

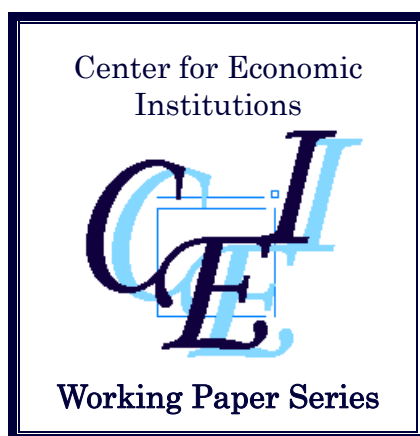
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*"When Things Get Tough Do the Tough Get
Going? Founders' Pre-entry Work Experience
and High-tech Start-up Survival during an
Industry Crisis"*

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When things get tough do the tough get going? Founders' pre-entry work experience and high-tech start-up survival during an industry crisis

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Abstract

This article adds new insights into the relationship between founders' human capital and the survival prospects of start-up businesses. The impact of founders' human capital on firm survival is controversial. On one hand, more experienced and skilled individuals are likely to create start-up businesses with a high chance of survival; on the other hand, their opportunity costs to run the firm may be high given the potential returns for investing their efforts in alternative employment opportunities. Analysing a sample of 179 Italian start-up companies created during 1995-early 2000 and operating in ICT services markets, this study provides evidence that, in intense industry crises (early 2000-2003), highly work experienced entrepreneurs may pursue an exit strategy and highlights the importance of distinguishing between different types of work experience and different exit routes. In particular, founding teams with highly *specific* work experience show higher probability of following the M&A route, while a higher level of *generic* work experience is more conducive to closure.

Keywords: High-tech entrepreneurship; Start-up exit; Founders' human capital; ICT

JEL classifications: L26; L86

Introduction

In the wide-ranging literature on the determinants of firm survival (see, e.g., Caves 1998 for a survey on main findings), the relationship between founders' human capital and survival prospects of young firms has not attracted a great deal of attention. In theoretical terms, the impact of founder human capital on firm survival is controversial. On one hand, more experienced and skilled individuals are more likely to create start-up companies with a high chance of survival; on the other hand, their opportunity costs to run the firm may be high given the potential returns for investing their efforts in alternative employment opportunities. Furthermore, highly skilled entrepreneurs may prefer to specialize in the entrepreneurial function, thus being more likely than untalented entrepreneurs to develop businesses of high quality and more likely to transfer them through sale or merger operations (see, e.g., Holmes and Schmitz 1990, 1995). The relationship between founders' human capital and young firm survival may also be influenced and moderated by several factors: the specific characteristics of the human capital considered, the type of exit, the specific time

period, firm age range, and the industrial sector under scrutiny. From an empirical point of view (see, e.g., Delmar and Shane 2006 for a survey), the general contention is that founders' human capital positively affects firm survival prospects (Delmar and Shane 2006; Santarelli and Vivarelli 2007), but in fact the available evidence is far from being conclusive. The first large-scale empirical study on the topic was reported by Bates (1990). His analysis of young business longevity for a sample of U.S. single-founded firms revealed that entrepreneur education was a major determinant of firm survival, but that managerial competencies did not exert any significant role. Since then a number of econometric analyses have tried to document a positive relationship between various measures of founders' human capital and survival, with heterogeneous results. Considering only the most prominent works, many studies found a significant positive impact on firm survival for only some of several measures of owners' human capital investigated (Brüderl et al. 1992; Cooper et al. 1994; Gimeno et al. 1997; Pennings et al. 1998; Taylor 1999; Van Praag 2003; Åstebro and Bernhardt 2003; Thompson 2005; Delmar and Shane 2006), while others did not document any significant effect at all or highlighted the presence of a negative relationship (Bates 1989; Nafziger and Terrel 1996; Cressy 1996; Storey and Wynarczyk 1996; Shane and Stuart 2002).

As suggested by Gimeno et al. (1997, p. 756) "there may be situations in which entrepreneurs do not continue their business even though, in terms of economic performance, they are better off than other entrepreneurs. They may take this action because of the opportunity costs associated with staying in business – their level of education and training may warrant more attractive economic returns in alternative employment opportunities. Similarly, a poorly performing venture may continue because of the entrepreneur's lack of other attractive options, strong physical attachment to the new venture, or high costs associated with switching into new employment." Quoting also McGrath (1999, p. 14): "an entrepreneur might disband an economically profitable business if other activities appear more lucrative or interesting". More recently, Bates (2005) pointed out that closure may not be regarded as synonymous with failure, highlighting that more educated and skilled owners may decide to discontinue operations of enterprises that are still successful because something more attractive has come along (in the same vein see also Watson and Everett 1993, 1996; Headd 2003, DeTienne et al. 2008). In other words, high-profile human capital characteristics may raise the opportunity costs of running the firm, as the entrepreneur may receive higher returns from switching to alternative occupations.

