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A close look at the contingencies of founders' effect on venture performance

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Abstract

Studies show that founders' industry-specific experience is beneficial to venture performance. However, we know little on the contingencies associated with such an effect. Using a panel dataset of 338 Italian high-tech ventures, we find that founders' industry-specific experience positively affects venture performance. However, changes in the top management team (TMT) during the initial phases of the venture's life weaken the positive relationship between founders' industry-specific experience and venture performance, whereas founders' functional heterogeneity does not. We further find evidence of substitution effects between founders' human and social capital affecting venture performance, such that the effect of founders' industry-specific experience on venture performance is attenuated when a subset of founders had common background prior to founding their venture.

JEL classification: L25, M13, O33

1. Introduction

Founders have a profound influence on the development and performance of new ventures (Nelson, 2003; Colombo and Grilli, 2005; Delmar and Shane, 2006). Studies document that new ventures with experienced founders enhance their survival chances (Brüderl *et al.*, 1992; Gimeno *et al.*, 1997) and the likelihood of a successful exit, such as an initial public offering (Shane and Stuart, 2002). However, there is less evidence of founders' influence on other dimensions of performance, such as sales and commercialization success.

These studies take several different theoretical stances to explain the founders' effect on various organizational outcomes. For instance, the imprinting perspective (Stinchcombe, 1965) considers how the founders, in conjunction with the environmental conditions at the time of organizational founding, leave a profound "imprint" on the organizational development for an extended period of time. These studies typically highlight the persistence of certain founders' characteristics over a long period of time after venture founding (Certo *et al.*, 2001; Nelson, 2003; Shrader and Siegel, 2007) or relate initial characteristics of founders' human capital to predict venture performance (Eisenhardt and Schoonhoven, 1990; Cooper *et al.*, 1994; Almus and Nerlinger, 1999; Colombo and Grilli, 2005; Unger *et al.*, 2011; Ganotakis, 2012). However, without properly controlling for the evolution of the top

management team (TMT) over time, studies cannot properly isolate the founders' effect from other confounding organizational developmental effects (see Beckman and Burton, 2008 for a notable exception). For instance, without controlling for the entry and/or the exit of highly capable TMT members, which may be correlated with the human capital originally possessed by the founders, it would be difficult to discern whether the current firm performance is driven by the founders' human capital or simply an artifact of the present managerial conduct and strategies. As such, disentangling founders' effect from the contemporaneous effect of the human capital possessed by the TMT and comparing the relative magnitude and associated contingencies of each effect can yield important insights.

Another commonly applied perspective in explaining the founders' effect is the theory on human and social capital. Human capital refers to the innate or acquired intelligence, skills, and expertise that a given organization is endowed with by the people working in that organization (Becker, 1975; Bontis *et al.*, 1999), whereas social capital refers to the social structure among economic actors that facilitate, or inhibit, production or achievement of certain ends (Coleman, 1988; Gedajlovic *et al.*, 2013). Although studies have illuminated the importance of human and social capital on venture performance (Davidsson and Honig, 2003), whether the two types of capital are complementary or substitutes appears to be context specific. Some studies argue that human capital breeds social capital that can be utilized to enhance venture performance (Mosey and Wright, 2007; Scholten *et al.*, 2015), whereas others argue that one type of capital may substitute the other. For instance, Adler and Kwon (2002: 21) posit that "like other forms of capital, social capital can either be a substitute for or complement other resources. As a substitute, actors can sometimes compensate for a lack of financial or human capital by superior 'connections'". It is thus unclear whether and how human and social capital interact in establishing the founders' effects.

A third stream of research considers the specific type of human capital that is beneficial to venture performance. Although most studies testing the founders' effect agree that founders' human capital enhances entrepreneurial outcomes, they diverge on the relative importance of generic (or general) vis-à-vis specific human capital affecting those outcomes. Some studies postulate that entrepreneurs must be "jack of all trades and master of none" (Lazear, 2004), whereas others emphasize the importance of industry-specific human capital in recognizing and acting on an entrepreneurial opportunity (Shane, 2000; Shepherd and DeTienne, 2005; Marvel, 2013; Dencker and Gruber, 2015). Such diverging perspectives could stem from differences in mechanisms driving the founders' effect as one type of human capital may be more salient than the other in a specific context, calling for a more context-based theorization of the founders' effect.

Reconciling these different perspectives, this study examines how founders' human and social capital affect venture performance using a panel dataset of 338 Italian technology-based ventures. We observe their sales growth from 1995 (or since foundation if they were founded after 1995) to 2008 (or before if they exited the dataset before 2008). Through a longitudinal design, we first tested a baseline hypothesis on the founders' effect by considering their human capital. Although we did not find an effect of founders' generic human capital on venture performance, we found a strong and persistent effect of founders' industry-specific human capital on venture performance, even after teasing out the contemporaneous effect of the TMT industry-specific human capital. By cleanly enucleating the effect of founders' human capital on venture performance, we advance the extant state of the art and further document the importance of industry-specific human capital on venture performance (Colombo and Grilli, 2005, 2010).

Moreover, we explicitly relaxed the assumption of stable founding teams and tested how entry and exit of TMT members during the early stages of a new venture, a fairly common event (Ucbasaran *et al.*, 2003), may affect the resilience of the founders' effect on venture performance. We reasoned that greater changes (i.e. entry or exit of new members) in the TMT during the initial phases of the venture would weaken the positive effect of the founders' industry-specific human capital on venture performance as such changes would lead to greater dissipation of the founders' effect. Likewise, we reasoned that functional heterogeneity of the founding team may weaken the positive effect of the founders' industry-specific human capital on venture performance as diversity of visions and ideas by heterogeneous team members would lead to greater dissipation of the founders' effect. We found a negative and significant interaction effect of early changes in TMT members, but we did not find a significant interaction effect of the founding team's functional heterogeneity.

Finally, we explored how human and social capital interact in establishing the founders' effect. We provide theory and empirical support on how prefounding common work background of a subset of founders, proxying founders' social capital (Ruef *et al.*, 2003), may attenuate the positive effect of founders' industry-specific human capital on venture performance, even though the direct effect positively affects venture performance. We attribute the above substitution effect due to the in- and out-group dynamics. Indeed, the sharing of the same work background by

founders can increase homophily among them (Lazarsfeld and Merton, 1954), which may in turn increase their possibilities to develop close ties before and during the founding of the venture (Ruef et al., 2003).[1] The fact that only some of the founders share a common work background and develop close ties create a bulk in terms of goal orientation and trust with other team members who do not have such ties. That is, a common work background may facilitate the sharing of tacit knowledge and routines if it connotes all founders but can create tensions if some founders do not share it.

By examining the contingencies of founders' effect, this study adds to the growing literature on the mutual interrelationships between social and human capital of entrepreneurs and their impact on venture performance (Davidsson and Honig, 2003; Bosma et al., 2004; Mosey and Wright, 2007; Backes-Gellner and Moog, 2013; Grichnik et al., 2014; Scholten et al., 2015). Specifically, in addition to showing that these two dimensions interact, we advance the idea that their interaction has a long-lasting impact on ventures performance, yet under certain conditions, this interaction may partially erode the founders' effect over time.

This works provides three relevant implications for entrepreneurs and managers of technology-based new ventures. First, when designing the initial composition of founders' human capital, entrepreneurs need to put emphasis on the industry-specific expertise of the team. Differently from generic human capital (such as education and nonindustry-specific work experience), industry-specific expertise has a positive lasting effect on venture performance in terms of sales and commercialization outcomes. Second, changes in the team composition weaken the industry-specific-driven founders' effect. Thus, if the initial composition of founders is suboptimal in terms of human capital, changes in the team allow to adjust such composition of human capital, thus allegedly leading to venture outcome enhancement. Otherwise, changes in the team composition may be detrimental to venture performance. Third, diversity management is a key issue for technology-based entrepreneurs. While diversity in terms of background and experience may bring advantages to the venture in terms of, for instance, ideas, resources, creativity, social, and business linkages, such diversity likely creates a faultline within the team, that is, between the subgroup of founders with common background and those without such background. Thus, entrepreneurs need to properly anticipate these in- and out-group behavioral conflicts, that may lead to reduced levels of team cohesion, social identity and performance.

