Human capital signals and entrepreneurs' success in equity crowdfunding

Evila Piva & Cristina Rossi-Lamastra

Grounding on research about the role of sig-nals in the attraction of equity finance, this paper studies the effects of diverse human capital signals on entrepre-neurs' success in equity crowdfunding. We argue that the human capital of an entrepreneur, who launches (alone or with other teammates) an equity crowdfunding campaign to finance her start-up, constitutes a set of signals of the start-up quality. The impact of each human capital signal on entrepreneur's success in equity crowdfunding depends on both signal fit with start-up quality and signal ambiguity. Empirical estimates on 284 entrepreneurs who launched equity crowdfunding campaigns indicate that only entrepreneurs' business education and entrepreneurial experience, two human capital signals that have both a good fit with start-up quality and a low degree of ambiguity, significantly contribute to entrepreneurs' success in equity crowdfunding.

Keywords Equity crowdfunding . Signalling theory. Human capital signals . Signal fit . Signal ambiguity

JEL classification D82 . G11 . G23 . M13 . L26

1 Introduction

The global crisis started in 2008 has drastically reduced bank borrowing (Kahle and Stulz 2013) and venture capital investments (EVCA 2013), thus urging entrepre-neurs to search alternative sources of finance for their start-ups. This has fuelled the rise of equity crowdfunding, a crowdfunding model in which entre-preneurs make an open call for selling equity shares of their start-ups to the crowd of Internet users (Ahlers et al. 2015, p. 955). Despite the increasing popularity of this model, available empirical evidence suggests that only few entrepreneurs succeed in financing their start-ups through equity crowdfunding (Vulkan et al. 2016), and we still know little on the drivers of their success.

Many contributions have explored success factors in reward crowdfunding (for a review of these studies, see Butticè et al. 2017); however, the peculiarities of the equity model limit the generalizability of these re-sults and call for further research that explicitly focuses on entrepreneurs' success in equity crowdfunding.

Scholars concur that the high information asymmetries faced by crowdfunding investors are the main obstacle for the entrepreneurs who aim to collect equity finance for their start-ups on the Internet. Crowdfunding investors are usually non-professionals, who interact with entrepreneurs in search for funds only in virtual settings (Drover et al. 2017,p.24),lackprior investing experience (Block et al. 2017) and have to make their investment decisions within a short time window (Courtney et al. 2016). Consequently, these investors encounter severe difficulties in assessing the

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E. Piva (✉) · C. Rossi-Lamastra
Department of Management, Economics and Industrial Engineering, Politecnico di Milano, via Lambruschini 4/b, 20156 Milan, Italy
e-mail: evila.piva@polimi.it

C. Rossi-Lamastra
e-mail: cristina1.rossi@polimi.it

unobserved quality of the start-ups for which entrepreneurs search equity finance. Grounding on the *signalling theory* (Spence 1973, 2002), several studies on equity crowdfunding highlight that entrepreneurs can alleviate the information asymmetries faced by investors by showing attributes and taking actions which *signal* their start-ups' quality. These actions and attributes include holding a patent (Block et al. 2017), having won governmental grants, having been financed by business angels (Ralcheva and Roosenboom 2016) or investors with a public profile on a crowdfunding platform (Vismara 2016a) and retaining equity finance of the start-ups (Vismara 2016b). Moving from the premise that entrepreneurs' human capital is an important signal for professional investors (e.g. venture capitalists and banks; Robb and Robinson 2014), Ahlers et al. (2015) investigate its effectiveness as a signal for non-professional crowdfunding investors. The authors broadly capture this human capital by using the number of start-ups' executive and non-executive directors and the share of them holding an MBA (*op. cit.*, p. 966). In our opinion, such an approach has two weaknesses. First, by resorting to aggregate measures, the authors disregard that the individual dimension may matter in the equity crowdfunding context. Such a dimension is obviously important for the entrepreneurs who run their start-ups alone.[1] Moreover, it is reasonable to expect that, even in case of entrepreneurs who run their start-ups with peers, the human capital of *each* entrepreneur signals the start-up quality to uniformed crowdfunding investors. Indeed, while professional investors are able to evaluate an entrepreneurial team as a whole and to assess the complementarities of its members' human capital (e.g. Kaplan and Strömberg 2004), crowdfunding investors lack the investment experience necessary to make such a holistic evaluation. Thus, they likely consider each team member individually. The well-known serial entrepreneur who has already launched several successful start-ups is a case in point. Crowdfunding investors may think that, if this entrepreneur searches for equity finance on the Internet for a new venture, the quality of this start-up must be high, because the skills and competences that she accumulated in her long-lasting entrepreneurial activity should allow her to identify and, subsequently, exploit valuable business opportunities. In other words, the human capital of this serial entrepreneur is enough to signal the quality of her start-up, be her a solo entrepreneur or part of a team. Second, the measures used by Ahlers et al. (2015) do not allow to take into account that human capital encompasses several dimensions, which span diverse fields and areas (e.g. Carmeli 2004). These diverse dimensions may be differently effective in reducing the information asymmetries faced by crowdfunding investors. Hence, the human capital of each entrepreneur should be theoretically regarded and empirically assessed as a *set of diverse signals*.

