailed information on more than 400 Italian NTBFs and more than 1,000 of their founders. The development of the database went through a series of steps. Firstly, Italian target firms that complied with the above mentioned criteria

² Note that a scheme may be available to all firms but it may provide preferential access or special measures to SMEs, new entrepreneurship and/or female entrepreneurship.

relating to age and sector of operations were identified. For the construction of the target “universe” a number of sources were used. These included lists provided by national industry associations, on-line and off-line commercial firm directories, and lists of participants in industry trades and expositions. Information provided by the national financial press, specialized magazines, other sectoral studies, and regional Chambers of Commerce was also considered. Altogether, around 2,000 firms were selected for potential inclusion in the database.

Second, a questionnaire was sent to the target firms either by fax or by e-mail. The aim of the questionnaire was to collect both quantitative information relating to the activity, structure and performance of firms and the characteristics of their founders, and opinions of firms' founders on specific issues. The questionnaire comprises further questions concerning the eventual benefit of direct public financial support measures.

Lastly, answers to the questionnaire were checked and the questionnaires were completed if necessary by educated personnel through phone or face-to-face interviews with firms' owner-managers. This final step was crucial in order to obtain missing data and ensure the accurateness of answers.

In 2001, another questionnaire was sent to the NTBFs included in RITA in order to update existing information on the firms and acquiring new data. In particular, on a subsample of subsidized firms we obtain information on the year these enterprises could access the support and the number of the law by which the subsidy was provided.

So, the sample used in the present work consists of 390 NTBFs. The number of firms that have received public financial support granted by the national government is 89. After the second survey, the size of the dataset shrank to 252 firms³. On this subsample, available information on the year of support and on the number of the law by which the support was granted is for 59 and 53 NTBFs, respectively. Note that there is no presumption here to have a random sample. First, unfortunately data provided by official national statistics do not allow to obtain a reliable description of the universe of Italian NTBFs. Second, the identification process of the target universe that was described above is likely to have lead to the oversampling of growth-oriented firms, while micro-firms probably are underrepresented. Third, the sample was drawn in 1999 and updated in 2001; so only firms having survived up to the survey dates were included. This notwithstanding, the sample is sufficiently large and heterogeneous to provide adequate coverage of

³ In particular during the 2000-2001, 21 firms have been acquired or have merged with other firms, 22 firms have stopped activity, 82 firms did not want to collaborate anymore, and 13 firms were not found or changed their core business into not technology-related activities. For what concerns the 89 subsidized firms, everyone was contacted, but 18 firms did not want to collaborate anymore and 1 was found to have merged with an other firm. No NTBFs was found to have stopped or changed activity.

Italian NTBFs. In addition, the information collected on the characteristics of these firms is much more accurate than in previous dataset of similar size.

4. The empirical analysis

4.1 The characteristics of subsidized firms

The composition of sample firms by sector of operation is presented in Table II. In particular, column 1 refers to the entire sample of NTBFs while column 2 and column 3 report the number and the percentage of subsidized enterprises for each different sector, respectively. The sample consists of 19 firms in the biotechnology and pharmaceutical industry (4.8% of the sample), 23 firms in the multimedia content sector (5.9%), 112 software houses (28.6%), 155 Internet and telecommunication service firms (39.9%), while the remaining firms operate in the ICT manufacturing sector (20.7% of the sample, i.e. 81 enterprises). So, most of the firms operate in Internet and TLC services and these also appear to be the less subsidized ones. The result is probably due to the relatively young age of the firms which operate in such industry, as highlighted by Table III which shows that the number of subsidized firms is greater within the oldest enterprises (39% of the sample firms created in the period 1980-1985 and 42% of those set up in the period 1986-1990 have managed to receive some type of direct financial support at national level, against 16% of firms that were born in 1991-1995 and 14% of NTBFs created in 1996-2000). This suggests that age of the firm may be an important determinant of NTBFs' access to public direct financial support.

