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Abstract

This paper tests the presence of an 'entrepreneurial imprinting effect' of founders' human capital on entrepreneurial ventures' performance. More specifically, we empirically explore the impact of entrepreneurs' human capital on a firm's sales growth performance by disentangling the effect of the stock of human capital possessed at foundation from the potential injections and losses of human capital due to exit of founders and/or addition of new owner-managers in the entrepreneurial team over time. Our analysis is based on a panel dataset composed of 338 Italian new technology-based firms (NTBFs) observed from 1995 (or since their foundation) to 2008 (or until their exit from the dataset). We consider the effects of several dimensions of entrepreneurial human capital on firm sales growth and estimate Gibrat law-type dynamic panel data models using OLS estimator and GMM-system estimator to control for endogeneity. Overall, our results point to a positive and significant presence of an 'entrepreneurial imprinting effect' exerted by founders' specific work experience on venture growth which is robust to a series of controls.

JEL classification: L25, L26, O31

Keywords: Entrepreneurial ventures, imprinting effect, entrepreneurs' human capital, firm growth, new technology-based firms

Introduction

The idea that organisms in the early stages of their life are incredibly receptive and unconsciously learn from their environment is well accepted. As a consequence, these first experiences leave an imprint on the organism which has an enduring effect on its behavior. This 'imprinting effect' has been studied in a wide spectrum of scientific disciplines including ethology (e.g. from Spalding's and Heinroth's early studies that inspired Konrad Lorenz's research on graylag geese) to psychology (e.g. Sigmund Freud), evolutionary biology and epidemiology. It has also been studied in the field of organization science. Stinchcombe (1965) proposed the 'organization imprinting hypothesis', which states that the initial stages of development of human organizations play a major role in their subsequent progress through their influence on managerial structure and conduct, and their interaction with the external environment.

Since then, organizational sociologists, entrepreneurship researchers and management scholars have emphasized the relevance of imprinting and the path-dependence of organizational evolution. As a consequence, the importance of 'initial conditions' for understanding the evolution of human organizations is well known (e.g. Boeker, 1988, 1989; Baron, Hannan, & Burton, 1999).[1] With regard to entrepreneurial ventures, one of the most important imprinting forces – other than the environment in which the birth of a new venture takes place ('environmental imprinting') – is the human capital endowment of the founders ('entrepreneurial imprinting'). In this case, the argument resembles Lorenz's original *filial imprinting* (Lorenz, 1937): the members of the founding team represent the parents of the new venture and their actions, knowledge, competences, ideas, implemented strategies (and routines) before, during and immediately after the firm's inception will indelibly mark the

[1] Boeker (1988, p. 34, italics in original) states: "while organizations undergo modifications and display varying degrees of flexibility, *they are cast at birth into a mold that is discernible in all subsequent stages of their life cycle*".

new entrepreneurial venture for the rest of its life, even after the original founders have left the organization.

Building on the competence- and resource-based view of the firm, the empirical evidence suggests a (weak) positive relationship between founders' human capital and the performance of new entrepreneurial ventures over time (see the meta-analysis by Unger et al., 2011). However, most of the analyses do not provide support of a founders' *imprinting* effect. As we show in this paper, the typical research design in the field is unable to properly test the entrepreneurial *imprinting* hypothesis for the simple fact that studies on the topic do not observe the evolution of entrepreneurs' human capital over time. For example, they do not account for the exit of founders and/or the addition of new owner-managers in the entrepreneurial team. This makes it impossible to disentangle how much of the (positive) impact of entrepreneurs' human capital is due to the imprinting effect and how much is due to on-going changes in the composition of the entrepreneurial team.

Recognizing this lacuna in the entrepreneurship literature, we undertake a deeper investigation of the 'entrepreneurial imprinting effect' on the sales growth performance of Italian entrepreneurial ventures. Somewhat surprisingly, although there are recent imprinting-related studies examining the influence of founders' human capital on the evolution of venture's size (e.g. Roberts, Klepper, & Hayward, 2011), growth and professionalization (Colombo & Grilli, 2005, 2010, 2013), alliance network evolution (e.g. Milanov & Fernhaber, 2009), and commercialization strategies (Conceição, Fontes, & Calapez, 2012), there are no studies which explicitly test the *imprinting effect* exerted by founders' human capital on entrepreneurial venture performance. Understanding the nature and size of this effect will aid in developing our understanding of the dynamics of entrepreneurship and the determinants of entrepreneurial venture performance. This issue has also important policy and social welfare implications since (high-tech) entrepreneurial ventures are a key driver of

the dynamic efficiency of modern economies (Audretsch, 1995; Aspelund, Berg-Utby, & Skjevdal, 2005). Thus, from a policy perspective, it is important to understand the factors that underpin their economic performance.

We perform our analysis on an unbalanced panel dataset composed of 338 Italian new technology-based firms (NTBFs) observed from 1995 (or since their foundation) to 2008 (or from their exit from the dataset).[2] Grounded in the vast empirical literature on the evolution of firm growth over time known as Gibrat's Law (Chesher, 1979; Evans, 1987), we estimate augmented Gibrat law-type dynamic panel data models by OLS (Ordinary Least Squares) and also controlling for the potential endogeneity of (some) independent variables through a GMM (Generalized Method of Moments) - system estimator for panel data (Blundell & Bond, 1998). In doing so, we estimate the impact of several dimensions of entrepreneurial human capital on venture sales growth performance.

Following Becker (1975) and a consolidated empirical literature on the impact of founders' human capital on NTBF growth and related performance (Colombo, Delmastro, & Grilli, 2004; Colombo & Grilli 2005, 2010; Ganotakis, 2012), we make the distinction between the *generic* and *specific* components of human capital. According to Colombo & Grilli (2005, p. 796):

> "…generic human capital relates to the general knowledge acquired by entrepreneurs through both formal education and professional experience. Specific human capital consists of capabilities that founders can directly apply to the entrepreneurial job in the newly created firm. These include knowledge of the industry in which the new firm operates, that is *industry-specific* human capital obtained by founders through prior work experience in the same industry. They also include knowledge of how to manage a new firm, that is *entrepreneur-specific* human capital; this is developed by founders through "leadership experience" (Brüderl, Preisendörfer, & Ziegler, 1992)".

[2] This study adheres to the *gold standard definition* of a 'new technology-based firm' originally due to Arthur D. Little (1977) that identifies a NTBF as an independent firm less than 25 years old and active in high technology industries.

In order to properly test the imprinting hypothesis on venture growth, our research design also controls for new owner-managers entering the entrepreneurial team and founders exiting the venture. Overall, our results point to a robust, positive and statistically significant presence of an 'entrepreneurial imprinting effect' in relation to the component of specific human capital represented by founders' pre-entry work experience in the same sector as the start-up.

The paper proceeds as follows. In the next section, we identify the main challenges from an empirical point of view of investigating the "entrepreneurial imprinting effect". Then, we briefly synthesize the extant literature and we develop our research hypotheses. In the following sections, we describe the dataset, and the estimation methodologies we employ. The results of the analysis along with some robustness checks follows. Finally, a discussion of the main findings and their implications concludes the paper.

Technical aspects of testing the imprinting hypothesis

In psychology and child development studies investigating the relationship between the early phases of child development and their subsequent adult behaviour, the use of a "direct" research design is deemed as unsuited to the analysis of the imprinting effect because it is infeasible for individuals to deduce *ex-post* how much initial events and parents' education affected their subsequent behaviour. The same difficulties arise in our empirical context. We cannot ask the present owner-managers of a successful venture to evaluate if – and to what extent – their success depends on their knowledge and competences or by the original founding team at venture's inception. Due to causal ambiguity (e.g. Lippman & Rumelt, 1982; Peteraf, 1993) or simply respondents' lack of information and subjectivity, the reliability of this direct approach is highly questionable.