This work is much in the spirit of Gimeno et al. (1997) and the reasoning of Bates (2005). Considering the exit behaviour during the telecom and dot.com bust from early 2000 to 2003 for a sample of Italian ICT start-up companies created during the boom period of 1995 to early 2000,¹ this empirical analysis suggests that founders' pre-entry professional experience may negatively

affect firm survival during a severe industry recession. Moreover, it shows that the exit route chosen may depend on the nature of the work experience of entrepreneurs. In particular, over the “tough time” of early 2000 to 2003, ICT entrepreneurs with a high level of specific work experience (i.e., gained in the same sector as the start-up company) have more intensively pursued an “exit strategy” through the merger and acquisition (M&A) channel, while founding teams with a high level of generic work experience (i.e., gained in other sectors) have been more likely to close down their start-up firm.²

In so doing, the paper adds to the extant literature on young firm dynamics in different respects. First, it highlights that founders’ human capital affects new venture survival prospects, but not necessarily in a positive way. During a very intense industry-specific negative shock, a high level of human capital and the associated level of outside options may represent a life line for entrepreneurs aiming at escaping the industry crisis effects. Second, it stresses the importance when it comes to explain firm survival through founders’ human capital of discriminating both between different typology of competencies possessed by entrepreneurs and between different exit routes. As to this latter aspect, the results of this study suggest that considering plain survival as a measure of performance may be somehow misleading for what concerns young firms operating in technologically intensive industries and turbulent markets.

Theoretical hypotheses

Founders’ human capital is a primary asset for new firms (Chandler and Hanks 1994; Peteraf and Shanley 1997; Reuber and Fischer 1999; van Praag 2003), in particular for high-technology start-ups (Cooper and Bruno 1997; Feeser and Willard 1990).³ Valuable business projects are introduced into markets by more competent entrepreneurs and in general founders’ human capital strongly and positively affects the performance of young firms. In this context, especially for high-technology sectors, the distinction between specific and generic founders’ human capital is highly relevant. In fact, what really seems to matter in shaping the prospects and performance of start-up firms in high-technology sectors is the specific rather than the generic component of human capital (Feeser and Willard 1990; Colombo et al. 2004; Colombo and Grilli 2005, 2008). However, if the relatively superior contribution of specific compared to generic human capital is expected to hold regardless of the industry conditions under which young firms operate, it is clear that the overall scenario influences absolute performance. Young and small firms are generally more exposed to the effects of industry crises. Allegedly they are more likely to be forced or willing to look for a way to overcome a sector-specific recession.

A heuristic model of the relationships between founders' pre-entry work experience and firm exit routes during an intense industry-specific negative shock is conceptualised in Figure 1. The focus is on previous entrepreneurial work experience, which is one of the most relevant of founders' human capital characteristics in shaping the actual viability and future prospects of business projects in high-technology markets.

Two main characteristics affect the relationship between entrepreneurial pre-entry work experience and firm exit decisions during industry recession: the level of personal outside options available to entrepreneurs to escape the industry crisis and the economic value of the ICT business project implemented on start-up. For the former, a large body of literature on the employee turnover process (see, e.g., Griffeth and Hom 1995 for a survey) provides evidence that human capital increases the range of personal options available to an individual and raises the opportunity cost of her time. In our context, this implies that, everything else being equal, highly experienced entrepreneurs might be more willing to search for alternatives and be more likely to succeed in their search. Clearly, the specific negative ICT market conditions considered here and the focus on young start-ups strengthen this possibility. Especially in firm infancy stages, when entrepreneurs have not developed any strong psychological commitment to the firm, an "alternative reason" for firm exit (see Maertz and Campion 2004; DeTienne 2008) may be particularly relevant during an industry-specific recession.

The idea that, all else being equal, entrepreneurs with a high level of work experience gained in the same industry (i.e., *specific work experience*) are more likely to base their entrepreneurial ventures on innovative and profitable business ideas is well established (see, e.g., Venkataraman 1997; von Hippel 1988; Klepper 2001; Shane 2003). Shane (2000), using eight case studies of ventures exploiting a single MIT invention (three-dimensional printing), demonstrates that specific industry, business and market experience are all fundamental drivers of entrepreneurial discovery and exploitation of opportunities. Shepherd and DeTienne (2005), using a sample of MBA students, report that previous detailed knowledge of customer problems leads to an increase in the identification of the number and innovativeness of business opportunities. Marvel and Lumpkin (2007), analysing a sample of 145 technology entrepreneurs operating within US university-affiliated incubators, show that specific and extensive knowledge of the technology at the heart of the business is a major determinant of the introduction of more radical innovations into markets. Quite reasonably, founders with a high level of specific work experience usually also achieve better performance than other entrepreneurs. Brüderl et al. (1992) document a significantly lower failure rate for Bavarian new firms if the founders have business experience in the same sector. Cooper et al. (1994) find that industry-specific know-how contributes to both the survival and growth of their

sample firms. Siegel et al. (1993) show that in a sample of approximately 1600 Pennsylvania start-ups, the fact that the entrepreneurial team had prior experience in the same industry of the new firm was the only discriminating factor between high- and low-growth firms. Similarly, Gimeno et al. (1997) highlight a strong positive association between the post-entry performance of new firms and an index capturing the similarity of customers, suppliers, and products/services between the new firm and the organisation in which entrepreneurs were previously employed. Chandler and Jensen (1992) also find that similarity between the business of the new firm and that of the incubating organisation has a positive impact on growth. Cooper and Bruno (1977) consider young high-technology firms located on the San Francisco Peninsula in the 1970s. They show that high-growth firms were more likely than exit firms to have been founded by individuals from incubating organisations that operated in the same industry as the new firm. Similarly, Feeser and Willard (1990), comparing 39 high-growth computer producers with a matching set of low-growth firms, show that the former are more likely than the latter to have products, markets and technologies closely related to those of their founders' incubating organisation. Finally, analysis by Colombo and Grilli (2005, 2008) of a sample of Italian new technology-based firms reveals that years of specific work experience of the founders is an important predictor of firm growth.