The geographical distribution of the firms is presented in Table IV, with column 1 that refers to the entire sample and column 2 to the only subsidized enterprises. The table clearly shows that if most of the NTBFs are located in the Centre and North of Italy (86% of the sample), their access to direct support measures is fairly low (20% of the firms are subsidized) compared to southern enterprises (14% of the sample) that present a greater attitude to exploit direct financial support schemes (38% of them received subsidies at national level). Naturally, as highlighted in Section 2, the reason for such difference probably resides in the fact that a large number of schemes are explicitly designed to assist enterprises located in the South of Italy. But since most of NTBFs are located elsewhere and therefore they are not in the condition to fully benefit of the majority of these schemes, this raises more than a doubt on the capacity of the existing laws to support the high-tech sectors and possibly it calls for more specific and targeted measures.

Table V presents evidence on the level of human capital possessed by founders of NTBFs, again column 1 refers to the whole sample, while column 2 reports statistics for the subsidized enterprises. Following Becker (1975), we distinguish between *generic* and *specific* human capital.

Generic human capital relates to the general knowledge acquired by entrepreneurs through both formal education and professional experience. Specific human capital consists of the capabilities of individuals that can directly be applied to the entrepreneurial job in the newly created firm; it is very much related to the industry-specific skills that founders learned in the organization by which they were formerly employed and to the “leadership experience” gained either through a managerial position in another firm or in prior self-employment episodes (Cooper 1985, Preisdörfer and Voss 1990, Brüderl *et al.* 1992, Brüderl and Preisdörfer 2000). Before proceeding with the evidence of educational attainments and working background of founders of Italian NTBFs, two preliminary remarks are in order.

On one hand, as pointed out by Cooper and John (1977), the distinctive capabilities⁴ of a NTBF are closely related to the human capital of the founders, especially in the early years after foundation. Several studies have analyzed the effect of founders’ human capital on firms’ post-entry performances, finding a positive effect (see for instance Bates 1990, Brüderl *et al.* 1992, Brüderl and Preisdörfer 2000. See Storey 1994 for a survey). In addition, Colombo and Grilli (2003) find similar results for the same sample of NTBFs here considered and show that this is due both to the “wealth effect” of the human capital, captured as by the *generic* and the *specific* component, and to the “entrepreneurial ability effect”, associated only to the *specific* component. So, in accordance with the knowledge-based theory of the firm (see for instance Grant 1996), NTBFs established by highly qualified individuals outperform other NTBFs because of superior efficiency.

On the other hand, recent contributions suggest that individuals with greater entrepreneurial ability are those most likely to suffer from financial constraints and capital market imperfections: Åstebro and Bernhardt (1999) define the phenomenon as “the winner’s curse of human capital”; Colombo *et al.* (2002) put on evidence that there seems to be a considerable number of new firms in such a situation in Italian high-tech industries.

If public policy measures exist, it is clear that they should address the needs of such firms (i.e. those founded by individuals characterized by a high level of specific human capital but scarce financial resources), since these latter have the capabilities to survive and then to grow more than other firms, incrementing the overall social welfare, but they are not in the condition to do it because of lack of funds. The analysis of Table V shows that neither *generic* nor (and more importantly) *specific* human capital of founders discriminate in any significant way subsidized from non-subsidized firms, pointing to the inefficiencies of existing policy measures.

⁴ Distinctive capabilities (Winter 1987, Prahalad and Hamel 1990) can be defined as a firm’s ability to select, mobilize and use tangible and intangible assets to perform tasks in a unique way. They express what a firm is able to do better than other firms.

Conversely, Table VI aims at discovering if access to subsidies is associated to some specific characteristics of NTBFs. In particular, their location in a technology incubator⁵, the fact that at start-up time firms received valuable tangible and/or intangible resources from a “mother” company (e.g. complementary technologies, access to distribution channels, after-sale services, support to entry into international markets), their nature of academic spin-offs (i.e. one or more founders with an academic working background). All three factors seem to positively, albeit slightly, differentiate subsidized from non-subsidized NTBFs. The impact of such factors on the likelihood of gaining access to direct public support will be investigated more accurately in Section 5.