2. Founders' effect

Several studies suggest that new venture performance could be strongly influenced by initial conditions at foundation (Boeker, 1989; Brüderl et al., 1992; Pennings et al., 1998; Geroski et al., 2010). Competences at foundation are reputed to shape a venture's strategic choices and the development of the organizational routines that guide initial managerial decisions and impact long-term venture outcomes. Indeed, once an initial strategic decision is made, choices for subsequent strategic options might be significantly reduced (Gersick, 1991). This path-dependent process could influence a wide variety of venture strategies including commercialization policies (Arora and Gambardella, 2010; Conceição et al., 2012), alliance partner selection (Gulati and Gargiulo, 1999; Milanov and Fernhaber, 2009), organizational design choices (Colombo and Grilli, 2013), and hiring policies (Burton and Beckman, 2007).

An important theoretical argument underpinning the founders' effect stems from the fact that experienced and skilled entrepreneurs are more likely than inexperienced and unskilled ones to put in place better initial strategies. These initial moves can have a long-lasting effect on organizational performance. For instance, Barringer et al. (2005: 666) tell us about the Walt Disney anecdote: " . . . for years after the death of Walt Disney, Disney executives, when confronted with an important decision, would often ask aloud 'What would Walt do?' […]. Similarly, Hewlett–Packard's Rules of the Garage institutionalized the values of its innovative founders."

Several other reasons support the arguments in favor of the founders' effect. Strategic decisions typically involve "sunk costs" that cannot be recovered once allocated, and thus cause a form of decision-making inertia (Dixit and Pindyck, 1994). Arguments emphasizing "structural inertia" postulate that functional structures put in place during the initial phases of the organization will be difficult to change (Baron et al., 1999). Likewise, the organizational

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1 Quoting Ruef et al. (2003: 200): "[…] occupational attachments can be a source of homophily, as well as diversity, insofar as occupations provide a common basis of socialization and, possibly, interpersonal relationships", where (197): "[…] the mechanism of homophily implies that individuals sharing a common identity also tend to share values, beliefs, or norms." On the role of nonascriptive characteristics (like work background) in the generation of homophily see also the seminal contribution of Lazarsfeld and Merton (1954).

culture reflects the founders' cognitive biases and will be difficult to change (Schein, 1983), whereas other corporate decision makers may be influenced by the stature and gravitas of the founders (Nelson, 2003). Moreover, the mechanisms through which founders can affect entrepreneurial ventures can be both explicit and implicit. Regarding the former, founders can influence the way ventures are structured and organized through formal mission statements, the pursuit of explicit strategies, and the adoption of specific work design practices. As to the latter, founders can transmit their tacit know-how and noncodified organizational culture to their managers and employees (Schein, 1983).

2.1 The effect of founders' human capital

These arguments point toward the importance of founders' human capital on entrepreneurial performance (Eisenhardt and Schoonhoven, 1990; Davidsson and Honig, 2003; Grilli and Murtinu, 2018). We distinguish two types of human capital leading to entrepreneurial outcomes: generic or general (we use these two terms interchangeably pointing to their nonindustry-specific nature) and industry-specific human capital. Generic human capital refers to general knowledge and skillsets possessed by entrepreneurs that could be conducive to enhanced venture performance. For instance, general education and training lead to the development of generic human capital because an educated and well-trained entrepreneur could more efficiently and effectively found and manage a new venture (Becker, 1975). In contrast, industry-specific human capital refers to a particular set of knowledge and skills that could be relevant in a particular industry but would be less useful in other industries.

Although both types of human capital can be useful in recognizing entrepreneurial opportunities and founding a new venture, their relative beneficial effects remain unclear. Some studies (Lazear, 2004) emphasize the importance of generic human capital, claiming that entrepreneurs must be "jack of all trades but master of none," because new ventures typically lack resources and scale economies for labor specialization. As a result, these studies argue that entrepreneurs must handle diverse and sometimes unrelated tasks that require superior generic human capital. In contrast, other studies emphasize the importance of industry-specific human capital (Shane, 2000; Shepherd and DeTienne, 2005; Marvel, 2013; Dencker and Gruber, 2015). These studies suggest that only a subset of entrepreneurs can recognize a particular opportunity based on their prior knowledge and experience, and only those individuals with industry-specific experience would be able to carry out specific tasks relevant to the particular entrepreneurial opportunity (Kirzner, 1997). This logic stipulates that industry-specific entrepreneurial experience would lead to more favorable organizational outcomes.

We suggest that industry-specific human capital (vis-à-vis generic human capital) will positively lead to venture performance in the context of high-tech industries. Entrepreneurial opportunities in these industries often arise as a result of technological advances or incumbent firms' inability to address their customer needs (Christensen and Bower, 1996). Indeed, a large fraction of venture founders in high-tech industries are industry insiders (Agarwal *et al.*, 2004; Chatterji, 2009). Even after foundation, founders' technical and commercial competencies are often important factors leading to venture success in high-tech industries (Almus and Nerlinger, 1999; Colombo and Grilli, 2005; Ganotakis, 2012), because entrepreneurs with prior experience in their focal industry are more likely to understand the products and market needs of that particular industry and enhance venture performance due to better knowledge of commercialization practices, complementary assets, and supply chain dynamics, as compared with their counterparts without such experience, regardless of whether they possess high levels of generic human capital or not. Thus, we posit the following baseline hypothesis on the positive effect of founders' industry-specific human capital on high-tech venture performance.

> *H1: Founders' industry-specific human capital will have a positive effect on venture performance, over and above the contemporaneous effect of the TMT industry-specific human capital.*

But what are the theoretical boundaries of the founders' effect? Are there any team-specific factors that moderate such an effect? On the one hand, the founders' effect may need time after the birth of a new venture to shape the organizational routines or culture that affect the venture outcomes. Thus, we expect that the founders' effect may not materialize immediately after a venture's foundation (Crook *et al.*, 2011). On the other hand, the founders' effect may fade away with changes in the TMT and in the environment where the venture competes. Thus, the founders' effect could erode over time (Geroski *et al.*, 2010).

The life-cycle theory of the firm (Quinn and Cameron, 1983; Boeker and Karichalil, 2002) offers some perspectives to explain how the routines and cultural values at inception might not be of dramatic importance to the extent

that new ventures can "create positions as placeholders until executives with the relevant experience can be hired and the firm can be professionalized" (Beckman and Burton, 2008: 4). In contrast, the path-dependent theory of the firm (Beckman, 2006; Beckman and Burton, 2008) predicts that the impact of the founders' effect may be sticky and persistent over time. Founders' experience impacts the structure of the entrepreneurial ventures from the beginning (Baron et al., 1999; Baron and Hannan, 2002), whereas organizational changes may be problematic along the firm life cycle (Beckman and Burton, 2008). Based on these conflicting views, we develop theoretical arguments explaining how the rate of dissipation of the founders' effect is contingent on the characteristics of the founding team, including changes in its composition occurring during the early phases of the venture's life and the founding team's functional heterogeneity.

2.2 Early changes in TMT members

Changes in the composition of the TMT due to entry or exit of members can be a double-edged sword for venture performance (Chen and Thompson, 2015). On the one hand, the recruitment of new TMT members may insert fresh blood for the new ventures to become more apt adapting to environmental shifts and creating innovations (Rao and Drazin, 2002). On the other hand, frequent changes of TMT members may disrupt the establishment of organizational routines and transfer of tacit knowledge among employees, which in turn could hamper a venture's chance of survival (Geroski et al., 2010).

Although the direct effect of changes in TMT members is not clear, we suggest that changes in TMT members during the initial phases of a new venture will weaken the positive effect of founders' industry-specific human capital on venture performance. Changes of TMT members in the early phase of a new venture are likely to leave a weak legacy on the routines, culture, and practices of the newly created ventures (Hatch and Dyer, 2004; Geroski et al., 2010). Their knowledge and expertise are often tacit in nature and are difficult to codify through the production of manuals as firm values or in the form of a mission statement. Such knowledge typically takes time to be absorbed and learned by new members of the organizations (Argote et al., 2003). This is particularly the case with entrepreneurial ventures as they often lack established routines and are likely to experience greater discontinuities due to frequent turnover of employees. As a result, entry and departure of founding team members early in the ventures' life will likely weaken the positive effect of founders' industry-specific human capital on venture performance, independently from whether such entries and departures are positive or negative to the overall venture performance. Moreover, entry and exit of new TMT members will also accelerate the dissipation of the founders' effect as, on the one hand, the new members are more likely to bring fresh ideas and be less influenced by the legacy of the founders; on the other hand, founders who leave the TMT reduce the chances that "remaining" founders will imprint the venture. In contrast, when the composition of the TMT is stable during the initial phases of the new venture, the founders' effect is likely to persist over a longer period of time. We thus hypothesize a negative moderating effect of early changes in TMT on the positive relationship between founders' industry-specific human capital and venture performance.