The way imprinting effects are typically investigated in psychological studies is through an indirect method where individuals' genetic and/or environmental characteristics at birth are put into relation with subsequent observable individuals' actions and outcomes in order to infer the degree of dependence across time (e.g. Kisilevsky et al., 2003; Rushton & Bons 2005). The indirect approach is also applied by the extant empirical literature investigating the impact of human capital characteristics of founders (*in primis* education and work experience) on the (growth) performance of entrepreneurial ventures. In fact, the typical model specification employed by econometric studies in the field uses a dependent variable of the performance of firm i at time $t+n$, regressed on a series of variables measuring founders' human capital at the founding time t (e.g. see Unger et al., 2011 for a review).

This archetypal regression suffers from two important shortcomings in the light of a test for an entrepreneurial *imprinting effect*. First, the estimations are commonly run on samples that do not have sufficient heterogeneity in terms of founding team evolution (i.e. exit of founders or addition of new owner-managers in the entrepreneurial team) over time (e.g. Eisenhardt & Schoonhoven 1990; Cooper, Gimeno-Gascon, & Woo, 1994; Gimeno et al., 1997; Almus & Nerlinger, 1999). In other words, n is typically small and $t+n$ is close to t,[3] so that a positive impact of founders' human capital on entrepreneurial venture performance may simply reflect the fact that skilled and educated entrepreneurs run their ventures better than unskilled and uneducated ones. In addition, if n is sufficiently large and $t+n$ is much larger than t, the standard model specification controls for various founder-, firm-, industry- and geographical-specific variables, but it does not include any variables

[3] Most of the studies in the field including those reported above in parentheses analyze firms that are well below the threshold of an age of 10 years from inception, with most of the analyzed samples composed by very young start-ups.

capturing the evolution of the entrepreneurial team over time (e.g. Thompson, 2005; Colombo & Grilli, 2005, 2010).[4]

As a consequence, the existing empirical literature does not adequately analyse the existence of an entrepreneurial *imprinting effect* exerted on a venture performance by founders' human capital. If the overall probability that a founding team changes increases over time, failure to control for this may lead to biased results. In fact, any potential positive relationship found between founders' human capital and venture performance may not be due to an imprinting effect but simply driven by an omitted variable capturing the entrepreneurial team's evolution dynamics which is correlated with founders' human capital. For example, if entry (or exit) into (from) the original founding team of smart new owner-managers (founders) is correlated with the level of human capital originally possessed by founders, it is impossible to discern whether the current performance of the firm is driven by the imprinting of the original founding team or simply the result of the present managerial conducts and strategies.

Related literature and research hypotheses

Many scholars in entrepreneurship have focused on examining relationships between entrepreneurial characteristics and new venture performance (e.g., Eisenhardt & Schoonoven, 1990; Feeser & Willard, 1990; Vesper, 1990; Ucbasaran et al., 2003; Vanaelst et al., 2006; Roberts, Klepper, & Hayward, 2011). On average, they have shown that entrepreneurs'

[4] Thompson (2005)'s study on the impact of founders' pre-entry work experience on the survival of US ventures in the iron and steel shipbuilding industry of the nineteenth and twentieth centuries is surely the one embracing the longest *n* (90 years). His Cox proportional hazard analysis documents that (p. 26): "preentry experience is found to have a large and extremely persistent effect on survival" and in so doing points to a potentially extremely relevant "entrepreneurial imprinting effect". If the study in principle suffers from the limitation advanced in the main text (see *infra*), the extremely wide time horizon analysed makes it less pertinent with respect to other studies. In this respect, Thompson's (2005) study (without explicitly ever saying it) can be viewed as the first important evidence of the effect of entrepreneurial imprinting on firm survival.

human capital (education and experience) is positively related to entrepreneurial venture performance (Unger et al., 2011). In other words: high growth firms are more likely to be founded and run by teams of entrepreneurs with a high level of human capital (Cooper, Gimeno-Gascon, & Woo, 1994; McGee, Dowling, & Megginson, 1995; Feeser & Willard 1990). The relationship between entrepreneurs' human capital and firm performance appears to be particularly valuable in high-tech and research intensive industries (e.g. Cooper & Bruno, 1977) and relevant if some dimensions of human capital are considered. More specifically, what appears to matter in fostering growth performance for high-tech ventures is the 'specific' rather than the 'generic' component of human capital (see Becker, 1975, for this seminal distinction). Partly diverging from 'the jack of all trades and master of none' vision of the entrepreneur (e.g. Lazear, 2005), the empirical literature on NTBFs points to the former as the most relevant dimension in explaining growth performances of entrepreneurial ventures in high-tech industries (e.g. Almus & Nerlinger, 1999; Colombo & Grilli, 2005, 2010; Ganotakis, 2012), where 'specific' human capital includes all those technical and commercial competencies that entrepreneurs can directly apply to the new business and have been primarily gained through professional experience in the same markets and industries on which their NTBF operates. The underlying theoretical reasoning is that more industry-specific skilled individuals, *ceteris paribus*, are better able to identify and seize business opportunities (Shane, 2000; Shepherd & DeTienne, 2005; Ucbasaran, Westhead, & Wright, 2008; Marvel, 2013 among many others), position their venture, and run it accordingly (and this is more important in highly turbulent and risky industries as typically are the R&D intensive ones).[5] Therefore we posit the following research hypothesis, which constitutes our starting point on the investigation of the entrepreneurial imprinting hypothesis:

[5] See Eisenhardt & Martin (2000) and Tyson (1992).

H1: Entrepreneurs' specific human capital exerts a positive effect on the growth performance of high-tech entrepreneurial ventures.

The performance of entrepreneurial ventures (and more specifically NTBFs) is reputed to be strongly influenced by initial resources (Boeker, 1988, 1989; Gersick, 1991; McDougall, Shane, & Oviatt, 1994). As suggested by Boeker (1988, 1989) and Bamford, Dean, & McDougall (1999), early resources and competences at founding date have lasting effects which imprint the firm, limit its strategic choice, and continue to impact its long-term performance. The early stages of a firm's existence see the development of the organization's routines that guide initial strategies and managerial decisions. Gersick (1991) illustrates an initial strategy through a decision tree: once one decision is made, the resulting strategic options are reduced. This path-dependent evolution of a high-tech start-up's life is reputed to embrace a wide variety of firm strategies, ranging from commercialization policies (Arora & Gambardella, 2010; Conceição, Fontes, & Calapez, 2012) to alliance partners' selection (Gulati & Gargiulo, 1999; Milanov & Fernhaber, 2009), passing through organizational design choices (Colombo & Grilli, 2013) and labor's hiring policies (Burton & Beckman, 2007).

Starting from this presumption that initial strategies and early choices could limit the spectrum of a firm's subsequent options, the theoretical argument underpinning the imprinting effect of founders' specific human capital on high-tech venture growth performance resides in the fact that experienced and skilled entrepreneurs are more likely than inexperienced and unskilled ones to make at a firm's inception the right choices and pursue the most appropriate initial strategies. Since these initial moves have a long-lasting effect and constrain subsequent options, successful strategic choices at a firm's inception are more likely to breed successful strategic choices in later stages. This imprinting effect is

likely to benefit the firm regardless of the original founders' actual involvement in the firm or a founder's potential exit over the firm's life.