Moving from these premises, in this work, we show that the signalling effect of entrepreneurs' human capital dimensions depends on the *signal fit*, i.e. the correlation with the unobserved start-up quality (Connelly et al. 2011), and the *signal ambiguity*, i.e. the information clarity of the signal (Park and Patel 2015). Specifically, as we explain in Sect. 2, we expect that, for uninformed crowdfunding investors, entrepreneurs' formal education in economics and management (i.e. *business education*) and in fields related to the industry where their start-ups operate (i.e. *industry-related education*) are signals with a good fit with the quality of the start-ups that the entrepreneurs run. Thus, business education and industry-related education are more effective than entrepreneurs' education in other fields in alleviating the information asymmetries between crowdfunding investors and entrepreneurs. Therefore, entrepreneurs with business education and industry-related education are more likely to succeed in equity crowdfunding than entrepreneurs with education in other fields. The same holds for the work experience that entrepreneurs gained in running one or more ventures (i.e. *entrepreneurial experience*) and/or in being employed in the industry where their start-ups operate (i.e. *industry-specific work experience*) in comparison with other types of work experiences.

Then, we note that the aforementioned human capital signals have different degrees of ambiguity. Crowdfunding investors can easily infer that entrepreneurs' business education and entrepreneurial experience are useful in the entrepreneurial profession and thus associate these human capital signals to a higher start-up quality. Conversely, they encounter more difficulties in relating entrepreneurs' industry-related education and industry-specific work experience to start-up

[1] Interestingly, the number of solo entrepreneurs who search for equity finance on the Internet is not negligible. For instance, in the sample we use in the present study, more than 10% of the entrepreneurs run their start-ups alone.

quality. Therefore, entrepreneurs with business education and entrepreneurial experiences are more likely to succeed in equity crowdfunding than those with industry-related education and industry-specific work experience.

Results on a sample of 284 entrepreneurs that launched equity crowdfunding campaigns in Italy between mid-2012 and December 2013 support the above arguments.

The paper proceeds as follows. In Sect. 2, we formulate our research hypotheses. Sect. 3 describes the methodology we used to collect and analyse the data, while Sect. 4 reports the results of the empirical analysis. Sect. 5 concludes the paper by summarizing its findings, discussing its contribution, acknowledging its limitations and suggesting directions for future research.

2 Research hypotheses

Information asymmetries are a key challenge for the entrepreneurs who search equity financing for their start-ups (e.g. Hoenig and Henkel 2015). An entrepreneur who runs a start-up is better informed about its quality than any external resource providers, who can hardly assess the start-up quality (Shane and Stuart 2002). Accordingly, the entrepreneur has incentives to take actions and show attributes (of herself and/or of her start-up) that work as signals of start-up quality and, thus, reduce the information asymmetries faced by external investors. While making their investment decisions, investors use these signals to distinguish high-quality start-ups from low-quality ones (for a discussion in case of IPOs, see, e.g. Park and Patel 2015).

We expect signals to be particularly important in the context of equity crowdfunding where information asymmetries between entrepreneurs and investors are particularly severe. Equity crowdfunding campaigns have a limited duration (Skirnevskiy et al. 2017), and the interactions between the entrepreneurs who launch the campaigns and (potential) investors occur mainly online (Baucus and Mitteness 2016). Therefore, crowdfunding investors—who are mostly non-professionals with limited past investing experiences (Agrawal et al. 2014)—cannot conduct an in-depth face-to-face due diligence and/or engage in wide-range investigations about the start-ups for which entrepreneurs are searching for funding. Consequently, when making their investment decisions, these investors have to look for signals of start-ups' quality among the information that the entrepreneurs made available on the crowdfunding platform and/or easily accessible on the Internet. In line with the entrepreneurial finance literature, we state that entrepreneurs' human capital ranks prominently among these signals.

As signals are costly and the payoff of sending them is higher for high-quality agents than for low-quality ones (Spence 1973), just the former agents have incentives to send them. Hence, signals distinguish high from low-quality agents. Within this framework, Spence (1973) states that *education* is a human capital signal that distinguishes high ability workers from low ability workers, allowing the former to obtain better salaries. Overall, education is costly to acquire due to tuition fees and time for completing educational programs. However, it is less costly for high ability workers—who, for instance are faster in completing educational programs—than for low ability ones. Accordingly, only the former invest in education as they are the only workers for which the increase in salary associated to the educational attainments compensates education costs. By grounding (sometimes implicitly) on Spence's approach, the entrepreneurial finance literature documents that entrepreneurs' education favours the attraction of equity capital by certifying start-ups' quality to external investors (Franke et al. 2008; Hsu 2007). The over-arching idea of this research strand is that better educated entrepreneurs are smart individuals (Certo 2003), who can leverage what they learnt in their educational programs for creating higher quality start-ups. In line with these arguments, Ahlers et al. (2015) describe the possession of an MBA title as an effective human capital signal in equity crowdfunding. An MBA title is indeed costly to acquire and payoffs just for clever individuals, to whom it confers better managerial and decision making skills and greater ability to identify and enact opportunities (e.g. Lewis et al. 2014). Hence, by showing their MBA titles in the offering documents, entrepreneurs do reduce the information asymmetries faced by crowdfunding investors, thus increasing their probability of successful fundraising.