H2: The positive effect of founders' industry-specific human capital on venture performance will be negatively moderated by changes in TMT in the initial years after venture foundation.

2.3 Functional heterogeneity of the founding team

We further suggest a negative moderating effect of the founding team functional heterogeneity on the positive effect of founders' industry-specific human capital on venture performance. Unlike large and established firms that can accommodate highly specialized division of labor, venture founders are often involved in and oversee detailed tasks that require specialized functional expertise. TMT members with relatively homogeneous functional skillsets would be counterproductive in such situations as their scope of expertise is limited. In contrast, highly heterogeneous TMT members, in terms of their functional expertise, could resolve business problems that arise in the venture's initial stages. As such, the TMT's heterogeneous functional expertise could partially substitute the prescription by Lazear (2004) in that entrepreneurs must be "jack of all trades but master of none" as greater functional heterogeneity among TMT members could partially compensate the lack of entrepreneurs with superior generic skills. Indeed, greater TMT functional heterogeneity could increase the scope of management problems that can be resolved for growing ventures.

However, we suggest that the functional heterogeneity of the founding team will weaken the founders' effect. Low levels of founding team functional heterogeneity are likely to be associated with low levels of conflicts among

team members, high levels of cohesion, and groupthink that may hamper the likelihood of ventures deviating from the initial course of actions set by the founders (Pelled *et al.*, 1999; Ensley *et al.*, 2002; Eesley *et al.*, 2014). Although the higher likelihood of perseverance of founders' influence may or may not enhance venture performance, the founders' effect is more likely to be preserved when the founding team members are more homogeneous.

In contrast, new ventures with high levels of founding team functional heterogeneity are more likely to accept diverse lines of thinking and hire heterogeneous employees who are more likely to innovate on the vision, culture, and routines set by the founders. Although diversity of ideas may enhance venture performance by increasing the dynamism and agility that new ventures may use to enhance their performance, it would reduce the direct effect of founders influencing venture performance. Taken together, this line of reasoning suggests that high founding team functional heterogeneity of new ventures will weaken the founders' effect manifested through their industry-specific human capital on venture performance.

H3: The positive effect of founders' industry-specific human capital on venture performance will be negatively moderated by the functional heterogeneity of the founding team.

2.4 Social capital of the founding team: pre-existing common work background

Another factor that may impact the strength of the effect of founders' human capital may come into existence even before the focal venture is founded. In particular, we posit that the pre-existing common work background of a subset of founders can attenuate the effect of founders' industry-specific human capital on venture performance. Common work background of founders is critical in creating reciprocity, trust, social norms, participation in networks, and social agency that bind venture founders (Ruef *et al.*, 2003). Prior studies have treated these characteristics as fundamental factors influencing the level of social capital among members in an organization (Onyx and Bullen, 2000).

Although social capital has been generally considered as a positive predictor of venture creation and performance (Davidsson and Honig, 2003) and a result of superior entrepreneurial human capital (Mosey and Wright, 2007; Scholten *et al.*, 2015), its interaction effect with founders' human capital influencing venture performance is unclear. Founding members with a common work background are more likely to share the common language, goals, and ideals that can shape the trajectory of the venture and reduce transaction costs in working together as a team (Leana and Van Buren, 1999). However, the effect of founders' human capital on venture performance will be attenuated if the common work background is only shared by a partial group of founders. The pre-existing common background of a subset of founders will prevent the founders from developing a venture-specific identity that could be developed during the initial stages of a new venture. This is because the homophily brought in by sharing a common work background (Lazarsfeld and Merton, 1954; Ruef *et al.*, 2003) will facilitate founders to develop bonds that result in routines and processes amongst themselves.

Moreover, this separation between members with common work background and those without such background will give rise to the typical in- and out-group behavior that may create a faultline between the two groups (Lau and Murnighan, 1998). Prior research suggests that this division between in- and out-group members affects the level of group cohesion and task performance (Smith *et al.*, 1994). As such, we posit that the possible division between the two groups based on common work background prior to venture founding can be an inhibitor in developing the founders' effect due to the lack of common identity in the initial stages of a new venture. That is, similar to the moderating factors described previously influencing the rate of dissipation of the effect, a common work background of some founders will depress the effect of founders' human capital.

H4: The positive effect of founders' industry-specific human capital on venture performance will be negatively moderated by the common work background of a subset of founders.

Our theoretical framework is summarized in Figure 1, where we also report the four formulated hypotheses.

3. Data and sample

We draw on a sample of 338 new technology-based firms (NTBFs). Following the gold standard definition of NTBFs, originally proposed by Arthur (1977) and then followed by the empirical literature on the topic
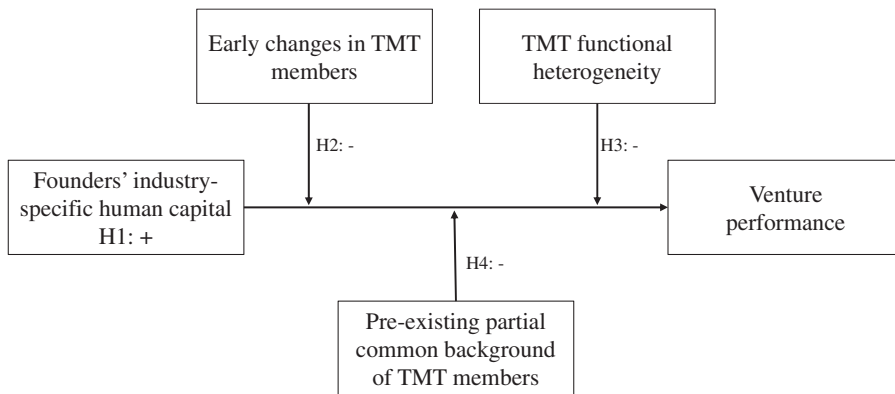
Figure 1. Theoretical model.

(Storey and Tether, 1998; Colombo and Grilli, 2005, 2010), an NTBF is an independent firm that is younger than 25 years old, is based on innovative activities, and is active in high-technology industries. Sample firms were independent at founding date (i.e. they were not controlled by another business organization even though another organization may have held minority shareholdings) and were still privately held during the observation period. They operated in the following high-tech manufacturing and service industries: information and communications technology (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; and R&D and engineering services. We observe their performances either from 1995 or from their foundation (if it is after 1995) up to 2008 (or the year when an NTBF exits the dataset due to a liquidation or acquisition event).

The sample is drawn from the Research on Entrepreneurship in Advanced Technologies (RITA) directory. The directory was created by a major Italian university in 1999 and was extended through the inclusion of new firms and was updated with new information through four different survey waves carried out in 2000, 2002, 2004, and 2008. The surveys were based on a questionnaire that was sent to the contact person of the target firms (i.e. firm owner or manager) by either fax or 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. In several cases, phone or face-to-face follow-up interviews were made with firm owner–managers. This final step provided an opportunity to collect missing data and ensured that the data were reliable. In the Appendix, we provide a detailed description of the construction of the population and the representativeness of the sample used in our analysis. By containing official data on firm status (*source*: Union of Italian Chambers of Commerce), we were able to track firm exit (due to bankruptcy or merger/acquisition) and performed the survivorship bias test reported in Section 4.1.

Among the NTBFs included as of December 31, 2012 in the RITA directory, we built the complete history of the founders' and subsequent owner–managers' human capital background for 338 firms. The complete history of the entrepreneurial teams (and human capital characteristics) was obtained directly from the survey respondents and was complemented and triangulated (when available) with the official documentation (i.e. *Telemaco* database) provided by the Union of Italian Chambers of Commerce. The survey included questions related to: (i) entrepreneurial team at foundation and its human capital (e.g. founders' identity, educational attainments, level of industry-specific and generic work experience, past entrepreneurial activity), and (ii) the subsequent evolution over time (e.g. information on the year of eventual entries of new owners and/or exits of founders, their identities and their human capital characteristics). The availability of the whole history of the entrepreneurial team represents a strong advantage compared with recent studies related to entrepreneurial teams and firm performance that were forced to rely only on data on the principal founder (Hmieleski *et al.*, 2013; Rauch and Rijsdijk, 2013). 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 to perform a rigorous test of the founders' effect hypothesis. Information provided by public data sources was also included in the RITA directory. In particular, data on firm sales between 1995 and 2008 were obtained through

firms' annual reports and balance sheets (*sources*: CERVED and AIDA—the Italian version of Bureau van Dijk's Orbis database—commercial databases).