Most of the empirical work studying the relationship between founders' human capital and firm growth performance assumes the existence of this imprinting effect without directly testing its actual presence (Almus & Nerlinger, 1999; Colombo & Grilli, 2005, 2010; Ganotakis, 2012 among others). As highlighted earlier, such studies do not control for the evolution dynamics characterizing the team of the original founders since they do not observe entry/exit of owner-managers.

As a matter of fact, with regard to the entrepreneurial *imprinting effect*, most of the evidence is of a qualitative nature. For instance, Barringer, Jones, & Neubaum (2005) tell us about the Walt Disney anecdote (p. 666): "It is widely believed that the founders of a firm place a lasting 'stamp' on their companies that influences the cultures and behaviors of their firms (Mullins, 1996). For example, for years after the death of Walt Disney, Disney executives, when confronted with an important decision, would often ask aloud "What would Walt do?" (Collins & Porras, 1994). Similarly, Hewlett–Packard's Rules of the Garage institutionalizes the values of its innovative founders [….]."

Adhering to this view, we formulate the main hypothesis of our analysis:

H2: Founders' specific human capital exerts an imprinting effect: it has a positive effect on the growth performance of the high-tech entrepreneurial venture independently from the degree of erosion of the founding team.

Data

In this paper, we draw on a sample of 338 NTBFs that are observed either from 1995 or from their foundation (if it is after 1995) up to 2008 (or the year of their exit from the dataset). Sample firms were established in 1983 or later and were independent at the time of

founding (i.e. they were not controlled by another business organization even though other organizations may have held minority shareholdings). They operated in the following high-tech manufacturing and service industries: ICT manufacturing (i.e., computers; electronic components; telecommunication equipment; optical, medical and electronic instruments); biotechnology, pharmaceuticals and advanced materials; aerospace, robotics and process automation equipment; software; Internet and telecommunication services; environmental services; R&D and engineering services. All sample firms are privately held.

The sample is drawn from the RITA directory (Research on Entrepreneurship in Advanced Technologies). Given the absence of reliable official statistics on the population of Italian NTBFs, the RITA directory is the most complete and detailed source of information presently available on this type of firm.[6]

The directory was created by the RITA Observatory research team at Politecnico di Milano at the end of 1999 and was extended through the inclusion of new firms and the update of new information through other four different survey waves carried out in 2002, 2004, 2007, and 2009. As a result, RITA is a survey-based dataset that includes information on a total of 1,979 NTBFs. The surveys were based on a questionnaire that was sent to the contact person of target firms (i.e., one of firm's owner-managers) either by fax or by e-mail. Answers to the questions were checked for internal coherence by trained research assistants and were compared with information published in firms' annual reports, on web sites and in the press. In several cases, phone or face-to-face follow-up interviews were made with firms'

[6] The use of official statistics in this domain is not possible for several reasons. First, in Italy most individuals who are defined as self-employed by official statistics (i.e., "independent employees") actually are salaried workers with atypical employment contracts. Unfortunately, on the basis of official data such individuals cannot be distinguished from owner-managers of a new firm. This means that the official number of high-tech entrepreneurial ventures is enormously inflated, especially in sectors like software where atypical employment contracts are very popular. In addition, official data do not distinguish firms that were established by one or more entrepreneurs (i.e., owner-managed firms) from firms that were created as subsidiaries of other firms. This again inflates the number of high-tech entrepreneurial ventures. Lastly, there are no official statistics about M&As: therefore one cannot distinguish firms that were acquired by another firm and lost independence while keeping their legal status, from independent high-tech entrepreneurial ventures.

owner-managers. This final step provided an opportunity to collect missing data and ensured that the data were reliable.

RITA constituted the empirical basis for several previous works on the relationship between entrepreneurs' human capital and NTBF performances (e.g. Colombo, Delmastro, & Grilli, 2004; Colombo & Grilli, 2005, 2010). In this respect, it is important to stress that because of the criteria used for inclusion in the RITA directory, the dataset is unlikely to include lifestyle firms and firms that are created purely for tax-saving reasons. Another important strength of the dataset is its longitudinal nature so that firms surveyed in a wave have been included in the subsequent one, thus they are monitored over time. Among other things, this enabled us to track their eventual exit (because of cease of operations, bankruptcy or merger/acquisition with/by another firm) and allowed us to perform the survivorship bias test reported in the robustness checks section.

The data collection process throughout the different survey waves was always carried out with the logic of ensuring representativeness (in terms of geographic location and sector affiliation) with the population of active Italian NTBFs in that specific time period. Accordingly, the construction of the population used information from a wide array of sources including: i) lists of the companies that are members of the national entrepreneurial associations of the focal industries; ii) lists of the members of the regional sections of the main Italian organisation representing manufacturing and services companies (Confindustria); iii) lists of the members of the local sites of Chambers of Commerce; and in 2009 the Infocert dataset of the Union of Italian Chambers of Commerce; iv) lists of companies that participated in the most important industry trades and expositions; v) lists of companies that purchased advertising services in popular off-line (e.g., Kompass) and on-line (e.g., Infoimprese.it) directories; vi) a list of young firms that were granted a license to provide telecommunication services (including Internet access services) by the Italian

communication authority (AGCOM); vii) the population of high-tech entrepreneurial ventures that were incubated in a science park or a business innovation center (BIC) affiliated with the respective national associations; viii) the population of high-tech entrepreneurial ventures that obtained equity financing from VC investors included in the Italian financial investor association (AIFI); and ix) the population of VC-backed high-tech entrepreneurial ventures that were included in the Thomson One database. Lastly, information provided by the national financial press, specialised magazines, and other sectoral studies was also used in the compilation of the directory. For each firm, the name of a contact person (i.e., one of the owner-managers) and his/her personal email address was collected in order to administer the questionnaire. While the RITA directory is not exhaustive of all self-employment episodes in high-tech sectors, it nevertheless provides an extensive and accurate coverage of the population of Italian entrepreneurial ventures in this domain excluding lifestyle companies, non-growth oriented firms and other non-entrepreneurial entities.

Among the 1,979 NTBFs included at 31/12/2012 in the RITA directory, we could reconstruct the *complete history* in terms of the *whole* founders' and subsequent owner-managers' human capital background for a sample of 338 firms.[7] The exclusion of firms for which we had incomplete data on the entire set of founders and owner-managers in the observed time span was a necessary step in order to perform a rigorous test of the entrepreneurial imprinting hypothesis. In this regard it is worth stressing that information provided by public data sources was also included in the RITA directory. In particular, data on firm sales were obtained through firms' annual reports and balance sheets (sources: CERVED and AIDA - the Italian version of Bureau van Dijk's Amadeus database - commercial databases). Survey-based information on the background of firms' owner-

[7] There are no statistically significant differences between the distribution of the 338 sample firms across geographic areas and industries of operation and the corresponding distributions of the 1,979 RITA population from which the sample was drawn ($\chi2(19)= 19.34$ and $\chi2(9)= 16.07$, respectively).

managers and founders and their entry/exit behavior was also triangulated (whenever possible) with alternative sources, and in particular with the official documentation provided by the Union of Italian Chambers of Commerce (i.e. Telemaco database).