4.2 The national government direct financial policies most used by NTBFs

Among the 89 firms of the sample that gained access to national direct financial support, we have information on the year on which the subsidies were granted for 59 NTBFs. Within these latter, we know the number of the law under which the support was provided for 53 enterprises. Table VII distinguishes all laws covering high-tech enterprises by the sectors on which operate the subsidized NTBFs. The first remark to be done is that among the 24 laws potentially available to NTBFs, only 16 of them have been actually utilised by high-tech ventures. The 5 laws explicitly designed to support technology innovation have been utilised by 25 firms. Roughly 50% of firms have utilised three laws: L. 46/82, L. 488/92, L. 140/97. All three laws are characterised by the aim of stimulating investment in R&D activities, but the first two are specifically designed for small and medium enterprises located in depressed areas (South of Italy), while the third one has more wide-ranging aims, and in fact it is the only one that has been utilised to some extent by NTBFs operating in all high-tech sectors. Rather interestingly, note also that the evaluation of applicants in all three laws is based on discretionary criteria. As we said before, both automatic and discretionary methods of evaluation of applicants are equally present within direct financing policies covering NTBFs (see again Table I). But high-tech enterprises seem to have benefited most from laws which provide discretionary criteria: if NTBFs have utilised direct financing schemes 61 times, in 41 cases they have accessed laws characterised by this type of evaluation of applicants. For what concerns instruments, both L. 46/82 and L. 488/92 provide capital and interest account contributions (L. 488/92 also financial guarantees), while L. 140/97 allows tax credit.

Table VIII sheds some light on the utilisation of laws by NTBFs differentiated on the basis of their geographical location. In spite of the fact that L. 46/82 has a specific focus on southern enterprises, none of the analysed NTBFs located in the South of Italy has been supported by this

⁵ See Colombo and Delmastro (2002) for a description of technology incubators in Italy.

scheme. L. 488/92 and L. 140/97 have been most utilised by NTBFs located in the South and North West, respectively. Note also that 21 over the 25 firms that have utilised schemes with a prominent focus on technology innovation (L. 46/82, L. 317/91, L. 451/94, 140/97, 196/97) are located in the North of Italy.

5. The econometric exercise

In order to better illustrate what differentiates subsidized from non-subsidized firms, this section is devoted to the analysis of the characteristics that enable NTBFs to gain first access to the direct financing schemes exposed in Section 2. For this purpose, in order to take into account the right-censored nature of the sample (firms which did not receive any State aid within the survey period) we employ a survival model⁶. In particular, we define the duration as the lifetime between the year of firm's foundation and the year when firms have received for the first time support by the national government.

The probability distribution of duration can be specified by the distribution function $F(t)=\Pr(T<t)$, which specifies the probability that the duration variable T is less than some value t . The hazard function is defined as $f(t)/S(t)$, where $f(t)$ is the probability density function and $S(t)$, which is equal to $1-F(t)$, is the survival function. The hazard function gives the instantaneous rate of receiving State aid, given that this has not been granted up to t . We choose to model duration and survival through a Weibull distribution, so $S(t)$ is equal to $\exp[-(\lambda t)^\alpha]$ and $h(t)$ is represented by $\lambda\alpha(\lambda t)^{\alpha-1}$; where $\lambda=\exp(-\beta'x)$, x is a set of time-varying covariates and β are the estimated parameters. In this specification, the hazard function is monotonically increasing in duration (positive duration dependence) if the scale parameter $\alpha>1$, and monotonically decreasing in duration (negative duration dependence) if $\alpha<1$. The set of variables used in the econometric model is illustrated in Table IX. Results for the Weibull regression are reported in Table X. Since we have information on the variables of our interest only for a subsample of firms, this econometric exercise is run on 243 NTBFs. As said before, the number of subsidized firms is 59. Survey period is 1980-2001.

Econometric results can be synthesised as follows⁷:

- Start-up size does not play any role.

⁶ For a comprehensive treatment of the techniques of duration analysis, see Lawless (1982) and Keifer (1988).

⁷ For the sake of synthesis, we omit to report the plot of estimated residuals against the integrated hazard which anyway excludes the presence of a problem connected to heteroschedasticity. Naturally, it is available upon request from the authors.

- Services activities show a negative albeit not statistically significant impact on the likelihood of gaining access to State aid.
- Age of the firm is positively correlated with the probability of receiving public aid ($\alpha=1.743$), and rarely public money and fiscal facilities have represented an effective support for NTBFs in the very early years after start-up. This is particularly worrisome, given that high-tech firms are likely to suffer from capital market imperfections more heavily when they are young and without reputation on the loan market⁸.
- Prior working experience of firms' founders does not represent a requisite in the selection process of the firms to be financed. Econometric estimates find no significant impact of the average number of worked years by founders (both of specific and generic nature) on the likelihood of access to public support.
- Neither the presence among founders of former managers, former university employees or individuals who had already started a business on their own can facilitate NTBFs in obtaining public subsidies.