3.1 Measures

3.1.1 Venture performance

We use sales growth as our measure of venture performance. Studies on performance of entrepreneurial ventures have shown contrasting results. One possible cause is the use of different growth measures, such as sales value (Lee et al., 2001), employment (Birley and Westhead, 1994), profitability (Spanos and Lioukas, 2001), or total assets (Achtenhagen et al., 2005). Delmar et al. (2003) argue that there is no "one best way" of measuring venture performance because it is a multidimensional phenomenon. Indeed, high-growth firms do not grow in the same way and what a "high-growth firm" is, both conceptually and operationally, depends on the growth measure used. Several scholars argue that traditional accounting-based indicators of profitability are inappropriate for NTBFs because most NTBFs are not profitable during the first few years after foundation (Shane and Stuart, 2002). As such, sales growth is typically preferred (Ardichvili et al., 1998) because it is relatively accessible, applies to (almost) all firms, is relatively insensitive to capital intensity and degree of integration (Delmar et al., 2003), and is a direct proxy of market legitimacy and penetration (Grilli and Murtinu, 2015). Accordingly, we focus on sales growth as NTBF performance.

3.1.2 Explanatory variables and descriptive statistics

Table 1 provides a summary of explanatory and control variables. *Entrepreneurial team variables* is a vector that includes four time-varying variables (measured at $t-1$) capturing the human capital endowment of the TMT. A first variable denotes the owner–managers' work experience in the same industry of their venture (*Specific Work Experience*). The other three variables capture the nonindustry-specific human capital by entrepreneurs, including the presence of serial entrepreneurs in the TMT (*Serial*), their general work experience (*General Work Experience*), and education (*Education*). We also control for the size of the venture team over time (*Owners*). The vector *Founding team variables* includes the same variables included in the vector *Entrepreneurial team variables* but *Founding Specific Work Experience*, *Founding Serial*, *Founding General Work Experience*, and *Founding Education* are measured at foundation and remain constant over time. *Founders* controls for the size of the founding team.

Variables capturing the moderating factors are the following. *Early Changes in TMT* controls for the potential exit of founders or the potential entry of owner–managers in the first 4 years after venture foundation (this 4-year cut-off point was subject to a sensitivity analysis, see footnote 4), whereas *Founding Functional Heterogeneity* counts the functional types of industry-specific work experience (i.e. technical, productive, commercial) in the founding team. Moreover, *Partial Common Work Background* controls for founding teams where at least two (but not all) founders come from the same work background—i.e. they were freelance professionals; they had the same business activities; or they worked in universities/research centers. *Full Common Work Background* controls for founding teams where all founders come from the same work background.

Table 2 provides comprehensive summary statistics of all variables used in the empirical analysis. Table 3 presents statistics related to the average changes to human capital variables over time. They are computed on the 34.32% (116 firms out of 338) of our sample firms that experienced a change in the composition of the original founding team, with an injection 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 sufficient variance in the variables of interest (minimum vs. maximum values, standard deviation values), but at the same time, a good balance between losses and injections of human capital variables across firms.

Table 4 presents the two correlation matrixes for the human capital variables measured at foundation and at time t, respectively. The two components of work experience are positively correlated in both periods, whereas other dimensions of human capital show lower (positive and negative) correlations. By construction, human capital variables show high intertemporal correlations (i.e. above 0.50). This is due to the panel data nature of our dataset and the limited degree of changes in TMT experienced by the founding teams in our sample over the observation period. Multicollinearity could be a concern in this setting. However, the variance inflation factor (VIF) test on the human

Table 1. Definition of explanatory variables

Variable	Definition
Lagged dependent variable	
$Sales_{t-1}$	Logarithm of sales value of firm i at time $t-1$
Founding team variables	
Founding Specific Work Experience	Average number of years of founders' work experience in the same industry of firm i before firm foundation
Founding Serial	One for firms with one or more founders with a self-employment experience before firm foundation
Founding Education	Average number of years of founders' education (from primary to postgraduate level) before firm foundation
Founding General Work Experience	Average number of years of founders' work experience in other industries than the one of firm i before firm foundation
Founders	Number of founders of firm i
Entrepreneurial team variables	
Specific Work Experience	Average number of years of owner–managers' pre-entry work experience in the same industry of firm i at time $t-1$
Serial	One for firms with one or more owner–managers with a previous self-employment experience at time $t-1$
Education	Average number of years of owner–managers' education (from primary to postgraduate level) at time $t-1$
General Work Experience	Average number of years of owner–managers' work pre-entry experience in other industries than the one of firm i at time $t-1$
Owners	Number of owner–managers of firm i at time $t-1$
Moderating variables	
Early Changes in TMT	One for firms with one or more founders who exited and/or with one or more owner–managers who entered by the 4th year since foundation date
Founding Functional Heterogeneity	Count variable given by the types of industry-specific work experience (technical, productive, commercial) possessed by the founding team
Partial Common Work Background	One for firms where at least two (but not all) founders come from the same work background (freelance professional job; same business activity; university faculty or activity in research centers)
Full Common Work Background	One for firms where all founders come from the same work background (freelance professional job; same business activity; university faculty or activity in research centers)
Firm-level controls	
Age	Number of years since firm foundation at year t
Age^2	Squared term of Age_{it}

capital variables of interest does not exceed the threshold of 10 (VIF = 9.17), which is often considered the rule of thumb for multicollinearity problems (Neter *et al.*, 1985; Kutner *et al.*, 2005). We ran a specific test (see Section 4.1) on a restricted sample with higher variance (i.e. composed only by those NTBFs that had experienced a change in the founding team) to reassure the robustness of our findings. Moreover, although the intertemporal correlations in our sample are high, they are not too dissimilar from those by other studies in a similar setting (Beckman and Burton, 2008).

3.2 Analytical approach

To test our hypotheses, we use an augmented Gibrat law specification (Chesher, 1979). We test H1 by estimating the following model:

$$Sales_{it} = \alpha_0 + \alpha_1 Sales_{it-1} + \beta'_1 Entrepreneurial\ Team_{it-1} + \beta'_2 Founding\ Team_{i0} + \\ + \alpha_2 X_{it} + T_t + \varepsilon_{it}.$$

where $Sales_{it}$ is the natural logarithm of yearly sales value at time t; $Entrepreneurial\ Team_{it-1}$ and $Founding\ Team_{i0}$

Table 2. Descriptive statistics of explanatory variables

Variable	Mean	Median	SD	Min	Max
Sales$_t$	12.8203	12.9528	1.8594	0	18.2802
Founding Specific Work Experience	6.2523	2.3333	8.3482	0	36
Founding Serial	0.4109	0	0.4922	0	1
Founding Education	15.2480	15.5	2.8318	5.3333	22
Founding General Work Experience	13.3635	12	8.5880	0	50
Founders	2.3473	2	1.0734	1	7
Specific Work Experience	6.0332	1.6667	7.9831	0	41
Serial	0.4076	0	0.4915	0	1
Education	15.3519	15.5	2.7260	4.8	22
General Work Experience	13.3993	12	8.4420	0	50
Owners	2.3659	2	1.1296	1	8
Early Changes in TMT	0.0675	0	0.2510	0	1
Founding Functional Heterogeneity	1.0514	1	0.7404	0	3
Partial Common Work Background	0.2495	0	0.4329	0	1
Full Common Work Background	0.2219	0	0.4156	0	1
Age	7.9350	6	5.6069	1	24

Table 3. Dynamics of entrepreneurial teams over time

Variable	Mean	SD	Min	Max
ΔSpecific Work Experience	−0.2222	2.9002	−18	15
ΔSerial	−0.0082	0.2838	−1	1
ΔEducation	0.1003	1.0268	−5.6667	9
ΔGeneral Work Experience	0.0209	3.1190	−18	15
ΔOwners	0.0525	1.1812	−3	4

are two vectors of variables capturing the stock of TMT human capital over time and at foundation, respectively; X_{it} is a vector of control variables; T_t are year-dummies and finally ε_{it} are independent and identically distributed disturbance terms.[2] Support for H1 requires that the variable capturing founders' industry-specific human capital—*Founding Specific Work Experience*—is positive and statistically significant. In fact, the vector of coefficients β_2 measures the impact that founders' human capital has on NTBFs' sales growth net of the impact of the current level of entrepreneurs' human capital. To test H2, H3, and H4, we extend this basic model by interacting the industry-specific human capital variable at foundation with founding team characteristics and founders' pre-existing common background variables affecting the extent of the founders' effect.