Methodology

Growth measure

Studies on growth and performance of entrepreneurial ventures have shown contrasting results. One possible cause might be the use of different growth measures such as sales growth (Lee, Lee, & Pennings, 2001), employment growth (Westhead & Birley, 1994), profitability (Spanos & Lioukas, 2001), or total assets (Achtenhagen, Melin, & Naldi, 2004). Delmar, Davidsson, & Gartner (2003) argue that there is no "one best way" of measuring growth because it is a multidimensional phenomenon. They showed that high-growth firms do not grow in the same way and that "what a 'high-growth firm' is, conceptually and operationally, is very dependent on the growth measure used (p. 211)". Several scholars argue that traditional accounting-based indicators of profitability are inappropriate for NTBFs because most start-ups do not make any profit during their first years (Shane & Stuart, 2002). Sales growth (often measured as growth in total revenues; Hanks et al., 1993) is typically preferred as a measure of firm growth and financial performance of new ventures (Ardishvili et al., 1998) because it is relatively accessible, it applies to (almost) all sorts of firms, it is relatively insensitive to capital intensity and degree of integration (Delmar, Davidsson, & Gartner, 2003), and it is a direct proxy of market legitimacy and penetration. While technological progress and innovation may be labor saving (and so they are not reflected in a high-tech venture's employment growth), successful innovators are expected to reach greater sales (Coad & Rao, 2006; Czarnitzki & Delanote, 2013). Accordingly, in this study we focus on sales growth as NTBF growth measure performance.

Econometric specification

To test our hypotheses, we use an augmented Gibrat law specification (Chesher, 1979). The initial hypothesis H1 is investigated by implementing the following model (equation 1):

$$Sales_{it} = \alpha_0 + \alpha_1 Sales_{it-1} + \beta_1' EntrepreneurialTeamSHC_{it} + \beta_2' EntrepreneurialTeamGHC_{it} + \\ + \alpha_2 X_{it} + T_t + \varepsilon_{it}.$$

$Sales_{it}$ is the natural logarithm of sales value at time t; $EntrepreneurialTeamSHC_{it}$ and $EntrepreneurialTeamGHC_{it}$ are vectors of variables capturing the stock of *specific* and *generic* human capital possessed by the owner-managers over time. In particular, we capture the level of competencies possessed by the founding team and observed at the firm's foundation (t = 0), and how the possible entry/exit of owner-managers in subsequent years modifies the value of this variable by the corresponding injection or loss of human capital; X_{it} is a vector of control variables; T_t are year-dummies and finally ε_{it} are i.i.d. disturbance terms.[8] The first research hypothesis H1 predicts that the variables capturing entrepreneurs' specific human capital and included in the vector $EntrepreneurialTeamSHC_{it}$ are positive and statistically significant.

To test hypothesis H2, we augment equation (1) with the additional vectors $FoundingTeamSHC_i$ and $FoundingTeamGHC_i$ which include the same variables of $EntrepreneurialTeamSHC_{it}$ and $EntrepreneurialTeamGHC_{it}$ but now these variables are measured only at foundation and are not time-varying. Thus, the new model specification becomes (equation 2):

[8] We include year-dummies in the main specification in order to control for inflation and macro-economic shocks because a Wald test confirms their statistical significance ($\chi2(12)= 34.19$). In this respect, note that the use of a deflated sales series leave results unchanged (results are available upon request from the authors). Conversely, industry effects are omitted because they are jointly insignificant in determining sectorial differences in firm's growth dynamics ($\chi2(9)= 4.67$).

$$Sales_{it} = \alpha_0 + \alpha_1 Sales_{it-1} + \beta_1' EntrepreneurialTeamSHC_{it} + \beta_2' EntrepreneurialTeamGHC_{it} + \beta_3' FoundingTeamSHC_i + \beta_4' FoundingTeamGHC_i + \alpha_2 X_{it} + T_t + \varepsilon_{it}.$$

.

Support for hypothesis H2 requires that variables capturing founders' specific human capital contained in $FoundingTeamSHC_i$ are positive and statistically significant. In fact, the vector of coefficients β_3 measures the impact that founders' *specific* human capital has on the sales growth of entrepreneurial ventures net of the contemporaneous impact that the present level of entrepreneurs' *specific* human capital exerts on sales growth. In this respect, the coefficients β_3 related to specific human capital represent a direct test of the *entrepreneurial imprinting hypothesis.*

Definition of independent variables and descriptive statistics

Definition of independent variables of interest and controls used in the empirical analysis is provided in Table 1. Starting from equation (1), $EntrepreneurialTeamSHC_{it}$ include: $SpecWorkExp_{it}$ is the total number of years of pre-entry work experience of owner-managers in the same industry of firm *i* at time *t*; $DSerial_{it}$ is a dummy variable that equals 1 for NTBFs with one or more owner-managers with a previous self-employment experience at time *t*. The vector of variables capturing owner-managers' generic human capital, i.e. $EntrepreneurialTeamGHC_{it}$, is composed of: $OtherWorkExp_{it}$ which is the total number of years of pre-entry work experience of owner-managers in other industries than the one of firm *i* at time *t*; while $Educ_{it}$ is the total number of years of education at graduate and post-graduate level of owner-managers of firm *i* at time *t*. In order to control for the size of the entrepreneurial team over time, we also add the control $NOwners_{it}$ which is the number of owner-managers of firm *i* at time *t*.

Equation (2) augments model's (1) specification with two additional vectors of variables related to founders' human capital: $FoundingTeamSHC_{i0}$ and $FoundingTeamGHC_{i0}$. The two vectors comprise the same variables of $EntrepreneurialTeamSHC_{it}$ and

$EntrepreneurialTeamGHC_{it}$, but now $SpecWorkExp_{i0}$, $DSerial_{i0}$, $OtherWorkExp_{i0}$ and $Educ_{i0}$ are measured at a firm's inception and are time-invariant. In this case, $NFounders_{i0}$ controls for the size of the founding team.

Finally, the vector X_{it} controls for the age of the firm and its square term. In the robustness check section, this vector will be augmented with several other firm-level covariates in order to investigate if results on founders' human capital are sensitive to some omitted variable bias.

[Table 1 about here]

In Table 2, we provide a comprehensive set of summary statistics of all the variables used in the empirical analysis. In Table 3, we present statistics related to the changes occurred to human capital variables over time. They are computed on the 34.32% (116 firms out of 338) of our sample firms which experienced a change in the composition of the original founding team, with an injection and/or loss of one or more members. Differences are computed through the following formula: Variable(t)- Variable(foundation). Thus, a positive (negative) number means that the focal variable at time t is higher (lower) than the same variable at foundation, because of a greater entry (exit) of owner-managers into the team. Statistics show a remarkable variance in the variable of interest (minimum vs. maximum values, standard deviation's values) but at the same time a good balance between losses and injections of human capital variables across firms, as highlighted by the low mean and median values. In particular, injections of *generic* human capital are slightly greater than corresponding losses (mean $\Delta Educ$ = 1.2890, mean $\Delta OtherWorkExp$ = 0.1379); while the reverse is true for *specific* human capital (mean $\Delta SpecWorkExp$ = -0.5452, mean $\Delta Serial$ = -0.0082).

[Table 2 about here]

[Table 3 about here]

Estimation method

First, models are estimated through OLS. In order to account for heteroskedasticity and for arbitrary autocorrelation within a firm, in OLS estimates we use a cluster-robust covariance matrix as the errors of the same NTBF observed over multiple years might be correlated.