We expand on these arguments and claim that entrepreneurs can obtain education in different *fields*. These diverse educational attainments are differently effective as signals of start-up quality for equity crowdfunding investors. In particular, we distinguish business education, industry-related education and education in any other fields (hereafter, simply referred to as *other*

education) and we argue that these signals differ as to their fit, i.e. their correlation with unobserved start-up quality.

Entrepreneurs' business education is a signal with a good fit for crowdfunding investors. Evidence exists that individuals select and complete successfully the educational programs, which are closer to their innate inclinations and abilities (see, e.g. Wang and Degol 2013). Accordingly, crowdfunding investors, who observe entrepreneurs with education in economics and management, likely infer that they possess innate abilities to identify and enact business opportunities, assess the viability of their business, evaluate costs and organizational structures, develop better business and marketing plans, make sense of how markets work and understand customers' needs and their competitive environment. Investors also expect that, by completing educational programs in business and economics, entrepreneurs have further sharpened their innate abilities by learning the appropriate tools, theories and techniques. As these abilities are *highly specific* (Marvel 2013: 404) to the entrepreneurial profession—i.e. they are particularly useful for running a venture (see Robinson and Sexton 1994 for a similar argument)—entrepreneurs' business education strongly correlates with their start-ups' quality.

A similar reasoning applies to entrepreneurs' industry-related education, which likely has a strong correlation with start-up quality—i.e. it is a signal with a good fit for crowdfunding investors. Indeed, entrepreneurs with industry-related education possess skills that allow them to operate successfully in the industry: they can master industry-specific technologies, solve industry-specific technical problems and understand industry-specific customers' needs (Lofstrom et al. 2014). Conversely, the skills that entrepreneurs acquired through education in any other fields are probably less applicable in the entrepreneurial profession. For instance, it is reasonable to expect that a degree in arts and humanities is of a limited help for an entrepreneur in running a software start-up. Thus, entrepreneurs' other education is a signal with a worse fit than entrepreneurs' business education and industry-related education. Accordingly, we expect that these latter signals are more effective in reducing the information asymmetries faced by crowdfunding investors and, thus, are more likely to lead entrepreneurs to success in equity crowdfunding. This prediction is in line with findings of the entrepreneurial finance literature, which shows that the business education and industry-related education of the entrepreneurs certify their start-ups' quality and increase their probability of raising equity capital from external investors (see, e.g. Becker-Blease and Sohl 2015; Cohen and Dean 2005; Hsu 2007; Hustedde and Pulver 1992; Zimmerman and Zeitz 2002 among the others).

The above arguments lead to hypotheses 1 and 2.

> H1. Entrepreneurs with business education are more likely to succeed in equity crowdfunding than entrepreneurs with other education.
> H2. Entrepreneurs with industry-related education are more likely to succeed in equity crowdfunding than entrepreneurs with other education.

In a similar vein, we claim that entrepreneurs can obtain work experience in different *areas of expertise.* These diverse work experiences are differently effective signals for equity crowdfunding investors. In particular, we argue that entrepreneurial experience, industry-specific work experience and any other types of work experiences (hereafter simply referred to as *other work experience*) are differently correlated to start-up quality (i.e. they differ as to the signal fit).

Prior studies show that both venture capitalists and business angels attach a high value to entrepreneurial experience, when making their investment decisions (Carpentier and Suret 2015; Gimmon and Levie 2010). Building on this evidence, we contend that entrepreneurial experience is a signal with a good fit with start-up quality. Experienced entrepreneurs likely have superior innate abilities in searching and enacting the best opportunities (for a recent discussion on serial entrepreneurs' innate abilities see, e.g. Spivack et al. 2014). Moreover, in their prior self-employment episodes, they have developed the comprehensive set of skills and competences, which are fundamental in the entrepreneurial profession (Lazear 2004, 2005) and allow them to effectively play multiple roles (being simultaneously managers, accountants, technicians, salespersons and so on). In addition, while running their prior ventures, serial entrepreneurs have likely established social relations with customers and suppliers, which have now become a crucial resource for their new start-ups. Important skills and social relations may be developed through both successful and unsuccessful self-employment episodes. In particular, failures are learning occasions through which entrepreneurs may revise

expectations and approaches to entrepreneurship (Sitkin 1992; McGrath 1999). In line with this view, evidence exists that external investors appreciate also unsuccessful entrepreneurial experiences (Hsu 2007).