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 appropriate estimation techniques. Indeed, a reverse causality concern may arise in that past sales growth performance influences changes in the composition of the TMT. To address the dynamic bias and other potential endogeneity

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2   We include year fixed effects in the main specification to control for inflation and macroeconomic shocks because a Wald test confirms their statistical significance ($\chi^2(10) = 31.17$). The use of a deflated sales series leaves results unchanged. Conversely, industry effects are omitted because they are jointly insignificant in determining industry differences in firm growth dynamics ($\chi^2(7) = 2.98$). However, it is worthwhile to note that our results hold when we include industry dummies associated with the following NACE codes: ICT manufacturing (30.02, 32, 33); telecommunications services (64.2); Internet (72.60); software (72.2); biotechnology and pharmaceuticals (24.4, 73.1); robotics (29.5); aerospace (35.5); and other industries not explicitly included in the NACE classification such as energy services and nanotechnology. Different reclassifications and groupings of the above industries do not lead to significant changes in our results. All these results are available upon request from the authors.

Table 4. (a) Correlation matrix at foundation and (b) correlation matrix at time t

	1	2	3	4	5
(a)					
1. *Founding Specific Work Experience*	1				
2. *Founding Serial*	0.1257	1			
3. *Founding Education*	−0.0841	−0.1564	1		
4. *Founding General Work Experience*	0.3745	0.2626	−0.1716	1	
5. *Founders*	−0.0574	0.0735	0.0335	−0.1163	1
(b)					
1. *Specific Work Experience*	1				
2. *Serial*	0.1188	1			
3. *Education*	−0.0823	−0.1347	1		
4. *General Work Experience*	0.3664	0.2538	−0.1827	1	
5. *Owners*	−0.0240	0.0712	0.0222	−0.1119	1

concerns, we resort to the system generalized method of moments (GMM-SYS) estimator. To limit the number of instruments that can result in significant finite sample bias and avoid potential measurement errors (Roodman, 2009), we estimate our models with a reduced instrument set, with moment conditions in the interval between $t-2$ and $t-5$. The pseudo-first stage regressions ensure the robustness of our procedure: F-statistics on both the instruments in first differences and the instruments in levels are always greater than 10, which is the commonly accepted threshold (Staiger and Stock, 1997). To evaluate the relevance of all the GMM-SYS estimates, we applied different (standard in the GMM-context) tests. The Hansen tests to examine the validity of overidentifying restrictions for each regression were satisfactory. Moreover, in all GMM estimations, the autoregressive coefficient was not close to the unity, excluding any stationarity concerns.

4. Results

Table 5 presents the OLS (column 1) and GMM results (column 2). OLS estimates are shown for comparison purposes only. In the explanation of our findings, we primarily focus on the GMM results.

H1 predicts that founders' industry-specific work experience exerts a positive and significant effect on venture performance. The coefficient of *Founding Specific Work Experience* is positive and significant at the 10% level in both OLS and GMM regressions. The other variables related to human capital (*Founding Serial*, *Founding General Work Experience*, and *Founding Education*) are found to exert a negligible impact.

Founding team and entrepreneurial team variables in the same regression may lead to potential multicollinearity. The two sets of variables are somewhat highly correlated. For instance, the pairwise correlation between *Owners* and *Founders* is equal to +0.8. However, the mean VIF test on those vectors of variables is lower than the commonly used threshold of 10. It is worth noting that the inclusion of both sets of variables is the only way to isolate the founders' industry-specific human capital effect from the contemporaneous TMT effect. More importantly, the presence of multicollinearity (which does not seem to affect our data) would make our model specification a quite conservative test of the founders' effect in that the standard errors for both vectors of covariates would become larger (and not smaller) when both vectors of covariates are included (Lindner *et al.*, 2020). As a final remark, note that we tested our model excluding contemporaneous TMT effects (both with OLS and GMM) and our findings remain unaltered, with *Founding Specific Work Experience* as the only human capital variable to show a positive and statistically significant coefficient (results are available upon request).

Beside statistical relevance, we also gauge the economic magnitude of these econometric results (Schwab *et al.*, 2011). We calculate the yearly sales value of the "median" NTBF: ca. €275,700. This NTBF is a 6 years old firm whose founding team was composed by two founders with an average of 15 years of education, 12 of general work experience, 2 of industry-specific work experience, and no entrepreneurial experience (all other time-varying human capital variables are set at their median value). When calculating the sales value of the "median" firm with a

Table 5. Main results

	(1) OLS	(2) GMM
$Sales_{t-1}$	0.5136***	0.2695***
	(0.0535)	(0.0624)
Founding team variables		
Founding Specific Work Experience	0.0231*	0.0653*
	(0.0139)	(0.0339)
Founding Serial	0.0914	0.1894
	(0.1587)	(0.6978)
Founding Education	−0.0075	−0.0904
	(0.0360)	(0.1032)
Founding General Work Experience	−0.0007	−0.0522
	(0.0136)	(0.0370)
Founders	−0.0296	0.0652
	(0.0549)	(0.1558)
Entrepreneurial team variables		
Specific Work Experience	−0.0066	0.0339
	(0.0139)	(0.0283)
Serial	−0.0059	0.2129
	(0.1606)	(0.4425)
Education	−0.0102	0.0768
	(0.0367)	(0.0908)
General Work Experience	−0.0044	0.0107
	(0.0132)	(0.0348)
Owners	0.0528	0.2847*
	(0.0507)	(0.1593)
Controls		
Age	0.0254	0.1469
	(0.0285)	(0.1056)
Age^2	0.0008	−0.0028
	(0.0012)	(0.0044)
Year dummies	Yes	Yes
Constant	6.2343***	7.8416***
	(0.6873)	(1.4634)
Number of observations	1555	1555
Number of firms	338	338
R^2	0.6184	
Hansen		192.26 [214]
AR(1)		−1.26
AR(2)		−0.87

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).

*$P < 0.10$,

**$P < 0.05$,

***$P < 0.01$.

founding team with an average of 0 year (25° percentile), 11 years (75° percentile), 17 years (90° percentile), and 26 years (95° percentile) of industry-specific work experience at foundation, we find the following yearly sales values, respectively: ca. €241,900 (−12.3%), €496,100 (+79.9%), €734,100 (+166.3%), and €1,321,300 (+379.3%). Table 6 reports these findings. Overall, these results show an economically relevant effect by the founders' industry-specific work experience.

Table 7 shows the results of testing H2 (column 1), H3 (column 2), and H4 (column 3). To test H2, we add *Early Changes in TMT* and its interaction with the variable *Founding Specific Work Experience* (*Founding Specific Work*

Table 6. Economic relevance of main findings

Founding Specific Work Experience	Sales value (increase in %)
0 (25° percentile)	241,900 (−12.3%)
2 (50° percentile)	275,700
11 (75° percentile)	496,100 (+79.9%)
17 (90° percentile)	734,100 (+166.3%)
26 (95° percentile)	1,321,300 (+379.3%)

Simulation based on the estimates of Table 5, column 2. The baseline firm is a 6-year-old NTBF with all time-varying human capital variables at their median values, whose founding team is composed of two founders with an average of 15 years of education, 12 of general work experience, and no entrepreneurial experience. The years of industry-specific work experience vary according to its distribution (50°, 75°, 90°, and 95° percentiles).