These results may be interpreted as signals that existing public measures find difficulties in individuating those entrepreneurs who are more likely to have started promising business projects and may suggest the need of more specific subsidy schemes for the NTBF sector.

- Conversely, educational background measured by the average number of years spent by founders in educational programmes, has a positive impact on the likelihood of obtaining public support.
- Firms that at start-up time receive help from a “mother” company are much more likely to benefit from public aid.
- Also geographic localisation significantly affects the likelihood of obtaining public support. In particular, everything else being equal, the probability is sensibly greater for firms located in the South of Italy. The result clearly depends on the high number of laws explicitly designed for this geographic area.
- Moreover, enterprises located in technological incubators show a greater ability to obtain public help. Actually these structures help firms on being better informed about available opportunities and could also give them greater visibility towards policy makers.
- Finally, the likelihood of receiving public support sensibly increases for firms that participated in EU research projects. This result confirms the fact that firms which are used to have frequent

⁸ The importance of what is usually referred to as “relationship lending” is well-documented [see Berger and Udell (2002) for a brief survey]. This literature draws attention on the importance of the strength of the relationship between

contacts with public institutions (at national or international level), are then favoured on getting public support. The reason possibly lies in the increased level of their competencies and skills. In addition, such firms are usually much more likely to be aware of the existing opportunities.

6. Concluding remarks

The paper aims at investigating the ability of existing national government direct financial policies to support the Italian NTBF sector. In spite of the importance of the issue, the empirical literature on the evaluation of public support schemes to entrepreneurship is rather scarce. In this context, high-tech firms are particularly worth of attention, given their strategic role in terms of overall economic growth and the “near universal recognition of the presence of market failure in the provision of finance of new technology-based firms” (Storey and Tether 1998, p. 1049) because of the specific characteristics of these business activities (i.e. highly uncertain returns, low collateral value, high information asymmetries between lenders and borrowers, see Carpenter and Petersen 2002). If indiscriminate public support is rightly deemed both unfeasible and inefficient, since it turns out to subsidize inefficiencies, public interventions should target those enterprises characterized by high potentiality in terms of growth and post-entry performance, which anyway may find difficulties on realizing their business projects because of lack of enough funds or resources. Whilst some European countries have adopted national government support policies which explicitly target NTBFs; in Italy and in other EU countries, there are no public support measures specifically designed for the NTBF sector. So, some questions arise: to what extent are NTBFs of these countries able to get funds from the public administration? And to what extent these policies are able to target promising high-tech enterprises?

The paper addresses these issues. It focuses on the Italian case and provides a review of the available public subsidies granted at national level. Then, it analyses a sample of 390 NTBFs, extracted from the RITA database, developed at Politecnico di Milano, that have been established between 1980 and 2000 and operate in high-tech industries in both manufacturing and services. Descriptive statistics and the econometric analysis (run on a subsample of 243 firms), highlight the need of more specific measures than the existing ones. These latter are in fact especially designed to support southern entrepreneurship and manufacturing firms and seem inappropriate to provide aid to NTBFs located in the Centre-North of Italy and operating in services. Moreover, variables capturing the level of human capital at disposal of the high-tech ventures, fail on discriminating

loan officers and borrowers in order to analyse both credit availability and more favorable credit terms such as collateral requirements and interest rates.

between subsidized and non subsidized firms, suggesting the urge of more well-targeted policy schemes.