Also, industry-specific experience is a signal with a good fit with unobserved start-up quality. Crowdfunding investors can likely easily infer that an entrepreneur, who has already worked in the industry where her start-up operates, is familiar with the start-up's environment (for a similar argument, see Cohen and Dean 2005); has in-depth industry-specific knowledge of technologies, production processes and competitive dynamics (e.g. Burton et al. 2002; Behrens et al. 2012; Gimeno et al. 1997); and, thus, she has a superior ability to grasp opportunities in the industry (Feeser and Willard 1990). Moreover, having worked in the start-up's industry in the past, the entrepreneur has likely developed social contacts with customers, suppliers and other relevant stakeholders, which she can leverage in her start-up. As both industry-specific knowledge and industry-specific social capital are valuable resources for an entrepreneur (Shepherd 1999), industry-specific experience points to high start-up quality. Conversely, the skills and contacts that an entrepreneur developed through other work experience are less easy to leverage in the focal start-up. For instance, while working in the software industry, an entrepreneur likely developed sophisticated knowledge on programming languages and algorithms for software optimization. Clearly, these skills are hardly applicable while running a biotech start-up. Hence, entrepreneurs' other work experience is a signal with worse fit than entrepreneurial experience and industry-specific work experience. Hence, we expect that these latter signals are better able than other work experience to reduce the information asymmetries faced by crowdfunding investors and, ultimately, to drive entrepreneurs towards success in equity crowdfunding. We thus put forth hypotheses 3 and 4.

> H3. Entrepreneurs with entrepreneurial experience are more likely to succeed in equity crowdfunding than those with other work experience.
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> H4. Entrepreneurs with industry-specific work experience are more likely to succeed in equity crowdfunding than those with other work experience.

However, the effectiveness of a signal depends not only on its fit, but also on its level of *ambiguity*, i.e. the extent to which a signal is clear, not noisy and not open to multiple interpretations (Park and Patel 2015; Arnold et al. 2010). The less ambiguous a signal, the higher its effectiveness is, because it is easier for the receiver to attach a meaning to the signal and use it to infer its sender's unobserved quality (Epstein and Schneider 2008). We argue that, in the context of equity crowdfunding, entrepreneurs' business education and entrepreneurial experience are less ambiguous signals than industry-related education and industry-specific work experience, respectively.

Business education relates to entrepreneurs' abilities to face and make sense of competitive dynamics, understand cost structures and organize resources. All these abilities are clearly useful in the entrepreneurial profession, and thus, crowdfunding investors can unambiguously associate them with high start-up quality. Conversely, in case of industry-related education, the link between the skills provided by the educational program completed by an entrepreneur and the skills needed in the industry where she operates is often ambiguous as scientific fields do not perfectly match industrial sectors. For instance, a university degree in chemistry constitutes industry-related education for an entrepreneur who establishes a biotech start-up. However, assessing to what extent skills provided by this degree help the entrepreneur in running her start-up and are thus indicative of start-up quality requires highly specialized knowledge of both the chemistry scientific field and the biotech industry. As crowdfunding investors are unlikely to possess such knowledge, they can hardly attach a meaning to this signal, which turns out to have a limited effect in reducing their information asymmetries. Basing on this discussion, we formulate hypothesis 5.

> H5. Entrepreneurs with business education are more likely to succeed in equity crowdfunding than those with industry-related education.

Similar arguments apply when comparing entrepreneurial experiences and industry-specific work experience. The former endows an entrepreneur with general-purpose skills that are of fundamental importance in the entrepreneurial profession and that crowdfunding investors can easily recognize as signals of start-up quality. Conversely, the skills that an entrepreneur developed through prior work experiences in her start-up's industry and the relationship between these skills and the start-up quality are harder to interpret for crowdfunding investors. First, industry-specific skills significantly vary depending on the position that the entrepreneur had in the

hierarchy of her prior employer(s), the function(s) she worked in or the people with whom she related (Burton et al. 2002). Second, information on entrepreneurs' prior work experience is usually scattered within the biographies and/or business plans, which entrepreneurs posted on the crowdfunding platforms or in public repositories, such as LinkedIn. These information sources usually report just a (sometime vague) description of the job position, the employer's name (if any) and the number of years that an individual spent in that position. While singling out whether an entrepreneur run a start-up in the past may be relatively easily, spotting whether she has industry-specific work experience is undoubtedly more complicated. In other words, information on industry-specific experience available to crowdfunding investors is "less structured" and thus more ambiguous (Peterson 2004) than information on entrepreneurial experience. Accordingly, hypothesis 6 is as follows.

> H6. Entrepreneurs with entrepreneurial experience are more likely to succeed in equity crowdfunding than those with industry-specific work experience.