However, the inclusion of the lagged dependent variable among covariates and the potential endogenous nature of the relationship between the human capital of entrepreneurs after foundation and venture growth recommend the use of other estimation techniques. In fact, while the variables included in $FoundingTeamSHC_{i0}$ and $FoundingTeamGHC_{i0}$ are exogenous by construction, those included in $EntrepreneurialTeamSHC_{it}$ and $EntrepreneurialTeamGHC_{it}$ may not be. For example, a reverse causality concern may arise to the extent that past sales growth performances influence changes in the composition of entrepreneurial teams. In order to address the dynamic bias and other potential endogeneity problems, following the literature on dynamic panel data models (Blundell and Bond 1998), other than using OLS we also resort to the system generalized method of moments (GMM-SYS) estimator.

In GMM-SYS methodology, other than using lagged levels of the series as instruments for first differences equations, additional moment conditions are employed using first differences as instruments for variables in levels, starting from t-2 for all the endogenous variables.[9] To evaluate the relevance of all the GMM-SYS estimates, we applied different (standard in the GMM-context) tests. First, we implemented the Arellano and Bond tests for first- and second-order serial autocorrelations of residuals (AR(1), AR(2)). If ε_{it} was not

[9] The GMM-SYS estimator may also present few drawbacks. First, the use of a large number of instruments can result in significant finite sample bias. Moreover, measurement errors can cause potential distortions. In order to deal with both problems (Bond, 2002; Roodman, 2009), we estimate our models with a reduced instrument set, with moment conditions in the interval between t-2 and t-5. Note also that pseudo-first stage regressions were run in order to gauge the goodness of such instruments. Results corroborate the robustness of the employed GMM-SYS estimator: F-statistics for the statistical significance of instruments in first differences are always greater than 10, which is the commonly accepted threshold (see Staiger & Stock, 1997).

serially correlated, the difference of residuals should have been characterized by a negative first-order serial correlation and the absence of a second-order serial correlation. Then, the Hansen test for the validity of overidentifying restrictions was implemented for each regression. These statistics tested the null hypothesis that the specified orthogonality conditions are equal to zero (Hansen, 1982). The failure to reject the null hypothesis indicated that the instruments are valid. Finally, in all GMM estimations the autoregressive coefficient is not close to the unity, thus excluding any stationarity concerns. All these tests reassure us on the feasibility of the GMM approach.

Results

Test of the hypotheses

Tables 4 and 5 show the results of the estimation of equations [1] and [2], respectively.

[Table 4 about here]

[Table 5 about here]

With regard to our first hypothesis, we found that only entrepreneurs' specific work experience exerts a positive and significant effect on the sales growth of entrepreneurial ventures: the coefficient of $SpecWorkExp_{it}$ is positive and significant at 5% level in OLS estimates and at 10% in GMM-SYS estimates, while all the other owner-managers' human capital variables are always not statistically significant at conventional confidence levels. The variable $DSerial_{it}$ produces a positive but insignificant effect on NTBF sales growth.[10] Thus,

[10] This result is not totally unexpected if compared with previous evidence on the drivers of NTBF growth in the Italian economy. A previous analysis on a comparable sample of Italian NTBFs reveals a negligible impact of pre-entry managerial experience on their sales growth (e.g. Colombo & Grilli, 2010). In this respect, note also that we investigated if the experience gained by founders in previous occupations as managers of other firms exerted any impact on sales growth dynamics. The related dummy variable capturing the presence in the entrepreneurial team of entrepreneurs with previous managerial experience turns out to be positive but statistically insignificant, while the main results of our analysis remain unchanged.

we conclude that H1 finds only weak support, and hypothesis H2 will be investigated especially with reference to the effect of founders' specific work experience rather than the impact of past entrepreneurial episodes.

Accordingly, we find that founders' specific work experience does exert an entrepreneurial *imprinting effect*, supporting hypothesis H2. Estimates of equation (2) reveal that $SpecWorkExp_{it}$ loses statistical significance, while the corresponding variable computed at firm's inception, $SpecWorkExp_{i0}$, is the only one to show a positive and statistical significant coefficient, at 5% in OLS and 10% statistical significance level in GMM-SYS regressions. The effect is also of relevant economic magnitude: taking GMM-SYS estimates, a one-year increase in this specific variable produces in the long run an average increase in the size of the benchmark firm of +8.34% (statistically significant at 10%). The difference between not having and having a large endowment of specific human capital at foundation may be extremely dramatic. When we look globally at the vector $FoundingTeamSHC_i$, passing from no entrepreneurial experience ($DSerial_{i0} = 0$) and a very low level of specific work experience ($SpecWorkExp_{i0}$ = 5 years, 5° percentile) to an opposite situation characterized by an extremely important amount of founders' specific human capital ($DSerial_{i0} = 1$; $SpecWorkExp_{i0}$ = 79 years, 95° percentile) produces an immediate increase in size of +217.03% (GMM-SYS estimates, effect significant at 10% statistical level).

Interestingly, after controlling for the initial endowment at foundation, the evolution of human capital in the top management team has no significant effects on the NTBF sales growth performance. Finally, the estimates show that an NTBF's age has a linear positive significant impact on sales growth (in GMM-SYS estimates only).

Robustness checks

We also conducted a range of robustness checks in order to verify the veracity of our findings related to the entrepreneurial *imprinting effect*.

Alternative operationalization of variables and models' specification. The results of the first robustness check is provided in Tables 6 and 7 – these two tables are analogues of Tables 4 and 5 in that they estimate the models presented in Equations 1 and 2. However, in this robustness section, we estimate the models using the averaged (mean) value across entrepreneurial teams. Specifically, we use the team's average (rather than the total) number of years of graduate and post-graduate education and of specific and generic work experience of founders and of owner-managers of firm *i* at time *t*. The substitution of variables capturing total years with the corresponding averaged covariates (i.e. $Educ\_avg_{it}$, $SpecWorkExp\_avg_{it}$, $OtherWorkExp\_avg_{it}$, $Educ\_avg_{i0}$, $SpecWorkExp\_avg_{i0}$, $OtherWorkExp\_avg_{i0}$) lead to broadly close results with those already exposed and still confirm (particularly in the GMM-SYS estimates) that founders' previous work experience in the same industry is the only source of an *imprinting effect* on firm sales growth.

We also use further alternative strategies for the operationalization of variables of interest. First, $SpecWorkExp\_avg_{it}$ was augmented year-by-year in order to capture the fact that entrepreneurs acquire specific work experience as their NTBFs continue to operate in high-tech markets. Secondly, to avoid any overlap between the vectors of human capital variables at foundation, the vectors $EntrepreneurialTeamSHC_{it}$ and $EntrepreneurialTeamGHC_{it}$ were pre-multiplied by (1-$DSeed_{it}$), where $DSeed_{it}$ is a dummy variable that equals 1 if the NTBF is at founding time. Again results in both cases were in line with those presented.