During a very intense recession, such as the one experienced by the ICT sector in the time-frame considered here, the “capability” effect of specific pre-entry work experience, with a positive effect on a firm's likelihood of survival, may be completely offset by an “alternative reason” for exit.⁴ If this is the case, since highly specific experienced entrepreneurs are more likely to have based their start-ups on a valuable business project, they are also more likely than other type of entrepreneurs to alleviate industry crisis effects by finding some possible acquirers for their firm or other partners to merge with.

In contrast, there is no evidence in the literature that work experience gained in different sectors from the start-up (i.e., *generic work experience*) is conducive to the discovery and exploitation of promising business opportunities in high-technology sectors.⁵ It is generally found that generic work experience does not lead to superior firm performance (see, e.g., Bruderl and Preisendörfer 2000; Colombo and Grilli 2005, 2008). However, *ceteris paribus*, in the same vein as for the specific component, generic experience is associated with a high level of personal outside options for the entrepreneur. Hence, generic work experience is not necessarily associated with viable and profitable business projects, but it does increase the opportunity cost for the entrepreneur to run the start-up instead of following alternative options. Therefore, low economic value of the new start-up combined with high opportunity costs to keep the business running during recession might force entrepreneurs with a high level of generic experience to close their business because of

an inability to find acquirers or partners; such an exit would allow them to use their time in more profitable activities.

The above arguments lead to the formulation of the following initial hypothesis:

Hypothesis H₁. During an intense industry-specific recession, founders' years of prior work experience may positively influence start-up exit.

Conditional upon acceptance of *H₁*, the following two other hypotheses on the relationship between founders' pre-entry work experience and the modes of firm exit are formulated:

Hypothesis H_{2a}. Founders' years of prior work experience in the same industry of the new firm are more positively associated with start-up exit via M&A.

Hypothesis H_{2b}. Founders' years of prior work experience in another industry of the new firm are more positively associated with start-up exit via closure of operations.

Empirical methodology

Data

We consider a sample of 179 Italian ICT start-up companies that operate in service industries: multimedia content, software, Internet services (e-commerce, ISP, web-related services), and telecommunication services. Sample firms were established between 1995 and the first quarter of 2000 and were independent at start-up time (i.e., they were not controlled by another business organisation). The sample of ICT start-up firms was extracted from the RITA (Research on Entrepreneurship in Advanced Technologies) database developed at Politecnico di Milano.⁶ The primary source of information from which RITA data were collected consists of a series of national surveys administered in the first semesters of the years 2000, 2002 and 2004. Data on sample firms come from the first round. The survey was based on a questionnaire that was sent to the contact person in the target firms (i.e., one of the owner-managers) either by fax or by e-mail. The first section of the questionnaire provides detailed information on the human capital characteristics of the firm's founders. The second section comprises further questions concerning the characteristics of the firm, including the year of foundation and the dynamics in the number of employees. Answers to the questionnaire were checked for internal coherence by trained personnel and were compared with information published in annual reports (as in the case of number of employees) and in the press. In several cases, phone or face-to-face follow-up interviews were conducted with owner-managers to obtaining missing data and ensure that data were reliable. The eventual survival

or exit from markets of sample firms between the second quarter of 2000 and 2003 was gathered in the second and third questionnaire rounds in 2002 and 2004. We collected information on sample firms being acquired or merged with other firms directly from the survey respondents. Data on firm closure and M&As for non-respondents were obtained from official documentation provided by the Union of Italian Chambers of Commerce.⁷ Of the 179 sample firms, 55 (30.7%) did not survive over the period from early 2000 to 2003: 29 (16.2%) closed down operations and 26 (14.5%) were acquired by or (much more rarely) merged with other firms.⁸ As to the 124 surviving firms (69.3%), information is available on whether ICT service start-ups experienced some changes in the composition of the entrepreneurial team during their lives (i.e., the leave of some founders and/or the addition of new owner-managers). Information on the relationship between founders' pre-entry work experience and stability of the founding team along time will be exploited in the "Discussion" section in order to further validate the results of the survival analysis presented in this section.

Finally, a caveat is in order on the use of the retrospective design here employed (similarly to Brüderl and Schussler 1990; Gimeno et al. 1997; Taylor 1999; Shane and Stuart 2002): lack of information on ICT services firms that were born and exited markets during the boom period limits our aim at investigating the determinants of ICT services firm exit under an industry recession (early 2000-2003) conditional upon survival in the boom period (1995-early 2000).