3 Methodology

3.1 Data collection and sample

This study uses information on the entrepreneurs that launched equity crowdfunding campaigns through the Italian platform SiamoSoci.[2] SiamoSoci was created in 2010 to match entrepreneurs who aimed to raise equity capital and investors. To use SiamoSoci, entrepreneurs had to post on the platform a short description (300 characters) of their start-ups, their names, their biographies (in case of start-ups run by a team of entrepreneurs, the names and biographies of all the team members had to be provided) and the amount they intended to raise (i.e. the target capital). Entrepreneurs could also post on the platform additional documents (e.g. start-ups' business plans, videos, presentations) that they considered useful for investors. These latter, once registered on SiamoSoci, could access all this information and select the start-up(s) to finance. If the total pledges met the target capital at the end of the crowdfunding period, the shares could be subscribed, the payment could be made and the financing contract be signed. After completing the transaction, each investor could use the platform to monitor her investment at any time.

The population of the present study consists of the 460 entrepreneurs, who launched and closed 160 campaigns on SiamoSoci between mid-2012, when the first crowdfunding campaign was launched on the platform, and 1 February 2014, the day in which we stopped the data collection for the present study.[3] We retrieved from the platform the names of these 460 entrepreneurs and downloaded their biographies, when available. We also searched for bibliographical information of these 460 entrepreneurs on LinkedIn, which we also used to collect the number of connections of each entrepreneur and build a control for entrepreneurs' social capital (for a description of the variable, see Sect. 3.2). We retrieved completed data on the variables of interest for this study for 284 entrepreneurs (57%), which thus constitute the sample of our econometric analysis. χ^2 tests and t tests show that no significant differences exist between the entrepreneurs in the sample and those in target population, both in terms of their own characteristics and of those of the campaigns they launched.

Overall, these 284 entrepreneurs launched 129 crowdfunding campaigns, either with other entrepreneurs (255 entrepreneurs were part of an entrepreneurial team, about 90%) or alone (solo entrepreneurs were 29, 10%). Thirty-seven entrepreneurs (13%) succeeded in raising equity capital for their start-ups through SiamoSoci, having launched the 12 campaigns that met the target capital. In line with the literature that

[2] SiamoSoci was the first equity crowdfunding platform created in Italy. More than 2 years after its establishment, the Consob Regulation no. 18592 "The collection of risk capital on the part of innovative start-ups via on-line portals" (http://www.consob.it/mainen/documenti/english/laws/reg18592e.htm) entered into force. This regulation included a set of rules and requisites for the managers of equity crowdfunding platforms aimed at reducing operational and legal risks and the risk of litigation and fraud. The regulation also established a register where platforms had to be included to be allowed to use the label "equity crowdfunding platforms". In light of the new Italian regulation, SiamoSoci could not use the label equity crowdfunding platform any more and in 2014, it started changing its activity to become a marketplace for entrepreneurs searching for business angels' investments. However, despite the lack of formal recognition by Consob, during the period under scrutiny in this study, SiamoSoci functioned de facto as an equity crowdfunding platform: it matched entrepreneurs and investors through the Internet, although the finalization of the financing contract had to be done off line. As a detailed analysis of this latter legal aspect goes beyond the purposes of this study, we refer to SiamoSoci as an equity crowdfunding platform.

[3] During the period of observation, 187 campaigns were launched on SiamoSoci, but 21 of them (about 11%) were still open and raising capital when we stopped the data collection.

acknowledges the presence of a gender bias in equity crowdfunding (Mohammadi and Shafi 2017), 253 (89%) sample entrepreneurs are males.

There is considerable variance across campaigns as to the total amount of capital that sample entrepreneurs sought to raise: the minimum is 10,000 €, while the maximum is 2,500,000 €. On average, the amount of capital that sample entrepreneurs of funded start-ups were searching for is significantly lower (138,333 €) than that of non-funded ones (271,014 €), witnessing the negative relation between target capital and crowdfunding success found by several studies (Mollick 2014; Colombo et al. 2015a, b).

As for the capital raised, the entrepreneurs who were successful in crowdfunding raised much more than the target capital (+ 79%). Conversely, 92 out of the 117 campaigns launched by entrepreneurs who were not successful (i.e. 79%) did not raise any pledges. In the remaining 25 campaigns, pledges covered around 33% of the target capital. The number of investors is highly variable, ranging from a minimum of 1 to a maximum of 27 in funded campaigns and from 0 to 10 in non-funded campaigns. The typical duration of the crowdfunding campaign was around 4 months. Approximately 30% of the campaigns were set to last between 4 and 5 months.

Finally, it is worth observing that a remarkable number of sample entrepreneurs launched campaigns aimed at funding start-ups that operated in service industries (117 campaigns; about 91%) and that were nascent ventures (50 campaigns out of 129; i.e. 39%). Quite interestingly, the percentage of campaigns aimed at funding nascent ventures is higher among the campaigns that met the target capital (50% vs. 38%).