[Table 6 about here]

[Table 7 about here]

In Table 8, we estimated Equation 2 using a restricted sample of observations, which is based on 609 observations (116 firms). The sample was restricted to include only those NTBFs that had experienced a change in the founding managerial team: those who hadn't

were excluded from the analysis. The consequent drastic reduction in sample size makes infeasible the use of the GMM technique so we are forced to rely only on OLS estimates. Again, results obtained from the restricted sample corroborated those related to the full sample (see Table 5) and point to the industry-specific work experience of the founding team as the only statistically significant variable.[11]

[Table 8 about here]

In Table 9, two final robustness checks were undertaken by including some additional firm-level explanatory variables (column 1) and the inverse Mills ratio on firm exit (column 2) in order to control for potential omitted variable and survivorship biases, respectively. Again the high number of instruments that this augmented specification would have implied make the use of GMM-SYS problematic and we again rely solely on OLS. The first additional explanatory variable we include is an impulse dummy that takes value one in the year the NTBF *i* established a technological (commercial) alliance: $DTechAlliance_{it}$ ($DCommAlliance_{it}$).[12] There is evidence suggesting that such an alliance may have an impact on NTBF performance (see Eisenhardt & Schoonhoven, 1996; Stuart, 2000). We also include a dummy variable ($DIncubated_{it}$) that takes the value one if NTBF *i* is in an incubator or in a business innovation center (BIC) at time *t* (note that we control for entry year in and exit year from the incubator/BIC). This may affect the NTBF performance since there are opportunities to learn (and get support) from others in an incubator (see Mian, 1996). To capture the effects of government support for business ventures, we include two dummy

[11] We also conducted other robustness checks. Our sample also includes venture capital (VC)-backed firms. In particular, 22 firms received VC during their life (out of 338 firms). VC investors are able to spur the growth of investee companies (see Bertoni, Colombo, & Grilli, 2011) and are likely to weak the positive relationship between entrepreneurs' human capital and firm growth (Colombo & Grilli, 2010). To control for that, we run regressions excluding VC-backed firms from our estimates. Results are very similar to those previously discussed.

[12] We also try other specifications in which we include alternatively: i) two step dummies that take value one from the year the NTBF *i* established a technological or commercial alliance on; ii) two step dummies that take value one if the the NTBF *i* established a technological or commercial alliance in all years of operation. The results are unchanged.

variables which equal one if the NTBF received any public financing by central government ($DPubFin\_Gov_{it}$) or by a local government ($DPubFin\_Loc_{it}$) (see Audretsch, Link, & Scott, 2002; Link & Scott, 2010). Lastly, we include a dummy variable ($DInternational_{it}$) to capture whether NTBF *i* has (at least) one subsidiary in a foreign country (see Kogut & Zander, 1993). We also controlled for geographical location by including a series of Italian regional (NUTS 2 level) dummies.

The results for this extended model are presented in Table 9. Little has changed in the results reported in this table: the founders' specific work experience variable is still positive and significant, confirming our finding on its *imprinting effect* on NTBF sales growth. The only additional explanatory variable that we have included in this model that has any statistical significance is $DInternational_{it}$. This variable is positively signed which indicates that new ventures with a foreign subsidiary have higher sales growth, *ceteris paribus*.

[Table 9 about here]

Test for survivorship bias. RITA is an unbalanced panel dataset. The unbalanced nature may be caused by a sample selection issue. In fact, sample NTBFs might exit from the RITA dataset because of several events: cease of operations, bankruptcy or merger/acquisition with/by another firm. Following Wooldridge (1995), we implemented a variable-addition test to detect potential survivorship bias in our data (see also Baltagi, 2003, pp. 223-224). For each year, from an exit equation estimated through a probit model, we compute the inverse Mills ratio (IMR) term to be inserted in the main equation using the unbalanced panel. The dependent variable is a dummy variable that equals 1 in the year the focal firm exited the sample. The independent variables include firm size, firm age, and other control variables. The results are reported in Table 9. The coefficient of the inverse Mills ratio is not significant, thus suggesting the absence of any remarkable survivorship bias in our estimates.

Moreover, results related to the positive and significant effect of the variable $SpecWorkExp_{i0}$ are further confirmed.

Conclusions

Summary of findings

In this paper, we have investigated the presence of an 'entrepreneurial *imprinting effect*' on entrepreneurial ventures' sales growth. By controlling for the (potential) exit of founders or addition of new owner-managers in the entrepreneurial team over time, we have disentangled the impact of founders' human capital from the impact that the actual stock of human capital possessed by firm's owner-managers continue to exert over time. Previous studies in high-tech entrepreneurship have generally found a positive effect of entrepreneurs' specific human capital on firm growth. But such studies are not able to test the potential imprinting effect exerted by entrepreneurs on their venture. In fact, the positive effect they found may simply reflect the fact that more skilled and experienced entrepreneurs run their ventures better than less skilled and less experienced ones. This is due to the fact that such studies do not have variables (or at least proxies) to capture the dynamics of the entrepreneurial team over time. This way, any potential positive impact of founders' human capital on venture performance might be driven by the evolution of owner-managers' human capital in the entrepreneurial team.

Our study is the first systematic analysis on the existence of an entrepreneurial *imprinting effect* on NTBF sales growth. The test we performed was made possible by the availability of a longitudinal dataset (RITA) composed by 338 Italian NTBFs with a more fine-grained description of the complete evolution of founders and owner-managers' human capital over time than the one available in previous analyses. The longitudinal nature of our large dataset also enabled us to properly control for the potential endogeneity bias that may

affect the relationship between entrepreneurs' human capital and venture growth. The analysis points to the existence of an important entrepreneurial *imprinting effect* exerted by founders' *specific* human capital, and most prominently by founders' *specific pre-entry work experience*, on the sales growth performance of NTBFs. Conversely, entrepreneurs' generic human capital is found to play a negligible role in shaping growth dynamics of NTBFs.

Limitations

This work represents a first empirical test on the existence of an entrepreneurial *imprinting effect* exerted by founders' human capital on the (sales) growth of entrepreneurial ventures. Several future research directories can be traced on the basis of some (unavoidable) limitations of the present study. First, we focus here on a sample of NTBFs based in Italy and this calls into question the generalizability of our results with respect as to different sectors and different countries. If we can speculate that differences might be relevant when we consider less technological-intensive industries or more technology-advanced countries than Italy, these conjectures are worth of being investigated in future work. Secondly, our longitudinal sample presents a sufficient but limited degree of turbulence in the entrepreneurial team's turnover over time (slightly more than one third of our sample firms experienced the exit and/or the entry of at least one member in the entrepreneurial team). Estimating the relationship of interest in more "turbulent" environments in terms of entrepreneurial team turnover would represent an important test of the validity of the findings presented here.

Implications

This notwithstanding, we believe that important implications can be drawn from our analysis at various levels. From a theoretical perspective, our analysis corroborates the knowledge- and competence-based (Grant, 1996) view of high-tech ventures, but at the same time it emphasizes the importance of an evolutionary and path-dependent perspective (Nelson

& Winter, 1982, 2002) in order to better understand an entrepreneurial venture's development and its ultimate performance. If "a fundamental proposition in evolutionary economics is that firms have ways of doing things that show strong elements of continuity" (p. 11, Dosi, Nelson, & Winter, 2000), our work provides evidence that this continuity also passes through founders' capabilities and their specific knowledge. And that the initial moves of capable entrepreneurs heavily reverberate in subsequent stages of a firm's life. At the same time, our analysis is not necessarily at odds with all those studies that point to dynamic capabilities as an important driver of the long-term performance of entrepreneurial ventures (e.g. Eisenhardt & Martin 2000; Winter, 2003). In this respect, our work suggests that, after foundation, injections and/or exits of new owner- managers (and their human capital) in/from the entrepreneurial team are not an effective way of rapidly adapting to the environmental context. Conversely, founders have the possibility to determine by the very beginning of operations the ability of their firms to change and promptly react to modified business conditions. In doing so, our work provides empirical support to Teece & Pisano (1994) when they claim that "the competitive advantage of firms stems from dynamic capabilities rooted in high performance routines operating inside the firm, embedded in the firm's processes and conditioned by its history. Because of imperfect factor markets, or more precisely the non-tradability of 'soft' assets like values, culture, and organizational experience, these capabilities generally cannot be bought; they must be built (p. 553)". We showed that more skilled and experienced entrepreneurs are more likely to succeed in this (difficult) task.