Specification of the econometric analysis

First, a probit model was estimated to investigate the relationship between variables of founder human capital and the probability of firm exit over the turmoil period from early 2000 to 2003. Then a bivariate probit model was used to distinguish the effects of human capital variables on the probability of closure and of being merged or acquired, allowing for correction terms to be interrelated. Since correlation was weak (i.e., the correlation parameter ρ between the error terms of the two equations was not statistically significant), two separate probit models were also estimated, one for closure and the other for M&A. Finally, as a robustness check, a multinomial probit was estimated with the dependent variable that takes a value of 1 for closure and 2 for M&A. Definitions of the dependent and explanatory variables and some descriptive statistics are reported in Table 1. Table 2 highlights the correlation matrix between the explanatory variables. Variables of founder human capital include: the size of the founding team (*Founders*); educational attainment (*Education*), measured by the mean number of years of education of founders; pre-entry work experience gained in the same industry as the start-up company (*Specific work experience*), and in different sectors (*Generic work experience*), both measured by the mean number of years of professional experience of founders before firm foundation;⁹ and managerial experience

(*Managerial experience*), which is a dummy variable capturing the presence within the founding team of one or more founders with a prior management position in a company. Strictly following the empirical literature on firm survival, models also include the following control variables: size measured in terms of logarithm of employees at the end of 1999 (*Size*),¹⁰ age of the firm (*Age*) and access to external sources of financing at start-up time (*Bank debt*). Finally, an industry dummy variable (*Internet*) differentiates start-up companies active in Internet services (e-commerce, ISP, web-related services) from the others.

Results

Results are reported in Table 3. *Size* and *Education* show highly non-significant coefficients, while *Managerial experience* exerts a significant negative impact (90% level) on the probability of exit. More interestingly, founders' pre-entry work experience exerts a significant positive effect on the probability of exit, confirming hypothesis H_1 : both *Specific work experience* and *Generic work experience* have a significant positive coefficient (at 95% and 90%, respectively). Further insights into the impact of previous work experience on firm exit are gained by distinguishing closure from M&A. The bivariate probit model specifies two different equations for the two exit routes. Its estimation highlights a negative, albeit non-significant, ρ coefficient, suggesting a weak negative correlation between the error terms of the two equations. Without any remarkable loss of efficiency, two separate probit models were therefore estimated. Overall, *Specific work experience* has a positive impact on the probability of ICT services firms being merged or acquired (at 90% and 95% in the bivariate and univariate probit models, respectively), but has no influence on the probability of closure. The opposite applies to *Generic work experience*, which has a significant positive impact on the probability of closure in both the bivariate (at 95%) and univariate probit (at 90%) models, but no significant coefficients for the M&A route.¹¹ Thus, both hypotheses H_{2a} and H_{2b} turn out to be confirmed. Based on the estimates of the closure probit equation, considering a three years-old Internet company established by two individuals having minimum values of pre-entry work experience (equal to null), with all other variables at their mean value (median value for dummies), the probability of firm closure is 17.3%. The percentage almost doubles to 34.3%, for the same firm having the value of the variable *Generic work experience* at its 90th percentile (equal to 18). Analogously, based on the estimates of the M&A probit equation, considering the same firm as before, the probability of M&A is 15.0%. The probability raises to 34.2% for an increase of the variable *Specific work experience* at its 90th percentile (equal to 14).

For the other variables of human capital, no significant patterns are apparent, except for the number of founders, which shows a weak negative influence exclusively on firm closure.

Managerial experience, which has a significant negative impact on the probability of exit, loses this significance when the type of exit is specified. For the control variables, *Bank debt* exhibits significant negative correlation (95% level) on firm exit, while *Age* and *Size* are highly non-significant. Again, further insights can be gained by distinguishing closure from M&A. In fact, while the impact of firm age continues to be non-significant,¹² the effect of *Size* on the probability of closure is significantly negative (90% level), while it is significantly positive (95% level) on M&A in both the bivariate and univariate probit specifications. This result confirms the highly different nature of exit via closure compared to M&A and suggests how sale to or the merger with other firms may represent a rather successful exit strategy for a high-tech start-up firm. The coefficient for *Bank debt* loses its significance for closure in the M&A equation, although it retains a negative sign.¹³ Being a dot.com firm positively affects the probability of exit via both closure and M&A.

Finally, the estimation results for the multinomial probit model are very similar to the findings highlighted above, speaking in favour of the estimates robustness. In terms of pre-entry work experience, the *Generic* variable impacts closure but not M&A, and the opposite is observed for the *Specific* variable.