3.2 Model specification and variables

Our econometric analysis aims to investigate the effect of an entrepreneur's human capital on the probability that she succeeds in equity crowdfunding. To this end, we use the entrepreneur as the unit of analysis and we model the probability of her success in crowdfunding using robust Probit estimates. The dependent variable, *d_funded*, is a dummy that equals 1 if the entrepreneur launched a campaign where total pledges covered 100% of the target capital (or more) and 0 if she launched a campaign where pledges covered less than the target capital. To check the robustness of our results, as we describe in the following section, we also use two alternative measures of entrepreneurs' success in crowdfunding: the percentage of the target capital that an entrepreneur raised during the campaign (*target_capital_share*) and the number of individual investors that made pledges in the campaign (*investor_number*). In our specifications, both the dependent variables and the campaign-specific controls have the same value for all the entrepreneurs who launched the same campaign. As a consequence, observations (i.e. entrepreneurs) referring to the same campaign are probably not independent; thus, the errors of the econometric models are independent across the campaigns, but not *within* the same campaign. We solve this issue by clustering observations at the campaign level. A similar approach is in Giudici et al. (2017).

Our explanatory variables are measures of the human capital signals we considered in Sect. 2. We built them using individual-level biographical information on sample entrepreneurs triangulated from two sources: the documents posted on the SiamoSoci platform and the entrepreneurs' LinkedIn biographies (whenever available). For each entrepreneur, we first recorded in a dataset all the educational attainments at graduate and post-graduate levels. We then classified each educational attainment distinguishing degrees in economics and management, degrees related to the industry of operation of the focal start-up (e.g. a degree in biology for an entrepreneur running a start-up in the biotech industry) and all the remaining degrees. As in some cases, it may be difficult to distinguishing between the latter two categories; the authors independently assigned each degree to one category and discussed any disagreements until a consensus was reached. Then, for each entrepreneur, we built three variables computed as the total number of years spent in education in economics and management fields (*business_education*), in fields related to the start-up industry (*industry_related_education*) and in any other fields (*other_education*).

Subsequently, we recorded in the dataset information on all the work experiences gained by sample entrepreneurs before launching their equity crowdfunding campaign. For each work experience, we recorded the start and end years, the name of the employer and whether the sample individual was an entrepreneur in her prior company. Specifically, we coded an individual as an entrepreneur in her prior company if she defined herself as a *shareholder*, *owner* or *founder*; otherwise, we labelled her as an

employee. We then used the name of the employer company to detect the entrepreneur's prior industry of operation. Using this information, the two authors independently assigned each work experience reported in sample entrepreneurs' biographies to the following categories: work experience (i) as an entrepreneur, (ii) in the same industry of the focal start-up and (iii) in other industries. In line with the procedure followed to build the variables capturing entrepreneurs' education, the authors discussed any disagreements until they reached consensus. Next, for every entrepreneur, we computed the total number of years in the above work categories and respectively labelled the variables *ln_entrepreneurial_experience*, *ln_industry_specific_work_exp* and *ln_other_work_exp*. As the total number of years in the three work categories had highly skewed distributions, we built the variables using logarithmic transformations.

We include a comprehensive list of control variables, which are in line with the crowdfunding literature and, more generally, with research on entrepreneurial finance. The literature on reward crowdfunding highlights the paramount importance of the social capital of the proponents of crowdfunding campaigns as a key driver of successful fundraising (Ordanini et al. 2011; Agrawal et al. 2011) and uses social networks to build proxies of social capital (Mollick 2014; Colombo et al. 2015a). Accordingly, we used information on sample entrepreneurs' LinkedIn connections to build *ln_LinkedIn_connections*. For each entrepreneur, we computed this variable as the natural logarithm of the connections that she had on her LinkedIn profile when she launched the focal crowdfunding campaign.[4] As entrepreneurs' gender may influence their crowdfunding success (Mohammadi and Shafi 2017), the list of controls also includes *d_female*, a dummy equal to one for female entrepreneurs. Furthermore, we consider that, when an entrepreneur launches a crowdfunding campaign for a start-up, which she runs with other entrepreneurs, the human capital of her teammates likely influences her crowdfunding success. Thus, we insert three controls. First, we control for the number of entrepreneurs running the start-up, winsorized at the 2nd and 98th percentiles (*n_entrepreneurs*; for a similar approach, see Ahlers et al. 2015; Vismara 2016a, b; Vulkan et al. 2016). Second, as prior studies show that having broad competences and, especially, diverse functional experience within the team of entrepreneurs makes a start-up more attractive to external investors (e.g. Kaplan and Strömberg 2004), we include two measures of competence heterogeneity within the team: *d_heterogeneous_education* and *d_heterogeneous_experience*. Both controls are dummy variables. *d_heterogeneous_education* equals 1 if the focal entrepreneur and her teammates graduated in different fields and 0 otherwise. For instance, if the focal entrepreneur had a degree in the economics and management field, the dummy equals 1 if there is at least one teammate with a degree in fields related to the start-up industry or in other fields not related to the start-up industry. Instead, *d_heterogeneous_experience* equals 1 if the focal entrepreneur and her teammates gained work experience in different areas and 0 otherwise. Both variables equal 0 for solo entrepreneurs, who have no teammates.