From an entrepreneurial perspective, we highlight that the initial endowment of (specific) human capital is not likely just to have a transient effect on a high-tech venture sales growth. In this respect, entrepreneurs have to be aware that initial (knowledge) resources are of paramount importance because they do not only affect the immediate performance but also determine the long-run one. Would-be entrepreneurs have to bear in

mind that bringing other very competent individuals into the entrepreneurial team right from the venture's inception can be a crucial determinant for the success of the business idea while future injections are likely to produce limited effects. By the same token, the exit from the entrepreneurial team of a competent founder could be of little concern for the prospects of the firm, if this founder has had enough time to imprint with his knowledge the entrepreneurial venture's organizational practices, routines and culture.

As a consequence, our study provides to policymakers some important potential channels through which the competitiveness of an entrepreneurial venture might be increased. By highlighting how founders' specific knowledge resources determine high-tech new ventures' sales growth, our work emphasizes that in order to establish a vibrant and solid high-tech entrepreneurial segment, policymakers should target the quality of the entrepreneurs rather than simply the quantity of the individuals who decide to establish a new venture. Thus, it is important not just to incentivize more individuals to turn to self-employment but to convince those individuals who have the best chances to succeed to create their own new high-tech venture. In this respect, we very much share the view of Eberhart, Eesley, & Eisenhardt (2012) in saying that easing entry into the self-employment condition could be less effective than alleviating burdens arising from the exit. Especially in the European Union, targeted policy interventions are needed both at the regulatory and cultural levels in order to limit the opportunity cost of high-tech entrepreneurship and enable a rapid second start for honestly failed high-tech entrepreneurs (see on this point also Armour & Cumming, 2006).

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Tables

Table 1: Definition of independent variables

Variable	Definition
Lagged dependent variable	
$Sales_{it-1}$	Logarithm of sales of firm *i* at time *t-1*
Founding team variables	
<u>*Specific human capital*</u>	
$SpecWorkExp_{i0}$	Total number of years of work experience of founders in the same industry of firm *i* before firm's foundation
$DSerial_{i0}$	One for firms with one or more founders with a previous self-employment experience before firm's foundation
<u>*Generic human capital*</u>	
$Educ_{i0}$	Total number of years of education at graduate and post-graduate level of founders of firm *i* before firm's foundation
$OtherWorkExp_{i0}$	Total number of years of work experience of founders in other industries than the one of firm *i* before firm's foundation
<u>*Control*</u>	
$NFounders_{i0}$	Number of founders of firm *i*
Entrepreneurial team variables	
<u>*Specific human capital*</u>	
$SpecWorkExp_{it}$	Total number of years of work experience of owners in the same industry of firm *i* at time *t*
$DSerial_{it}$	One for firms with one or more owners with a previous self-employment experience at time t
<u>*Generic human capital*</u>	
$Educ_{it}$	Total number of years of education at graduate and post-graduate level of owners of firm *i* at time *t*
$OtherWorkExp_{it}$	Total number of years of work experience of owners in other industries than the one of firm *i* at time *t*
<u>*Control*</u>	
$NOwners_{it}$	Number of owner-managers of firm *i* at time *t*
Firm-level controls	
Age_{it}	Number of years since firm's foundation at year *t*
Age^2_{it}	Squared term of Age_{it}

Table 2: Descriptive statistics of explanatory variables

Variable	*Mean*	*Median*	*S.D.*	*Min*	*Max*
$Sales_{it}$	12.8118	12.9420	1.8603	0	18.2802
$SpecWorkExp_{i0}$	14.2500	5	21.2780	0	129
$DSerial_{i0}$	0.4128	0	0.4925	0	1
$Educ_{i0}$	35.9000	34	18.6958	8	147
$OtherWorkExp_{i0}$	31.1641	23	28.2853	0	239
$NFounders_{i0}$	2.3462	2	1.0718	1	7
$SpecWorkExp_{it}$	14.0320	5	22.0189	0	140
$DSerial_{it}$	0.4096	0	0.4919	0	1
$Educ_{it}$	36.3994	31.5000	19.1369	8	168
$OtherWorkExp_{it}$	31.2038	24	27.2966	0	191
$NOwners_{it}$	2.3667	2	1.1276	1	8
Age_{it}	7.8865	6	5.6181	0	24

Table 3: Dynamics of entrepreneurial teams

Variable	*Mean*	*Median*	*S.D.*	*Min*	*Max*
ΔNOwners	0.0525	0	1.1812	-3	4
ΔEduc	1.2890	0	18.3181	-39	49
ΔSpecWorkExp	-0.5452	0	12.7586	-49	46
ΔOtherWorkExp	0.1379	0	22.6470	-88	70
ΔSerial	-0.0082	0	0.2838	-1	1

Table 4: Econometric results – Equation 1

	(1) OLS	(2) GMM
$Sales_{it-1}$	0.4846***	0.3087***
	(0.0517)	(0.0534)
Entrepreneurial team variables		
$SpecWorkExp_{it}$	0.0053**	0.0168*
	(0.0027)	(0.0087)
$DSerial_{it}$	0.1315	0.2819
	(0.0935)	(0.3249)
$Educ_{it}$	-0.0060	-0.0024
	(0.0055)	(0.0119)
$OtherWorkExp_{it}$	-0.0020	-0.0037
	(0.0021)	(0.0049)
$NOwners_{it}$	0.1478	0.1282
	(0.0969)	(0.2024)
Firm-level controls		
Age_{it}	0.0215	0.1529**
	(0.0292)	(0.0649)
Age^2_{it}	0.0012	-0.0032
	(0.0012)	(0.0033)
Year dummies	Yes	Yes
Constant	6.2183***	7.7481***
	(0.5863)	(0.6596)
Number of observations	1560	1560
Number of firms	338	338
R^2	0.5953	-
AR(1)	-	-1.49
AR(2)	-	-1.03
Hansen	-	204.85[219]

Note: standard errors in parentheses; degrees of freedom in square brackets. Year dummies are included in the estimates (coefficients are omitted in the table). Estimates are derived from OLS regressions with robust clustered standard errors and two-step system GMM with finite sample correction (Windmeijer, 2005). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Econometric results – Equation 2

	(1) OLS	(2) GMM
$Sales_{it-1}$	0.4807***	0.3035***
	(0.0509)	(0.0573)
Founding team variables		
$SpecWorkExp_{i0}$	0.0179**	0.0253*
	(0.0086)	(0.0137)
$DSerial_{i0}$	0.2283	0.2979
	(0.1984)	(0.5749)
$Educ_{i0}$	-0.0114	-0.0429
	(0.0131)	(0.0297)
$OtherWorkExp_{i0}$	-0.0059	-0.0098
	(0.0070)	(0.0153)
$NFounders_{i0}$	0.0642	0.7345
	(0.2171)	(0.6330)
Entrepreneurial team variables		
$SpecWorkExp_{it}$	-0.0119	0.0014
	(0.0088)	(0.0138)
$DSerial_{it}$	-0.1054	0.2220
	(0.1977)	(0.3740)
$Educ_{it}$	0.0026	0.0214
	(0.0120)	(0.0185)
$OtherWorkExp_{it}$	0.0035	-0.0024
	(0.0075)	(0.0083)
$NOwners_{it}$	0.1127	-0.0829
	(0.1805)	(0.2239)
Firm-level controls		
Age_{it}	0.0211	0.1191*
	(0.0286)	(0.0716)
Age^2_{it}	0.0011	-0.0017
	(0.0012)	(0.0032)
Year dummies	Yes	Yes
Constant	6.3369***	7.4557***
	(0.5987)	(1.0221)
Number of observations	1560	1560
Number of firms	338	338
R^2	0.6001	-
AR(1)	-	-1.26
AR(2)	-	-1.08
Hansen	-	198.21[214]