Table 7. Moderating factors: early changes in TMT, functional heterogeneity, and pre-existing common background

	(1) GMM	(2) GMM	(3) GMM
$Sales_{t-1}$	0.2518***	0.2694***	0.2477***
	(0.0648)	(0.0638)	(0.0634)
Founding team variables			
Founding Specific Work Experience	0.0956**	0.1213**	0.2085**
	(0.0411)	(0.0613)	(0.0899)
Founding Serial	0.6777	0.0373	0.3179
	(0.6714)	(0.7221)	(0.6692)
Founding Education	−0.0348	−0.0922	−0.1577
	(0.0915)	(0.1120)	(0.1363)
Founding General Work Experience	−0.0486	−0.0495	−0.0533
	(0.0418)	(0.0418)	(0.0492)
Founders	0.0996	0.0548	−0.1144
	(0.1554)	(0.1676)	(0.1880)
Entrepreneurial team variables			
Specific Work Experience	0.0438	0.0340	0.0427
	(0.0276)	(0.0282)	(0.0381)
Serial	−0.0834	0.1498	−0.3591
	(0.3964)	(0.4626)	(0.6058)
Education	0.0234	0.1308	0.1511
	(0.0830)	(0.0996)	(0.1058)
General Work Experience	−0.0064	0.0135	0.0019
	(0.0302)	(0.0350)	(0.0401)
Owners	0.2494*	0.2951*	0.4226**
	(0.1434)	(0.1601)	(0.1979)
Moderating factors			
Early Change in TMT	1.0944**		
	(0.4382)		
Founding Specific Work Experience*Early Change in TMT	−0.1258***		
	(0.0478)		
Founding Functional Heterogeneity		0.4429**	
		(0.2225)	
Founding Specific Work Experience*Founding Functional Heterogeneity		−0.0496	
		(0.0441)	
Partial Common Work Background			1.6797***
			(0.6126)

(continued)

Table 7. Continued

	(1) GMM	(2) GMM	(3) GMM
*Founding Specific Work Experience*Partial Common Work Background*			−0.2160*
			(0.1140)
Full Common Work Background			0.9635
			(0.7714)
*Founding Specific Work Experience*Full Common Work Background*			−0.1286
			(0.1072)
Controls			
Age	0.1667	0.1394	0.1497
	(0.1016)	(0.1057)	(0.1266)
Age^2	−0.0039	−0.0028	−0.0028
	(0.0040)	(0.0042)	(0.0050)
Year dummies	Yes	Yes	Yes
Constant	7.8331***	6.6496***	7.8920***
	(1.4786)	(1.6284)	(1.6706)
Number of observations	1555	1555	1555
Number of firms	338	338	338
Hansen	187.62 [212]	188.03 [212]	184.99 [212]
AR(1)	−1.11	−1.18	−1.22
AR(2)	−1.02	−0.99	−1.01

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 two-step system GMM with finite sample correction (Windmeijer, 2005).

*$P < 0.10$,
**$P < 0.05$,
***$P < 0.01$.

*Experience*Early Changes in TMT*) to the model specification shown in Table 5. Consistent with H2, estimates reveal a negative and significant (at the 1% level) moderating effect of *Early Changes in TMT* on the positive relationship between *Founding Specific Work Experience* and sales growth of NTBFs. That is, changes in the composition of the TMT occurring in the first 4 years after a firm's inception reduce the effect of founders' industry-specific human capital on venture performance. As to the direct effect of *Early Changes in TMT* on the NTBFs' sales growth, we found a positive and statistically significant (at the 5% level) impact.

In terms of economic magnitude, we repeated a similar simulation exercise as the one exposed above, taking a "median" NTBF, which is now, for this specific case, 4 (and not 6) years old (see the definition of *Early Changes in TMT*),[3] and that has not experienced any changes in a founding team composed by two founders with the same human capital characteristics previously highlighted. The yearly sales value of such firm is equal to ca. €170,000. When calculating the corresponding figure for the same NTBF experiencing changes in TMT in the first 4 years after foundation, the yearly sales value of this 4 years old NTBF is ca. €392,000 (+130.59%). This magnitude changes once higher values of *Founding Specific Work Experience* are considered: ca. €299,000 (+75.88%; 75° percentile), €249,000 (+46.47%; 90° percentile), €190,000 (+11.76%; 95° percentile), and €145,000 (−14.71%; 99° percentile).

With regard to H3, we insert the variable *Founding Functional Heterogeneity* in the model to capture the range of functions (technical, productive, commercial) of industry-specific work experience that the founding team is capable

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3   We performed a sensitivity analysis by considering time limits of 2, 3, and 5 years for measuring early changes in TMT. Results (available upon request from the authors) are consistent in both economic terms and statistical significance to those reported here, whereas the moderating effect concerning the 2-year threshold loses some statistical significance, possibly due to a reduction in the number of TMT change events.

to cover—and its interaction with *Founding Specific Work Experience*. Functional heterogeneity varies between 0 (no industry-specific working experience) and 3 (industry-specific work experience in all the three functions). The interaction term is not statistically significant, with the coefficient of *Founding Specific Work Experience* which is still positive and statistically significant (at the 5% level). As to the direct effect of *Founding Functional Heterogeneity* on venture sales growth, we found a positive and statistically significant (at the 5% level) impact.

To estimate the economic magnitude of this moderating effect, we again resort to a simulation, taking as benchmark the 6 years old "median" NTBF, which did not experience any changes in the founding team. When varying the *Founding Functional Heterogeneity* index between one (median value) and two (90° percentile), the percentage increase in yearly sales value corresponds to a not negligible +40.88% (ca. €388,400). When we consider higher values of *Founding Specific Work Experience*, such percentage increase in yearly sales value becomes negative and equal to −9.75% (ca. €248,800; 75° percentile), −33.06% (ca. €184,600; 90° percentile), and −57.13% (ca. €118,200; 95° percentile). However, the coefficient of the moderating factor is not statistically significant. Thus, H3 is not supported.

Finally, H4 predicts that common background of a subset of the founding team members will negatively moderate the relationship between industry-specific experience of founders and venture performance. Specifically, we add *Partial Common Work Background* and *Full Common Work Background* and their interactions with the variable *Founding Specific Work Experience* (*Founding Specific Work Experience*Partial Common Work Background* and *Founding Specific Work Experience*Full Common Work Background*) to the model specification shown in Table 5. Consistent with H4, estimates reveal a negative and significant (at the 10% level) moderating effect of *Partial Common Work Background* on the positive relationship between *Founding Specific Work Experience* and venture performance. In contrast, the moderating effect associated with *Full Common Work Background* is not statistically significant. That is, the founders' effect, through industry-specific work experience, on venture performance is attenuated if the common work background is only shared by a partial group of founders. As for the direct effects of *Partial Common Work Background* and *Full Common Work Background* on venture sales growth performance, we find a positive and statistically significant (at the 1% level) impact of the former, whereas the impact associated with the latter is negligible.

Looking at the economic magnitude of these results, the "median" 6 years old NTBF with no changes in the founding team, exhibits a yearly sales value equal to ca. €226,000. When calculating the corresponding figure for the same NTBF where common work background is only shared by a partial group of founders, the yearly sales value of this venture is ca. €787,000 (+248.3%). This magnitude changes once higher values of *Founding Specific Work Experience* are considered: ca. €735,000 (+225.6%; 75° percentile), €703,000 (+211.3%; 90° percentile), €657,000 (+191%; 95° percentile), and €614,000 (+172%; 99° percentile).

4.1 Robustness checks

We conducted a set of robustness checks to verify the reliability of our findings. First, we focused on the moderating role of the early changes in TMT members, highlighted in the main analysis of Table 7, to see if the negative coefficient of the associated variable is confirmed when restricting the sample only to those firms experiencing some (early and late) changes in the TMT. Results are exposed in Table 8 (column 1). Incidentally, the use of this restricted sample is also useful to verify the extent to which multicollinearity concerns (see Section 3.1.2) could drive the main results on the effect of founders' industry-specific human capital. Hence, estimations are based on 116 firms (609 observations) that represent those NTBFs experiencing a change in TMT during their whole life (i.e. not necessarily in the early stages). The VIF test turns out to be equal to 6.15, lower than that in our main analysis. The results are consistent with those exposed in Table 7, still pointing to a positive and statistically significant effect of *Founding Specific Work Experience* and a negative and significant moderating effect of the variable *Early Changes in TMT*.