In line with prior studies on the drivers of success in equity crowdfunding (Ahlers et al. 2015; Vismara 2016a, b), we also control for the target capital of the campaign launched by the focal entrepreneur including its logarithm (*ln_target_capital*). Then, we include the number of documents that the entrepreneur posted on the SiamoSoci platform in addition to the start-up business plan (*other_documents*). This latter variable is an inverse proxy of the extent of information asymmetries faced by potential investors. Ceteris paribus, the more are the documents that an entrepreneur made available online, the lower are these information asymmetries and the higher is the probability that the entrepreneur succeeds in raising equity finance through crowdfunding.

The uncertainty about future prospects of the start-up, which the focal entrepreneur is trying to finance online, may scare investors and reduce the probability that she

[4] For about half of sample entrepreneurs, the number of LinkedIn connections was collected *only* at mid-December 2013. As for these individuals, the number of connections when the campaign was launched was unknown, we could have not computed *ln_LinkedIn_connections*. Hence, we resorted to regression imputation. Specifically, we first estimated an OLS regression model on the sole individuals for which the number of LinkedIn connections was available both when the campaign was launched and at mid-December 2013. The dependent variable was the number of LinkedIn connections when the campaign was launched, while the independent variables were the number of connections at mid-December 2013, the number of months elapsed since campaign launch and the number of entrepreneurs involved in the start-up. The estimated coefficients were then used to impute the missing values.

succeeds in equity crowdfunding. To control for this aspect, we include *d_high_tech*, a dummy equalling 1 if this start-up operates in high-tech industries and 0 otherwise. Indeed, high-tech start-ups operate in high-velocity environments characterized by rapid and unpredictable changes (Bourgeois and Eisenhardt 1988) and have thus, on average, more uncertain prospects than those in other industries. Finally, our controls include *d_patentable*, a dummy variable equal to 1 if, according to the information available on the crowdfunding platform, the start-up held a patent or had filed/aimed at filing any patent applications when the crowdfunding campaign was launched. Patents create a barrier to entry for potential competitors that may ensure commercial success in the long term (Sudek 2006). Accordingly, researchers note that patent protection has a positive impact on an investor's decision to fund an entrepreneur and positively relates to the likelihood and the amount of external investor financing (see Hoenig and Henkel 2015 for a discussion of the role of patents in attracting external finance from venture capitalists).

Table 1 provides the descriptive statistics on the explanatory and control variables included in the models. Let us provide here some additional figures and comments about the measure of human capital signals of sample entrepreneurs. As to education, about 46% of sample entrepreneurs had graduate and/or post-graduate degrees in economics and management fields (22%), in fields related to their start-up industry (22%) or in both fields (2%). Quite interestingly, about 31% of sample entrepreneurs had no educational attainments at graduate or post-graduate levels. Conversely, all sample entrepreneurs had gained at least some work experience before founding the start-up they intended to fund through equity crowdfunding. About 51% of sample entrepreneurs had gained some entrepreneurial experience (20%), some industry-specific work experience (16%) or both entrepreneurial and industry-specific work experience (15%).

Table 1 also provides the correlation matrix for the explanatory and control variables. Correlations are in general low. However, we also performed a variance inflation factor (VIF) analysis, which suggests that multicollinearity is not a problem in our estimates. Indeed, the mean VIF is 1.36, well below the threshold of 5, while the maximum VIF is 1.91, well below the threshold of 10.

4 Results of the econometric analysis

4.1 The impact of human capital on entrepreneurs' success in crowdfunding

Table 2 presents the estimates of the main econometric models. In model 1, we include only the controls, while in model 2, we insert also the explanatory variables.

The estimates of model 1 reveal that the effects of the control variables are in line with the findings of prior research. The positive coefficient of *ln_LinkedIn_connections* (*p* value 0.000) provides evidence of the positive effect of entrepreneurs' social capital in the crowdfunding context. This result is in line with the well-documented positive impact of the social capital of the proponents of reward crowdfunding campaigns (see, among the many others, Mollick 2014 and Colombo et al. 2015a). In line with prior studies on equity crowdfunding, which use the campaign as unit of analysis (see, e.g. Vismara 2016a, b, Vulkan et al. 2016), we find that target capital has a negative effect on the probability that an entrepreneur is successful in equity crowdfunding, as the negative coefficient of *ln_target_capital* (*p* value 0.009) indicates. Moreover, the negative coefficient of *d_high_tech* (*p* value 0.043) confirms the finding of Ahlers et al. (2015) that success in equity crowdfunding is less likely the greater the level of uncertainty about the start-up's future prospects. The negligible effect of the number of entrepreneurs involved in the start-up is in line with Ahlers et al. (2015) as well. Finally, the positive and highly significant coefficient of *d_patentable* (*p* value 0.004) confirms that holding patents has positive effects on investors' decision to fund entrepreneurs in search for equity finance. The remaining controls are not significant at the conventional confidence levels.