Discussion

Specific vs. generic work experience

When things get tough do the tough get going? This empirical analysis based on a sample of Italian ICT start-up companies and their survival behaviour over the industry bust from early 2000 to 2003 suggests a negative answer. Why can this happen? The reason can be found by considering the two opposite forces that model the relationship between founders' human capital and firm survival (Gimeno et al. 1997). On the one hand, founders' knowledge is the primary asset for start-ups (Chandler and Hanks 1994; Peteraf and Shanley 1997; Reuber and Fischer 1999; van Praag 2003) and a high level of founders' human capital is likely to lead to a better firm, especially in high-tech industries (Cooper and Bruno 1997; Feeser and Willard 1990; Colombo and Grilli 2005). *Ceteris paribus*, this clearly implies a positive effect on a firm's likelihood of survival. On the other hand, a high level of founder human capital raises the opportunity cost of running the firm instead of taking alternative employment options. When a very dramatic and specific industry crisis arises and the overall industry performance declines, the latter effect may well dominate the former. However, the nature of the pre-entry work experience possessed by the founding team may shape which exit route is effectively available. Entrepreneurs characterised by a high level of generic work experience may be forced to close down operations because they cannot find acquirers or

other firms to merge with. They have entered unknown markets in a boom period, possibly with expectations that are too optimistic or unprofitable business projects, and when “things get tough” they may revise downward their expectations (Jovanovic 1982, Ericson and Pakes 1995), finding convenient to switch to alternative occupations and giving up their business activity. Entrepreneurs characterised by a high level of specific work experience are more likely to have based their entrepreneurial activity on a valuable business project (especially in high-tech sectors: e.g., Cooper and Bruno 1977; Cooper et al. 1994; Klepper 2001; Colombo and Grilli 2005). Accordingly, when “things get tough”, if they want to seize alternative options and possibly switch employment status, they will have more opportunities to find possible acquirers and other firms to merge with. Moreover, partners or acquirers may have the opportunity to exploit their level of specific pre-entry work experience if they are willing to continue working within the start-up firm.¹⁴ Thus, in severe industry crises, founders characterised by low levels of both generic and specific work experience may be the most likely to resist in markets simply because they do not have any other options than keeping their businesses running. In this respect, these findings echo those of other studies that show how individuals facing low opportunity costs are more likely to become entrepreneurs (Amit et al. 1995) and to remain in business by their own (Gimeno et al. 1997).

Founding team stability

In order to further validate the possible relevance of “adverse selection” phenomena among ICT services entrepreneurs during the industry crisis, an analysis on founding team stability along time of the surviving sub-sample was run. Out of the 124 surviving firms, 72 were the firms at 2003 which did not experience any changes in the entrepreneurial team from the original founders (58.1%). A probit model was estimated in order to relate stability of the founding team to founders’ pre-entry specific and generic work experience. The model included as controls all the other independent variables listed in Table 1. Results exposed in Table 4 highlight a negative relationship both of *Specific work experience* and *Generic work experience* with respect to the stability of the founding team (albeit only the latter one is statistically significant), with a joint significance of 90% (Wald test: $\chi^2(2)=4.78$). In other words, founding teams characterised by a high level of pre-entry work experience are more likely to be subjected to some changes, while less experienced founding teams are relatively more stable. In the same vein, also *Education* shows a negative and statistically significant coefficient (95% level). Quite reasonably, the age of the firm shows a negative and statistically significant coefficient (90% level) while *Size* exerts a positive albeit statistically weak impact on founding team stability. Finally, the variable *Founders* turns out to be negative although not statistically significant. In accordance also with the qualitative evidence we collected, this

suggests that most changes consist in one founder leaving the team, an event which is more likely the larger the team. Additions of new owner-managers had appeared to be infrequent during ICT services industry recession.

Conclusions

The relationship between founders' human capital and firm survival rates is complex and multifaceted. This empirical analysis is based on a sample of Italian start-up companies created during the telecom boom from 1995 to early 2000 and operating in ICT services markets. Their exit behaviour is observed during the telecom bust from early 2000 to 2003. The analysis highlights that during an intense industry-specific recession, skilled and experienced entrepreneurs may pursue an exit strategy. In particular, founding teams with high levels of specific work experience show a higher probability of following the M&A route, while a higher level of generic work experience is associated with the closure option. Less experienced entrepreneurs may survive in markets simply because they do not have any other more profitable alternative.

In the author's view, these results are interesting as they extend our understanding of the link between founders' human capital and young high-tech firm survival and they also reveal some promising directions for future research. First, firm exit through closure may well differ from the M&A route (Gimeno et al. 1997). This distinction is most likely to be relevant in young high-tech industries such as ICT services, and has hardly been made in existing empirical work on the topic. More generally, founders' human capital's impact on firm exit is likely to change according to specific measures of entrepreneurs' experience and modes of exit considered (for analogous conclusions see DeTienne and Cardon 2006). Second, the merely formal continuance of operations may be a poor proxy of young firm performance. Accordingly, generalisation of results about the impact of founders' human capital on the survival prospects of young firms may be very risky, since findings can be very sensitive to a number of factors, such as measures of human capital, and industry-, time-, macroeconomic-specific conditions on which empirical analyses are based. Finally, anecdotal evidence indicating that talented ICT entrepreneurs aim at establishing viable start-ups, sell them and then do something else is in line with the results of this study. In this context, one interesting advance would be a more in-depth analysis of the career paths of founders after exit: whether they turn to labour market or continue the self-employment experience and how this choice is modelled by the different nature of their competencies and the different exit routes previously followed. A second significant research progress would be a detailed investigation on entrepreneurs' motivations to pursue the M&A route. In principle, two different stories may apply to the "M&A exit strategy" of high-skilled entrepreneurs in "tough times": one on which they

leave any involvement in the acquired/merged firm and the other one where they continue to have an operative and/or a managerial role in the new organization. Discriminating between the two is a rather unexplored but extremely interesting issue for the entrepreneurship and managerial research fields since the implications in terms of survival chances of the original business idea may well differ under these two opposite scenarios.