Second, even if GMM estimation allows to control for the potential endogenous relationship between TMT composition after foundation and venture growth, the founders' industry-specific experience and initial TMT changes may be not independent. In simple words, founders lacking industry-specific human capital may aim to compensate for such a deficiency by, for instance, enlarging their TMT and thus bringing additional expertise from new team members. However, the pairwise correlation between *Founding Specific Work Experience* and *Early Changes in TMT* is relatively low ($r = +0.11$). Furthermore, the correlation is positive, meaning that TMT changes are more likely when the founders' industry-specific expertise is relatively higher; that is, a "compensation effect" does not

Table 8. Robustness checks

	(1) GMM	(2) GMM	(3) GMM	(4) GMM
Sales$_{t-1}$	0.2688***	0.1504***	0.2454***	0.2490***
	(0.0783)	(0.0452)	(0.0693)	(0.0657)
Founding team variables				
Founding Specific Work	0.0593*	0.1872**	0.1009**	0.1018*
Experience	(0.0350)	(0.0787)	(0.0450)	(0.0528)
Founding Serial	0.1306	0.2926	0.7169	0.6077
	(0.6590)	(0.9116)	(0.4579)	(0.7309)
Founding Education	0.0148	−0.1245	−0.0020	−0.0413
	(0.0871)	(0.2125)	(0.0946)	(0.1058)
Founding General Work	−0.0267	−0.1150	−0.0462	−0.0601
Experience	(0.0431)	(0.0831)	(0.0387)	(0.0569)
Founders	−0.0010	−0.2411	0.0703	0.0252
	(0.1792)	(0.2683)	(0.1724)	(0.2241)
Single Founder				−0.4278
				(0.8348)
*Single Founder*Manufacturing*				0.4241
				(1.5746)
Entrepreneurial team variables				
Specific Work Experience	−0.0001	0.0178	0.0295	0.0352
	(0.0324)	(0.0353)	(0.0350)	(0.0371)
Serial	−0.4286	0.1631	−0.2150	0.0372
	(0.6662)	(0.5350)	(0.4803)	(0.4943)
Education	0.0257	0.0406	−0.0223	0.0265
	(0.0789)	(0.1259)	(0.0787)	(0.0898)
General Work Experience	0.0487	0.0309	0.0016	0.0029
	(0.0465)	(0.0501)	(0.0275)	(0.0300)
Owners	0.2214*	0.4425	0.2111*	0.2787
	(0.1306)	(0.4243)	(0.1269)	(0.1991)
Moderating factors				
Early Change in TMT	1.4633***		1.1783*	1.2457*
	(0.5693)		(0.6747)	(0.6937)
Founding Specific Work	−0.0805**		−0.1346***	−0.1402**
*Experience*Early Change in TMT*	(0.0389)		(0.0513)	(0.0590)
Entry in TMT		0.5732		
		(0.8956)		
Exit from TMT		1.3654		
		(0.9975)		
Founding Specific Work		−0.1471*		
*Experience*Entry in TMT*		(0.0784)		
Founding Specific Work		−0.1608*		
*Experience*Exit from TMT*		(0.0884)		
Controls				
Age	0.1996**	0.2958***	0.1642**	0.1655
	(0.0850)	(0.0982)	(0.0695)	(0.1046)
Age^2	−0.0037	−0.0085**	−0.0034	−0.0037
	(0.0043)	(0.0039)	(0.0028)	(0.0042)
Manufacturing				0.2198
				(0.7413)
IMR			0.3824	
			(0.5159)	

(continued)

Table 8. Continued

	(1) GMM	(2) GMM	(3) GMM	(4) GMM
Year dummies	Yes	Yes	Yes	Yes
Constant	6.2489***	9.8182***	8.0318***	7.9767***
	(1.7084)	(3.0123)	(1.6653)	(1.6483)
Number of observations	609	1555	1507	1555
Number of firms	116	338	331	338
Hansen	76.45 [148]	199.75 [211]	169.30 [194]	184.65 [209]
AR(1)	−1.03	−0.40	0.32	−0.83
AR(2)	−1.05	−0.76	−0.77	−1.09

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 two-step system GMM with finite sample correction (Windmeijer, 2005).

$*P < 0.10$,
$**P < 0.05$,
$***P < 0.01$.

seem to be present in our data. Moreover, in Table 8 (column 2) we split TMT changes into entry and exit events: namely, *Entry in TMT* (*Exit from TMT*) is a dummy that equals one whether the number of owner–managers in the first 4 years after venture foundation is higher (lower) than the number of founders. Our results indicate that both entry and exit events do attenuate the main effect of founders' industry-specific human capital on venture performance.

Third, we tested for the possibility of survivorship bias in our sample because 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 dataset because of several events, including cease of operation, bankruptcy, or merger/acquisition with/by another firm. Following Semykina and Wooldridge (2010), we implemented a variable-addition test to detect potential survivorship bias in our data. For each year, from an exit equation estimated by means of a probit model, we computed the inverse Mills ratio 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 dataset. We included firm size, firm age, and other control variables. The exclusion restriction is a dummy that equals one for academic ventures, that is firms with at least one founder with previous research work experience in a university, and zero otherwise.[4] We take again the augmented specification with *Early Changes in TMT Members* as a reference model, whose estimation results are reported in Table 8 (column 3).[5] The coefficient of the inverse Mills ratio *(IMR)* is not significant, thus suggesting the absence of any remarkable survivorship bias in our estimates. Moreover, the results were still consistent with those in Table 7 (column 1).

Fourth, our results may be driven by a potential "single founder effect." Reasons are several: for instance, single founders (i) do not experience conflicts of views with other founders, and thus the imprinting process may be easier and faster; (ii) may be more likely than teams to grow less or at a slower pace; and (iii) do not experience faultlines driven by different backgrounds within the team. In our sample 79 out of 338 (23%) ventures have been founded by

4   Considering a similar sample of Italian NTBFs as the one considered here, a prior study detected how academic NTBFs exhibit "peculiar genetic characteristics" compared to nonacademic ones. The authors (Colombo and Piva, 2012) highlight how these characteristics impact NTBFs' exit rates. The analysis of a similar sample of Italian NTBFs (Colombo et al., 2010) does not reveal any strong statistical linkage between the academic nature of the firm and its performance, ensuring us on the use of our exclusion restriction.

5   All robustness checks performed here were repeated on all the other moderating factors explored in Table 7 and they all confirm both the statistically low moderating effect of functional heterogeneity and the negative and statistically significant interaction of pre-existing partial common work background of founders. Results are available upon request from the authors.

a single founder. Furthermore, the tendency to found a venture alone or with a team may relate to industry characteristics; for instance, manufacturing sectors are more capital intensive, and thus ventures are more likely to require more resources from the beginning than in the case of service industries. Thus, single founders may be not endowed with all the necessary resources to operate in manufacturing industries. In our sample, 171 out of 338 (50.6%) ventures are in manufacturing industries, and 39 of them (almost 23%) are led by a single founder. We augmented the model specification in Table 8 (column 1) with the dummy variable *Single Founder* indicating whether a new venture was founded by a single entrepreneur, the dummy *Manufacturing* that equals one if the venture operates in a manufacturing industry, and the interaction of these two variables. Results in Table 8 (column 4) fully confirm our main findings; plus, all the three added variables are not statistically significant.

We performed several other unreported tests that are not presented here for space reasons but are available upon request. First, we used alternative strategies for the operationalization of our variables. We estimated the models using the total number of years of education and work experience of founders, and of owner–managers of firm i at time $t-1$ (rather than the averaged values across entrepreneurial teams). Moreover, *Specific Work Experience* was augmented year-by-year because entrepreneurs may acquire industry-specific work experience as their NTBFs operate in high-tech industries. Results in all these models were consistent with our main results.

We also included additional firm-level explanatory variables to control for potential confounding factors. The high number of instruments makes the use of GMM-SYS problematic and we relied solely on OLS. The first additional explanatory variable is an impulse dummy that takes value one in the year the NTBF i established a technological or a commercial alliance. We also included a dummy variable that takes the value one if the 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). To capture the effects of government support, we included two dummy variables that equal to one if the NTBF i received any public financing by the central government or by a local government. Lastly, we included a dummy variable to capture whether the NTBF i has (at least) one subsidiary in a foreign country. We also controlled for geographical location by including a series of Italian regional (NUTS 2 level) dummies. The results of the estimates including these additional explanatory variables were consistent with those already presented.

Finally, 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 and are likely to weaken the positive relationship between entrepreneurs' human capital and firm growth (Colombo and Grilli, 2010). To control for that possibility, we ran regressions excluding VC-backed firms from our estimates. Again, the results were consistent with our main findings.