References

- Ástebro, T., Bernhardt, I., 1999, "The Winner's Curse of Human Capital," Center for Economic Studies, Working Paper CES 99-5, U.S. Department of Commerce.
- Bates, T., 1990, "Entrepreneur human capital inputs and small business longevity", *Review of Economics and Statistics*, vol. 72, pp. 551-559.
- Becker, G. S., *Human Capital*, 1975, New York: National Bureau of Economic Research.
- Berger, A. N., Udell, G. F., 2002, "Small Business Credit Availability and Relationship Lending: the Importance of Bank Organisational Structure", *Economic Journal*, 112 (477), F32-F53.
- Black, J., de Meza, D., Jeffreys, D., 1996, "House pricing, the supply of collateral and the enterprise economy", *Economic Journal*, vol. 106, pp. 60-75.
- Blanchflower, D., Oswald, A., 1998, "What Makes an Entrepreneur", *Journal of Labor Economics*, vol. 16, pp. 26-60.
- Brüderl, J., Preisendörfer, P., 2000, "Fast growing businesses: empirical evidence from a German study", *International Journal of Sociology*, vol. 30, pp. 45-70.
- Brüderl, J., Preisendörfer, P., Ziegler, R., 1992, "Survival chances of newly founded business organizations", *American Sociological Review*, vol.72, pp. 227-242.
- Carpenter, R. E, Petersen, B. C., 2002, "Capital market imperfections, high-tech investment, and new equity financing", *Economic Journal*, vol. 112, pp. F54-F72.
- Colombo, M. G., Delmastro, M., 2002, "How effective are technology incubators? Evidence from Italy", *Research Policy*, vol. 31, pp. 1103-1122.
- Colombo, M. G., Delmastro, M., Grilli, L., 2002, "Entrepreneurs' human capital, external financing, and the start-up size of new technology-based firms", *Proceedings of the 29^o EARIE Conference*, Madrid.
- Colombo, M. G., Grilli, L., 2003, "Founders' human capital and the growth of new technology-based firms", mimeo.
- Cooper A. C., 1985, "The role of incubator organizations in the founding of growth-oriented firms", *Journal of Business Venturing*, vol. 1, pp. 75-86.
- Cooper A. C., Bruno, A. V., 1977, "Success among high-technology firms", *Business Horizons*, vol. 20, pp. 16-22.
- Evans, D., Jovanovic, B., 1989, "An estimated model of entrepreneurial choice under liquidity constraints", *Journal of Political Economy*, vol. 97, pp. 808- 827.
- Evans, D., Leighton, L., 1989, "Some empirical aspects of entrepreneurship", *American Economic Review*, vol. 79, pp. 519- 535.

- Grant, R., 1996, "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, vol. 17 (Winter Special Issue), pp. 109-122.
- Holtz-Eakin, D., 2000, "Public policy toward entrepreneurship", *Small Business Economics*, vol. 15, pp. 283-291.
- Holtz-Eakin, D., Joulfaian, D., Rosen, H. S., 1994a, "Entrepreneurial decisions and liquidity constraints", *Rand Journal of Economics*, vol. 25, pp. 334-347.
- Holtz-Eakin, D., Joulfaian, D., Rosen, H. S., 1994b, "Sticking it out: entrepreneurial survival and liquidity constraints", *Journal of Political Economy*, vol. 102, pp. 53-75.
- Keifer, N., 1988, "Economic duration data and hazard functions", *Journal of Economic Literature*, vol. 26, pp. 646-679.
- Lawless, J. F., 1982, *Statistical models and methods for lifetime data*, Wiley, Toronto.
- Prahalad, C.K., Hamel, G., 1990, "The core competence of the corporation", *Harvard Business Review*, May-June, pp. 79-91.
- Preisendörfer, P., Voss, T., 1990, "Organizational mortality of small firms: the effects of entrepreneurial age and human capital", *Organizational Studies*, vol. 11, pp. 107-129.
- Santarelli, E., Vivarelli, M., 2002, "Is subsidizing entry an optimal policy?", *Industrial and Corporate Change*, vol. 11, pp. 39-52.
- Siegel, D., Wessner, C., Binks, M., Lockett, A., 2003, "Policies promoting innovation in small firms: evidence from the U.S. and U.K.", *Small Business Economics*, vol. 20, pp. 121-127.
- Storey, D. J., 1994, *Understanding the small business sector*, Thomson Learning, London.
- Storey, D. J., Tether, B. S., 1998, "Public policy measures to support new technology-based firms in the European Union", *Research Policy*, vol. 26, pp. 1037-1057.
- Westhead, P., Storey, D. J., 1997, "Financial constraints on the growth of high technology small firms in the United Kingdom", *Applied Financial Economics*, vol. 7, pp. 197-201.