NOTES

¹ For an analogous periodisation (and description) of the telecom boom and bust, see Fransman (2004).

² The term “closure” here used includes voluntary closure, liquidation and bankruptcy; while merger and acquisition (M&A) refers exclusively to a firm being acquired or merged with other firms. In this latter category, we also include those start-ups that continue operations as separate entities but have lost their independence (i.e., became controlled by other business organizations). The distinction between generic and specific human capital is originally due to Becker (1975). As concerns work experience, see Colombo et al. (2004), Colombo and Grilli (2005) and (2008) for the same operationalization of the two components as the one used here. See Marvel and Lumpkin (2007) for a slightly different empirical application in another context (i.e., “innovation radicalness”).

³ “For a new, high-technology firm, the primary assets are the knowledge and skills of the founders. Any competitive advantage the new firm achieves is likely to be based upon what the founders can do better than others” (Cooper and Bruno 1977, p. 21; see also Feeser and Willard 1990, p. 88).

⁴ Incidentally, note that besides a “capability” effect, a “wealth” effect may also be relevant. In fact, previous studies have shown a positive relationship between human capital and the wealth of individuals (Xu 1998; Åstebro and Bernhardt 2005). It is generally thought that young high-technology firms established by wealthier individuals are less affected by financial constraints because greater personal capital is available to finance operations and avoid involuntary exit. See Carpenter and Petersen (2002) for an analysis of capital market imperfections affecting high-technology start-ups and Colombo and Grilli (2007) for evidence regarding the Italian context.

⁵ The study by Marvel and Lumpkin (2007) constitutes a partial exception insofar as it demonstrates that general human capital may lead entrepreneurs to introduce more radical innovations into markets. Unfortunately, the authors do not investigate the profitability of these innovations.

⁶ The RITA database represents the most complete database nowadays available on Italian new technology-based firms (NTBFs) collecting information on a population of 1974 NTBFs. See Colombo et al. (2004) and Colombo and Grilli (2005) for a detailed description of the database and the procedure used to gather data. As to sample representativeness, χ^2 tests show that there are no statistically significant differences between the distributions of sample firms across ICT services sectors and regions and the corresponding distribution of the RITA population of 793 ICT services start-ups from which the sample was obtained.

⁷ The institution registers all business activities on the basis of fiscal codes and provides (upon payment request) eventual exit information on firms along time. Note also that reliability of data on firm exit was checked by inspecting (when available) firms’ websites.

⁸ Note that among sample firms only two went through an initial public offering (IPO) during the observation period. One after being already acquired by another firm and the other before acquisition. The exclusion of this latter from the analysis does not alter in any sensible way the results.

⁹ As customary in empirical studies on the impact of human capital on firm performances (see, e.g., Colombo and Grilli 2005, 2008), education and pre-entry work experience variables are introduced into models as “averages” instead of “total sums” across founders. This specification, which also includes the number of founders as an independent variable, allows to disentangle the truly qualitative effect of human capital covariates from merely quantitative aspects. However note that replacing “average” education and work experience variables with the corresponding sums of the years of education and work experience of founders brings very similar results to those exposed in the next paragraph (results are available upon request from the author).

¹⁰ Employment is commonly used as proxy for firm size in firm survival studies (see, e.g., Mata et al. 1995; Audretsch et al. 1999; Esteve-Perez et al. 2004; Dunne et al. 2005; Esteve-Perez and Manez-Castillejo 2006; Strotmann 2007). Different measures such as total assets (e.g., Agarwal and Audretsch 2001) or physical output (e.g., Thompson 2005) are less frequent. Note that the use of total amount of capital at foundation as an alternative measure of firm size brings very similar results (available upon request from the author) to those presented in the next paragraph.

¹¹ Model specifications including quadratic and interactive terms for founders' pre-entry generic and specific work experience were also employed. Results highlight the absence of any statistically significant non linear and super-additive effect on the probability of firm exit both via closure and M&A. Tests for the presence of concave or convex relationships between age and size, from one side, and the probability of exit (again for both exit modes) from the other one, were also run. Again these quadratic terms turn out to be always statistically insignificant. Finally, note that we also check if results on the impact of pre-entry work experience on firm exit were simply driven by the old age of some founders willing to retire. As to this aspect, entrepreneurs are on average young (the mean age of the founding teams is 34.7 years old), and the exclusion from the analysis of the two sample firms with a relatively "old founding team" (aged on average over 57 years), leaves all the findings here presented almost unchanged. All results are available upon request from the author.

¹² For a non-significant coefficient for the age variable once firm size and pre-entry work experience are taken into consideration, see also Thompson (2005). Also consider that all sample firms are less than five years old so they all potentially suffer from a "liability of newness" effect (Stinchcombe 1965).