Note: standard errors in parentheses; degrees of freedom in square brackets. Year dummies are included in the estimates (coefficients are omitted in the table). Estimates are derived from OLS regressions with robust clustered standard errors and two-step system GMM with finite sample correction (Windmeijer, 2005). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Robustness check (averaged variables) – Equation 1

	(1) OLS	(2) GMM
$Sales_{it-1}$	0.4836***	0.2748***
	(0.0515)	(0.0639)
Entrepreneurial team variables		
$SpecWorkExp\_avg_{it}$	0.0159**	0.0635***
	(0.0070)	(0.0205)
$DSerial_{it}$	0.0950	-0.1366
	(0.0945)	(0.2989)
$Educ\_avg_{it}$	-0.0197	0.0186
	(0.0152)	(0.0634)
$OtherWorkExp\_avg_{it}$	-0.0023	0.0055
	(0.0053)	(0.0199)
$NOwners_{it}$	0.0620*	0.2476**
	(0.0334)	(0.0976)
Firm-level controls		
Age_{it}	0.0218	0.1683*
	(0.0289)	(0.0861)
Age^2_{it}	0.0012	-0.0032
	(0.0012)	(0.0039)
Year dummies	Yes	Yes
Constant	6.5153***	7.1717***
	(0.6460)	(1.4721)
Number of observations	1560	1560
Number of firms	338	338
R^2	0.5973	-
AR(1)	-	-1.37
AR(2)	-	-1.02
Hansen	-	202.25[219]

Note: standard errors in parentheses; degrees of freedom in square brackets. Year dummies are included in the estimates (coefficients are omitted in the table). Estimates are derived from OLS regressions with robust clustered standard errors and two-step system GMM with finite sample correction (Windmeijer, 2005). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Robustness check (averaged variables) – Equation 2

	(1) OLS	(2) GMM
$Sales_{it-1}$	0.4813***	0.2651***
	(0.0510)	(0.0588)
Founding team variables		
$SpecWorkExp\_avg_{i0}$	0.0262	0.0649*
	(0.0169)	(0.0369)
$DSerial_{i0}$	0.2141	0.2626
	(0.2089)	(0.6929)
$Educ\_avg_{i0}$	0.0024	-0.0860
	(0.0389)	(0.1214)
$OtherWorkExp\_avg_{i0}$	-0.0118	-0.0638
	(0.0170)	(0.0514)
$NFounders_{i0}$	-0.0915	0.0898
	(0.0622)	(0.1659)
Entrepreneurial team variables		
$SpecWorkExp\_avg_{it}$	-0.0090	0.0335
	(0.0170)	(0.0288)
$DSerial_{it}$	-0.1026	0.0256
	(0.2098)	(0.4367)
$Educ\_avg_{it}$	-0.0242	0.0653
	(0.0400)	(0.1027)
$OtherWorkExp\_avg_{it}$	0.0078	0.0307
	(0.0165)	(0.0321)
$NOwners_{it}$	0.1288**	0.2848**
	(0.0591)	(0.1377)
Firm-level controls		
Age_{it}	0.0247	0.1524
	(0.0286)	(0.1032)
Age^2_{it}	0.0010	-0.0031
	(0.0012)	(0.0045)
Year dummies	Yes	Yes
Constant	6.6194***	7.8578***
	(0.6465)	(1.7458)
Number of observations	1560	1560
Number of firms	338	338
R^2	0.6002	-
AR(1)	-	-1.35
AR(2)	-	-1.02
Hansen	-	196.82[214]

Note: standard errors in parentheses; degrees of freedom in square brackets. Year dummies are included in the estimates (coefficients are omitted in the table). Estimates are derived from OLS regressions with robust clustered standard errors and two-step system GMM with finite sample correction (Windmeijer, 2005). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Robustness check (restricted sample) – Equation 2

	(1) OLS
$Sales_{it-1}$	0.4618***
	(0.0799)
Founding team variables	
$SpecWorkExp_{i0}$	0.0189**
	(0.0092)
$DSerial_{i0}$	0.1821
	(0.2302)
$Educ_{i0}$	-0.0102
	(0.0145)
$OtherWorkExp_{i0}$	-0.0051
	(0.0075)
$NFounders_{i0}$	0.0227
	(0.2587)
Entrepreneurial team variables	
$SpecWorkExp_{it}$	-0.0120
	(0.0093)
$DSerial_{it}$	-0.1352
	(0.2228)
$Educ_{it}$	0.0039
	(0.0126)
$OtherWorkExp_{it}$	0.0054
	(0.0079)
$NOwners_{it}$	0.0822
	(0.1873)
Firm-level controls	
Age_{it}	0.0898
	(0.0553)
Age^2_{it}	-0.0016
	(0.0022)
Year dummies	Yes
Constant	6.3582***
	(0.9806)
Number of observations	609
Number of firms	116
R^2	0.6199

Note: standard errors in parentheses; degrees of freedom in square brackets. Year dummies are included in the estimates (coefficients are omitted in the table). Estimates are derived from OLS regressions with robust clustered standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Robustness check (additional regressors and IMR) - Equation 2

	(1) OLS	(2) OLS
$Sales_{it-1}$	0.4490***	0.4756***
	(0.0512)	(0.0515)
Founding team variables		
$SpecWorkExp_{i0}$	0.0173**	0.0182**
	(0.0084)	(0.0089)
$DSerial_{i0}$	0.1774	0.2604
	(0.2044)	(0.2124)
$Educ_{i0}$	-0.0113	-0.0096
	(0.0123)	(0.0137)
$OtherWorkExp_{i0}$	-0.0046	-0.0083
	(0.0068)	(0.0072)
$NFounders_{i0}$	0.0570	0.0467
	(0.1881)	(0.2280)
Entrepreneurial team variables		
$SpecWorkExp_{it}$	-0.0110	-0.0125
	(0.0086)	(0.0091)
$DSerial_{it}$	-0.0969	-0.1267
	(0.2015)	(0.2127)
$Educ_{it}$	0.0063	-0.0007
	(0.0119)	(0.0126)
$OtherWorkExp_{it}$	0.0022	0.0056
	(0.0073)	(0.0076)
$NOwners_{it}$	0.0828	0.1592
	(0.1598)	(0.1921)
Firm-level controls		
Age_{it}	0.0413	0.0228
	(0.0289)	(0.0291)
Age^2_{it}	0.0003	0.0011
	(0.0011)	(0.0012)
Year dummies	Yes	Yes
Constant	7.2172***	6.4739***
	(0.6451)	(0.5923)
Additional variables		
Region dummies	Yes	-
$DTechAlliance_{it}$	-0.0182	-
	(0.2246)	
$DCommAlliance_{it}$	0.1156	-
	(0.1802)	
$DIncubated_{it}$	-0.0562	-
	(0.1532)	
$DPubFin\_Gov_{it}$	-0.0144	-
	(0.3104)	
$DPubFin\_Loc_{it}$	0.0496	-
	(0.1175)	
$DInternational_{it}$	1.1282***	-
	(0.1786)	
IMR	-	0.4408
		(0.3155)
Number of observations	1560	1512
Number of firms	338	331
R^2	0.6211	0.5970

Note: standard errors in parentheses; degrees of freedom in square brackets. Year dummies are included in the estimates (coefficients are omitted in the table). Estimates are derived from OLS regressions with robust clustered standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.