Table I. Illustrations of direct financing policies covering NTBFs.

| NUMBER OF THE LAW | | 1329 | 1089 | 902 | 46 | 696 | 26 | 44 | 64 | 113 | 318 | 346 | 317 | 215 | 488 | 17 | 236 | 451 | 95 | 341 | 140 | 196 | 266 | 449 | 388 | |
|--------------------------|--------------------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| YEAR OF THE LAW | | '65 | '68 | '76 | '82 | '83 | '86 | '86 | '86 | '86 | '87 | '88 | '91 | '92 | '92 | '93 | '93 | '94 | '95 | '95 | '97 | '97 | '97 | '97 | '00 | |
| FUNCTION | R&D | | X | | X | | X | | X | | | X | X | X | X | | X | X | X | X | X | X | | X | | |
| | INNOVATIVE MACHINERY | | | | | X | | | X | | X | | | | X | | | | | | | | | | | |
| | INVESTMENTS | X | X | X | X | | X | X | X | | | X | X | X | X | X | X | | | | X | | X | X | | |
| | LEARNING ACTIVITIES | | | | | | | X | | | | | | | | | | X | | X | | | | | | |
| | EMPLOYMENT | | | | | | X | X | X | X | | | | | X | | X | X | | X | | X | X | X | X | X |
| | DEPRESSED AREAS | | X | X | X | X | | X | X | X | X | X | X | X | X | | X | | X | X | | | | | | |
| | OTHER SPECIFIC AREAS | | | | | | X | | | | | | | | | | | | | | | | X | | X | |
| EVALUATION OF APPLICANTS | AUTOMATIC | X | | | | X | | | | | X | | X | X | | X | | X | | X | | X | X | X | X | |
| | DISCRETIONARY | | X | X | X | | X | X | X | X | | X | | | X | | X | | X | | X | | | | | |
| INSTRUMENT | TAX CREDIT | | | | | | | | | | | | X | X | | | | | | | X | | X | X | X | |
| | CAPITAL ACCOUNT CONTRIBUTIONS | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | | | X | | X | X | | | |
| | INTEREST ACCOUNT CONTRIBUTIONS | | X | X | X | | | X | X | | | X | X | X | X | | | | X | X | | | | | | |
| | TAX RELIEF | | X | | | | X | | | | | | | | | X | | X | | | | X | | | | |
| | EQUITY CAPITAL CONTRIBUTIONS | | X | | | | | | | | | | | | | | | | | X | | | | | | |
| | GUARANTEES | X | | | | | | | X | | | | | X | X | X | | | | | X | | | X | | |
| | TECHNICAL ASSISTANCE | | | | | | | X | | | | | | | | | | | | | | X | | | | |
| RECIPIENTS | ALL FIRMS | X | X | X | X | X | X | | | X | X | X | | X | | X | X | X | | | X | | | | X | |
| | SMEs | | X | | X | X | | X | X | | X | X | X | | X | | | X | X | X | | X | X | X | | |
| | NEW ENTREPRENEURSHIP | | | | | | | X | | | | | | X | | X | | X | | | | | | | | |
| | FEMALE ENTREPRENEURSHIP | | | | | | | | | | | | | X | | | | | | | | | | | | |

Table II. Sectoral composition of the sample.

| <i>Sector</i> | Total sample | Subsidized firms | % of subsidized firms by sector |
|------------------------------------|------------------------|------------------------|---------------------------------|
| | Number of observations | Number of observations | |
| <i>Internet and TLC services</i> | 155 | 19 | 12% |
| <i>Multimedia content</i> | 23 | 6 | 26% |
| <i>Software houses</i> | 112 | 29 | 26% |
| <i>ICT manufacturing</i> | 81 | 25 | 31% |
| <i>Biotechnology/Pharmaceutics</i> | 19 | 10 | 53% |

Table III. Sectoral composition of the sample by year of foundation of the firms. In parentheses the number of subsidized NTBFs.