¹³ For a positive relationship between having a bank loan at start-up time and the survival chances of new small businesses, see also Åstebro and Bernhardt (2003). In this respect, having a bank loan would reveal a greater commitment by entrepreneurs in running the new venture and a consequent superior reluctance of their firms to exit markets.

¹⁴ Note however that our analytical framework does not enable us to disentangle who is better off between the two types of individuals after firm exit. From one side, highly specific experienced entrepreneurs may gain financial returns by selling their start-up. On the other side, highly generic experienced entrepreneurs have more possibilities to invest their effort in activities outside the industry under crisis and consequently they might end up at least in the short term with a relatively higher income.

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Tables and Figures

Table 1 – Definition of dependent and explanatory variables

<i>Dependent variables</i>	<i>Description</i>	<i>Mean</i>	<i>S.D.</i>
<i>Exit</i>	Value of 1 for firms that did not survive between early 2000 and 2003	0.307	0.467
<i>Closure</i>	Value of 1 for firms that discontinued operations between early 2000 and 2003	0.162	0.369
<i>M&A</i>	Value of 1 for firms that have been acquired by or merged with other firms between early 2000 and 2003	0.145	0.353
<i>Explanatory variables</i>	<i>Description</i>	<i>Mean</i>	<i>S.D.</i>
<i>Founders</i>	Number of founders	2.888	1.741
<i>Education</i>	Average number of years of education of founders	15.096	2.386
<i>Specific work experience</i>	Average number of years of work experience of founders in the same sector of the start-up before firm's foundation	3.754	6.742
<i>Generic work experience</i>	Average number of years of work experience of founders in sectors other than that of the start-up before firm's foundation	7.855	7.784
<i>Managerial experience</i>	Value of 1 for firms with one or more founders with a prior management position in a company	0.257	0.438
<i>Size</i>	Logarithm of number of employees at the end of 1999	1.386	1.050
<i>Bank debt</i>	Value of 1 for firms which have obtained a bank debt at firm's foundation	0.162	0.369
<i>Age</i>	Number of years from 2000 to firm's foundation	3.201	1.552
<i>Internet</i>	Value of 1 for firms operating in Internet services (e-commerce, ISP, web-related services)	0.687	0.465

Legend. Number of observations is 179.

Table 2 – Correlation matrix of the explanatory variables of the econometric models

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>
<i>1. Founders</i>	1.000								
<i>2. Education</i>	0.023	1.000							
<i>3. Specific work experience</i>	-0.134	-0.005	1.000						
<i>4. Generic work experience</i>	-0.029	-0.063	-0.419	1.000					
<i>5. Managerial experience</i>	0.104	0.066	0.233	0.111	1.000				
<i>6. Size</i>	0.059	0.198	0.079	0.050	0.173	1.000			
<i>7. Bank debt</i>	-0.198	-0.040	0.090	-0.095	-0.119	-0.056	1.000		
<i>8. Age</i>	0.118	-0.098	-0.078	-0.123	-0.357	0.069	0.011	1.000	
<i>9. Internet</i>	-0.043	-0.096	-0.095	0.001	0.093	0.118	-0.030	-0.154	1.000

Legend. Number of observations is 179.

Table 3 – Determinants of firm exit via closure and M&A

<i>Model</i>	<i>Probit</i>	<i>Bivariate Probit</i>		<i>Probit</i>	<i>Probit</i>	<i>Multinomial Probit</i>	
<i>Dependent variable</i>	<i>Exit</i>	<i>Closure</i>	<i>M&A</i>	<i>Closure</i>	<i>M&A</i>	<i>Closure =1</i>	<i>M&A =2</i>
a_0 <i>Constant</i>	-1.580 (0.867)*	-0.596 (0.944)	-3.279 (0.957)***	-0.579 (0.973)	-3.441 (0.942)***	-1.304 (1.387)	-4.487 (1.334)***
a_1 <i>Founders</i>	-0.049 (0.081)	-0.203 (0.100)**	0.024 (0.083)	-0.166 (0.092)*	0.027 (0.084)	-0.212 (0.126)*	0.006 (0.122)
a_2 <i>Education</i>	0.022 (0.044)	-0.006 (0.046)	0.044 (0.046)	-0.011 (0.048)	0.056 (0.048)	0.002 (0.069)	0.081 (0.069)
a_3 <i>Specific work experience</i>	0.044 (0.018)**	0.019 (0.020)	0.044 (0.023)*	0.016 (0.021)	0.045 (0.020)**	0.045 (0.030)	0.075 (0.028)***
a_4 <i>Generic work experience</i>	0.029 (0.015)*	0.031 (0.016)**	0.010 (0.016)	0.030 (0.017)*	0.009 (0.018)	0.047 (0.024)*	0.030 (0.026)
a_5 <i>Management experience</i>	-0.466 (0.271)*	-0.087 (0.320)	-0.419 (0.351)	-0.132 (0.319)	-0.480 (0.351)	-0.376 (0.432)	-0.774 (0.481)
a_6 <i>Size</i>	0.068 (0.105)	-0.251 (0.130)*	0.274 (0.124)**	-0.217 (0.128)*	0.286 (0.127)**	-0.185 (0.175)	0.318 (0.175)*
a_7 <i>Bank debt</i>	-0.665 (0.311)**	-0.441 (0.365)	-0.566 (0.374)	-0.407 (0.361)	-0.635 (0.390)	-0.742 (0.498)	-1.060 (0.545)*
a_8 <i>Age</i>	-0.041 (0.078)	-0.093 (0.097)	0.094 (0.100)	-0.095 (0.094)	0.080 (0.092)	-0.117 (0.128)	0.058 (0.125)
a_9 <i>Internet</i>	0.973 (0.266)***	0.794 (0.319)**	0.855 (0.300)***	0.718 (0.306)**	0.873 (0.299)**	1.222 (0.425)***	1.442 (0.425)***
ρ	-	-0.990 (1.545)		-	-	-	
<i>Log-likelihood function</i>	-96.595	-125.039		-69.262	-62.458	-126.116	
<i>Wald test (χ^2)</i>	25.15 (9)***	122.92 (18)***		23.70 (9)***	29.59 (9)***	54.41 (18)***	
<i>Efron' pseudo R²</i>	0.16	-		0.13	0.16	-	