5. Discussion and conclusion

We explored the existence and the contingencies associated with the effect of founders' human capital on venture performance. Using a sample of NTBFs, we examined the effects of founders' generic (or general) and industry-specific human capital affecting venture performance, after controlling for the contemporaneous effect of the TMT human capital characteristics. We found that industry-specific human capital positively affected venture performance, whereas generic human capital did not. We further examined the contingencies moderating the effect of founders' industry-specific human capital. First, we found that both changes in the TMT during the initial years after the foundation of new ventures and founders' functional heterogeneity within their industry-specific work experience both positively impacted venture performance. However, only early changes in the TMT (in the form of both entries of new members or exits of founders) are found to weaken the positive effect of founders' industry-specific human capital, whereas the moderating effect of founders' functional heterogeneity is found to be statistically negligible albeit its economic importance. Second, we found a negative moderating effect of pre-existing common work background of a subset of founders on the relationship between founders' industry-specific human capital and venture performance, even though such common background had a positive and significant direct effect on venture performance. It appears that when common work background is only shared by some members of the founding team, it acts as a substitute for the effect of founders' human capital.

This study contributes to the investigation of founders' effects and entrepreneurship in several ways. First, although many prior studies have produced evidence in line with various forms of founders' effects influencing organizational outcomes (Brüderl *et al.*, 1992; Delmar and Shane, 2006; Beckman and Burton, 2008), only a few of them had the possibility to control for ongoing changes in the composition of the entrepreneurial teams (see Beckman and

Burton, 2008 for an exception). Instead, our longitudinal setting enabled us to relax the assumption of stable teams over time and test the founders' effect, by explicitly controlling for TMT changes over time. We then theorized contingencies under which the founders' effect might be stronger or weaker, and demonstrated that changes in the TMT composition during the initial phases of a new venture and prefounding common work background of a partial group of founders may attenuate the effect of the founders' industry-specific human capital. By considering these mechanisms, this study may shift the stream of research on the founders' effect toward explaining the contingencies associated with such an effect. From a theoretical perspective, our analysis points toward the importance of a path-dependent perspective of organizations (Nelson and Winter, 1982), but at the same time, it provides evidence that this continuity and its effect on venture performance strongly rely on the initial incidents of an organization.

Indeed, our results suggest that the founders' effect impacting venture performance may not be instilled instantaneously but requires founders' on-going involvement over the infancy stages of the organization. In this respect, our work provides some empirical support for Teece and Pisano's (1994: 553) claim that "because of imperfect factor markets, or more precisely the non-tradability of 'soft' assets like values, culture, and organizational experience, [...] capabilities generally cannot be bought; they must be built." These results are also consistent with the "path creation perspective" in that entrepreneurial ventures can influence how initial conditions affect their subsequent paths (Garud *et al.*, 2010; Bodas Freitas and Lawson, 2019). Moreover, the background of founders prior to the venture founding event may also influence the development of the founders' effect.

Second, this study provides novel insights on the debate between generic and industry-specific human capital on entrepreneurial success. Some scholars (Lazear, 2004) emphasize the role of general human capital in managing new ventures that lack resources and scale economies, yet others (Shane, 2000; Shepherd and DeTienne, 2005; Marvel, 2013) point toward industry-specific experience as a catalyst in recognizing and executing entrepreneurial endeavor. Our view is that the benefits of each type of capital are context specific. Our study shows that, at least in the context of high-tech industries, founders' industry-specific human capital is more valuable for new ventures compared with their generic human capital. This is perhaps because these industries require highly specialized knowledge to recognize and grasp entrepreneurial opportunities. However, our results also reveal that functionally heterogeneous TMTs can partially substitute the generic human capital required to grow by new ventures. Moreover, although functional heterogeneity of founders generally enhances venture performance, its moderating effect in strengthening or weakening the effect of founders' effect is not statistically significant despite its economic magnitude.

Third, we show another potential "dark side aspect of social capital" (Gedajlovic *et al.*, 2013). Indeed, several studies highlight nuances of the impact of social capital on ventures performance while posing a temporally contingent relationship between the two constructs and suggesting that the value of social capital often changes over time (Gedajlovic *et al.*, 2013) and life-cycle stages (Davidsson and Honig, 2003). Although our findings do not revert these arguments, this study nonetheless indicates that different mixes of social capital at the inception of founding teams have durable effects on the development and subsequent performance of a venture. That is, social capital does not only affect and contribute to shape current possibilities but it also affects the way founders imprint the venture with their human capital, and in doing so, it produces an enduring effect on its own. Although we could not push this investigation deeper due to data limitations, particularly on the side of founders' social capital measures, we advocate further investigation on the effect of founders' social capital on venture outcomes.

This study has several other limitations, which may provide opportunities for future studies. First, our results are based on a sample of Italian high-tech firms. Replications of our findings in other industry and country settings are warranted. Specifically, we call for further studies to explore the context-specific nature of the value of generic and industry-specific human capital in recognizing and executing entrepreneurial opportunities. Furthermore, contingencies of the founders' effect might also be highly context specific. For instance, macroeconomic or industry-specific turbulence could be a factor affecting the dissipation of the founders' effect. Thus, future studies may wish to further explore other firm- and environmental-specific contingencies. Second, our longitudinal sample presents a sufficient but limited degree of turbulence measured by the changes in TMTs over time as slightly more than one-third of our sample ventures experienced early entry or exit of one or more members in the TMT. Estimating the relationship of interest in more turbulent environments in terms of changes in TMTs could represent an important test of the validity of our findings. Relatedly, the Italian NTBFs here sampled are generally reluctant to hire external managers at foundation and thereafter (see Colombo and Grilli, 2013). This prevented us to analyze if top executives besides founders could also exert a potential founders' effect on their own. Finally, technology-based ventures are likely to suffer from horizontal agency costs among founders (Colombo *et al.*, 2014). Future research may investigate how the presence

and the type of these agency costs influence the ability and the chances of founders to imprint their venture, the duration of the founders' effect, and the potential creation of team faultlines.

Despite the aforementioned limitations, the present study highlights the importance of the effect of founders' human and social capital on venture performance and explains its contingencies. In doing so, it offers novel and interesting insights on the dynamics between founders of entrepreneurial ventures and the long-term performance of those ventures.

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Appendix

Population construction and sample representativeness

The use of official statistics in the domain of Italian NTBFs can be challenging for several reasons. First, most individuals who are defined as self-employed in Italy by official statistics (i.e. "independent employees") are actually salaried workers with atypical employment contracts. Unfortunately, such individuals cannot be distinguished from owner–managers of a new firm on the basis of official data. Hence, the official number of NTBFs is enormously inflated, particularly in industries 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 NTBFs.

We therefore resorted to several different information sources to obtain a reliable description of the population of Italian NTBFs. Accordingly, the construction of the population used information from a wide array of sources including:

i.　list of the companies that are members of the national entrepreneurial associations of the focal industries;

ii.　list of the members of the regional sections of the main Italian organization representing manufacturing and services companies (Confindustria);

iii.　list 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.　list of companies that participated in the most important industry trades and expositions;

v.　list of companies that purchased advertising services in popular off-line (e.g. Kompass) and on-line (e.g. Infoimprese.it) directories;

vi.　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 NTBFs that were incubated in a science park or in a BIC affiliated with the respective national associations;

viii. the population of NTBFs that obtained equity financing from VC investors included in the Italian financial investor association (AIFI);
  ix. the population of VC-backed NTBFs that were included in the Thomson One database; and
   x. information provided by the national financial press, specialist magazines, and industry studies.

For each firm, the name of a contact person (i.e. one of the owner–managers) and his/her personal email address was collected to administer the questionnaire. The data collection process throughout the different survey waves ensures representativeness (in terms of geographic location and industry affiliation) with the population of active Italian NTBFs in that specific time period. 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, nongrowth-oriented firms, and other nonentrepreneurial entities.

As of December 31, 2012, the RITA directory contained information on 1,979 NTBFs. The complete history of the whole founders' and subsequent owner–managers' human capital background and complete information on the dynamics of TMTs in terms of changes in TMT members were available for a sample of 338 firms, which is the sample on which our analysis is based. Finally, we note that there are no statistically significant differences between the distribution of the 338 sample firms across geographic areas and industries of operation and the corresponding distribution of the RITA population from which the sample was drawn ($\chi^2(19) = 19.34$ and $\chi^2(9) = 16.07$, respectively).