| <i>Sector</i> | 1980-1985 | 1986-1990 | 1991-1995 | 1996-2000 |
|------------------------------------|------------------------|------------------------|------------------------|------------------------|
| | Number of observations | Number of observations | Number of observations | Number of observations |
| <i>Internet and TLC services</i> | 4 (0) | 12 (3) | 49 (3) | 90 (13) |
| <i>Multimedia content</i> | 3 (1) | 3 (3) | 5 (0) | 12 (2) |
| <i>Software houses</i> | 18 (6) | 20 (10) | 44 (11) | 30 (2) |
| <i>ICT manufacturing</i> | 21 (10) | 25 (9) | 18 (4) | 17 (2) |
| <i>Biotechnology/Pharmaceutics</i> | 3 (2) | 7 (3) | 6 (2) | 3 (3) |
| <i>Total</i> | 49 (19) | 67 (28) | 122 (20) | 152 (22) |

Table IV. Geographical distribution of NTBFs.

| <i>Geographic area</i> | Total sample | Subsidized firms | Percentage of subsidized firms |
|------------------------|--------------|------------------|--------------------------------|
| <i>North-East</i> | 83 | 20 | 24% |
| <i>North-West</i> | 187 | 36 | 19% |
| <i>Centre</i> | 67 | 13 | 19% |
| <i>South</i> | 53 | 20 | 38% |

Table V. Human capital of founders of NTBFs.

| <i>Human Capital</i> | Total sample | Subsidized firms |
|---|--------------|------------------|
| GENERIC | | |
| Average number of years of founders' education | 14.9 | 15.7 |
| Average number of years of working experience gained by founders in other sectors than the one of the start-up before firm's foundation | 7.9 | 7.8 |
| SPECIFIC | | |
| Average number of years of working experience gained by founders in the same sector of the start-up before firm's foundation | 4.6 | 4.4 |
| Percentage of firms with one or more founders with a prior management position | 28% | 28% |

Table VI. Specific characteristics of NTBFs.

| <i>Specific characteristics</i> | Total sample | Subsidized firms |
|--|--------------|------------------|
| Percentage of firms located in a technology incubator | 13% | 19% |
| Percentage of corporate spin-offs (i.e. firms that received at start-up time some type of aid from a "mother" company) | 11% | 17% |
| Average start-up size | 6.8 | 8.9 |
| Percentage of academic spin-offs | 5% | 10% |

Table VII. Distribution of laws across sectors of supported NTBFs.

| <i>Sector/Laws</i> | 46 | 26 | 44 | 64 | 317 | 488 | 17 | 236 | 451 | 95 | 341 | 140 | 196 | 266 | 449 | 388 | Total |
|------------------------------------|-----------|-----------|-----------|-----------|------------|------------|-----------|------------|------------|-----------|------------|------------|------------|------------|------------|------------|-----------------------|
| <i>Internet and TLC services</i> | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 2 | 1 | 0 | 12 |
| <i>Multimedia content</i> | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 8 |
| <i>Software houses</i> | 3 | 0 | 1 | 2 | 1 | 2 | 0 | 1 | 0 | 0 | 2 | 3 | 0 | 1 | 1 | 1 | 18 |
| <i>ICT manufacturing</i> | 3 | 1 | 0 | 1 | 1 | 2 | 1 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 2 | 18 |
| <i>Biotechnology/Pharmaceutics</i> | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 5 |
| Total | 8 | 1 | 2 | 4 | 2 | 9 | 1 | 5 | 4 | 1 | 3 | 9 | 2 | 3 | 3 | 4 | 61^a |

Legend:

^a Total is equal to 61, since 6 firms have received support under two laws and 1 firm has utilised three laws.

Table VIII. Distribution of laws across geographic location of supported NTBFs.

| Number of law | North West | North East | Centre | South |
|----------------------|-------------------|-------------------|---------------|--------------|
| 46/82 | 6 | 2 | 0 | 0 |
| 26/86 | 0 | 1 | 0 | 0 |
| 44/86 | 0 | 0 | 0 | 2 |
| 64/86 | 0 | 0 | 0 | 4 |
| 317/91 | 0 | 1 | 0 | 1 |
| 488/92 | 1 | 0 | 0 | 8 |
| 17/93 | 0 | 1 | 0 | 0 |
| 236/93 | 1 | 1 | 1 | 2 |
| 451/94 | 3 | 0 | 0 | 1 |
| 95/95 | 0 | 1 | 0 | 0 |
| 341/95 | 0 | 0 | 1 | 2 |
| 140/97 | 8 | 1 | 0 | 0 |
| 196/97 | 0 | 0 | 1 | 1 |
| 266/97 | 1 | 1 | 0 | 1 |
| 449/97 | 1 | 1 | 0 | 1 |
| 388/00 | 2 | 0 | 0 | 2 |
| Total | 23 | 10 | 3 | 25 |