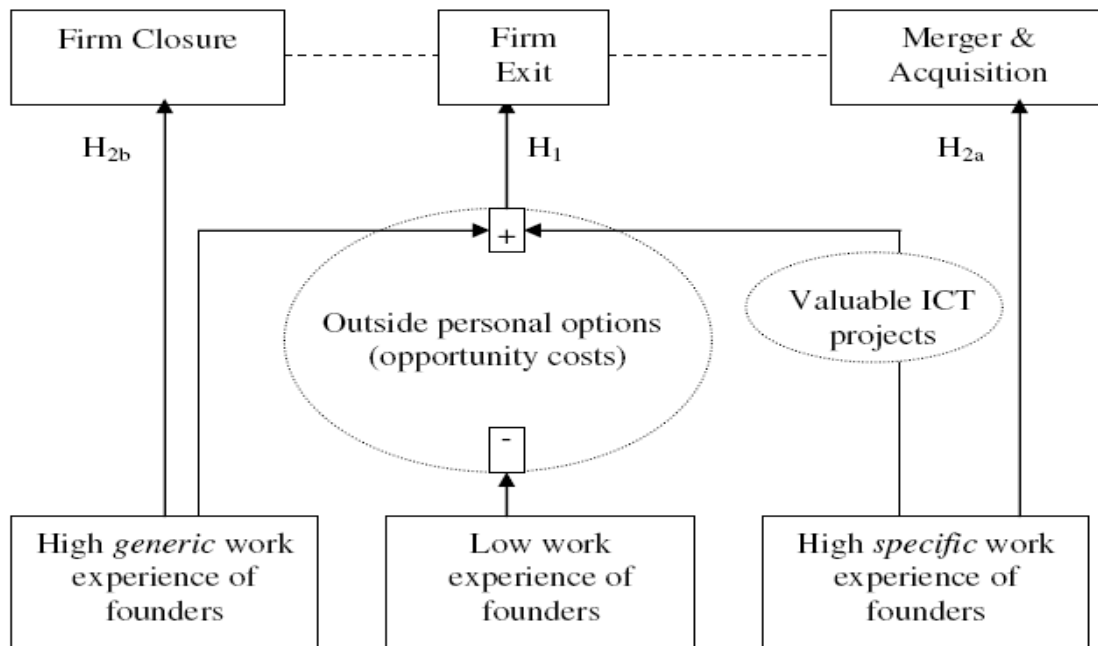
Legend. Significance levels: * >90%; ** >95%; *** >99%. Robust standard errors in parentheses. Number of observations is 179.

Table 4 – Founders’ pre-entry work experience and founding team stability

<i>Model</i>		<i>Probit</i>
<i>Dependent variable</i>		<i>No change in the founding team = 1</i>
a_0	<i>Constant</i>	2.900 (1.069)***
a_1	<i>Founders</i>	-0.074 (0.078)
a_2	<i>Education</i>	-0.106 (0.052)**
a_3	<i>Specific work experience</i>	-0.014 (0.025)
a_4	<i>Generic work experience</i>	-0.042 (0.020)**
a_5	<i>Management experience</i>	-0.090 (0.312)
a_6	<i>Size</i>	0.143 (0.134)
a_7	<i>Bank debt</i>	0.123 (0.303)
a_8	<i>Age</i>	-0.160 (0.091)*
a_9	<i>Internet</i>	-0.258 (0.265)
<i>Log-likelihood function</i>		-78.325
<i>Wald test (χ^2): $a_3 = a_4=0$</i>		4.78 (2)*
<i>Efron’ pseudo R^2</i>		0.10

Legend. Significance levels: * >90%; ** >95%; *** >99%. Robust standard errors in parentheses. Number of observations is 124.

Figure 1 – Founders’ pre-entry work experience and firm exit: a heuristic model



Legend: H_1 : During an intense industry-specific recession, founders’ years of prior work experience may positively influence start-up exit; H_{2a} : Founders’ years of prior work experience in the same industry of the new firm are more positively associated with start-up exit via M&A; H_{2b} : Founders’ years of prior work experience in another industry of the new firm are more positively associated with start-up exit via closure of operations.