Table IX. Description of variables used in the Weibull survival regression.

| Dependent Variable | Description |
|---------------------------|---|
| <i>Logduration</i> | Logarithm of the lifetime between year of firm's foundation and year on which the firm received the subsidy |
| Independent Variables | Description |
| <i>Education</i> | Average number of years of founders' education |
| <i>Specworkexp</i> | Average number of years of working experience gained by founders in the same sector of the start-up before firm's foundation |
| <i>Genworkexp</i> | Average number of years of working experience gained by founders in other sectors than the one of the start-up before firm's foundation |
| <i>DManager</i> | One for firms with one or more founders with a prior management position |
| <i>DEntrepreneur</i> | One for firms with one or more founders with a previous self-employment experience |
| <i>Academic spin-off</i> | One for firms with one or more founders characterised by an academic working background |
| <i>DMother company</i> | One for firms that at start-up time, received some kind of aid by a "mother" company |
| <i>DIncubated</i> | One for firms located in a technology incubator |
| <i>EU projects</i> | Number of EU research projects joined by a firm |
| <i>Size</i> | Start-up size of the firm (including founders) |
| <i>Laws</i> | Number of laws potentially available to firms |
| <i>Infrastructure</i> | Value of the index measuring regional infrastructures in 1992 (mean value among Italian regions=100) |
| <i>Centre</i> | One for firms located in the Centre of Italy |
| <i>North East</i> | One for firms located in the North East of Italy |
| <i>North West</i> | One for firms located in the North West of Italy |
| <i>Internet</i> | One for firms operating in Internet and TLC services |
| <i>Multimedia content</i> | One for firms operating in the multimedia content sector |
| <i>Software</i> | One for firms operating in the software sector |

Table X. Results of the Weibull survival regression.

| | <i>Coeff.</i> | <i>Std.Err.</i> | <i>t-ratio</i> | <i>P-value</i> |
|---------------------------|---------------|-----------------|----------------|----------------|
| <i>Costant</i> | 4.415 | 0.950 | 4.649 | 0.000 |
| <i>Education</i> | -0.081 | 0.038 | -2.110 | 0.035 |
| <i>Specworkexp</i> | 0.016 | 0.025 | 0.627 | 0.531 |
| <i>Genworkexp</i> | 0.003 | 0.014 | 0.206 | 0.837 |
| <i>DManager</i> | 0.096 | 0.212 | 0.451 | 0.652 |
| <i>DEntrepreneur</i> | -0.245 | 0.186 | -1.314 | 0.189 |
| <i>Academic spin-off</i> | -0.332 | 0.372 | -0.892 | 0.372 |
| <i>DMother company</i> | -0.884 | 0.370 | -2.390 | 0.017 |
| <i>DIncubated</i> | -0.411 | 0.236 | -1.743 | 0.081 |
| <i>EU projects</i> | -0.502 | 0.228 | -2.199 | 0.028 |
| <i>Size</i> | -0.002 | 0.005 | -0.439 | 0.661 |
| <i>Laws</i> | -0.071 | 0.037 | -1.939 | 0.053 |
| <i>Infrastructure</i> | 0.005 | 0.005 | 0.881 | 0.378 |
| <i>Centre</i> | 1.156 | 0.563 | 2.056 | 0.040 |
| <i>North East</i> | 0.716 | 0.437 | 1.639 | 0.101 |
| <i>North West</i> | 0.763 | 0.430 | 1.775 | 0.076 |
| <i>Internet</i> | 0.417 | 0.351 | 1.187 | 0.235 |
| <i>Multimedia content</i> | 0.231 | 0.352 | 0.656 | 0.512 |
| <i>Software</i> | 0.150 | 0.255 | 0.587 | 0.557 |

Legend: number of observations is 2022 (243 firms); Log-likelihood function: -215.419; estimate of α : 1.743 (0.289).