Model 2 reveals that, among the measures of entrepreneurs' human capital signals, only *business_education* and *ln_entrepreneurial_experience* have a positive and significant impact on the probability that an entrepreneur succeeds in equity crowdfunding. Both effects have a large magnitude. The predicted value of *d_funded* increases by 42% (from 0.21 to 0.30) for a 1-year increase (from 0 to 1) in the value of *business_education*, while it increases by 37% (from 0.22 to 0.30) for a 1-year increase of the entrepreneurial experience (from 0 to 1, i.e. *ln_entrepreneurial_experience* increases from 0 to 0.69). Both changes in the predicted value of *d_funded*

Table 1 Descriptive statistics on the independent variables and correlation matrix

	Variable	Mean	Std. dev.	Min	Max	1	2	3	4	5
1	business_education	0.884	1.799	0.000	8.000	1.000				
2	industry_related_education	1.261	2.402	0.000	8.000	− 0.216	1.000			
3	other_education	1.289	2.238	0.000	13.000	− 0.237	− 0.261	1.000		
4	ln_entrepreneurial_experience	0.653	1.021	0.000	3.761	0.021	− 0.056	0.000	1.000	
5	ln_industry_specific_work_exp	0.552	0.926	0.000	3.912	− 0.038	0.071	− 0.066	0.252	1.000
6	ln_other_work_exp	2.326	1.083	0.000	4.625	− 0.079	− 0.005	0.167	0.364	− 0.008
7	ln_LinkedIn_connections	5.859	1.556	0.000	7.840	0.135	0.112	0.191	0.066	0.009
8	d_female	0.109	0.312	0.000	1.000	− 0.003	− 0.066	0.121	− 0.122	− 0.045
9	n_entrepreneurs	3.630	1.756	1.000	10.000	− 0.065	0.120	0.019	− 0.038	0.008
10	d_heterogeneous_education	0.570	0.496	0.000	1.000	− 0.149	0.100	0.068	0.026	0.035
11	d_heterogeneous_experience	0.479	0.500	0.000	1.000	− 0.024	0.031	0.074	− 0.351	− 0.197
12	ln_target_capital	11.989	0.990	9.210	14.732	− 0.024	0.179	− 0.047	0.073	0.169
13	other_documents	2.835	1.944	0.000	13.000	− 0.039	− 0.043	0.134	0.039	− 0.087
14	d_high_tech	0.641	0.481	0.000	1.000	− 0.089	0.042	0.035	0.036	0.025
15	d_patentable	0.225	0.419	0.000	1.000	− 0.040	0.138	− 0.032	0.112	0.107

	6	7	8	9	10	11	12	13	14
1									
2									
3									
4									
5									
6	1.000								
7	0.141	1.000							
8	− 0.020	0.036	1.000						
9	0.001	0.383	0.061	1.000					
10	0.072	0.447	0.007	0.434	1.000				
11	− 0.206	0.299	0.049	0.432	0.334	1.000			
12	− 0.046	0.192	0.033	0.098	0.025	0.029	1.000		
13	0.170	0.213	− 0.046	0.246	0.073	0.133	0.051	1.000	
14	0.094	0.278	− 0.068	0.031	0.151	0.101	0.008	− 0.003	1.000
15	0.073	− 0.049	− 0.027	0.220	0.060	0.090	0.101	0.089	− 0.194

Table 2 The antecedents of entrepreneurs' success in equity crowdfunding: a Probit model on the probability to meet the target capital

	Model 1			Model 2		
Constant	1.308	(2.506)		2.109	(2.487)	
business_education	–			0.280	(0.063)	***
industry_related_education	–			0.022	(0.052)	
other_education	–			0.065	(0.051)	
ln_entrepreneurial_experience	–			0.362	(0.123)	***
ln_industry_specific_work_exp	–			0.027	(0.149)	
ln_other_work_exp	–			− 0.203	(0.143)	
ln_LinkedIn_connections	0.745	(0.190)	***	0.640	(0.211)	***
d_female	− 0.113	(0.197)		− 0.006	(0.229)	
n_entrepreneurs	− 0.013	(0.095)		0.034	(0.095)	
d_heterogeneous_education	− 0.240	(0.397)		− 0.114	(0.390)	
d_heterogeneous_experience	0.098	(0.308)		0.362	(0.370)	
ln_target_capital	− 0.601	(0.231)	***	− 0.707	(0.238)	***
other_documents	0.088	(0.107)		0.167	(0.111)	
d_high_tech	− 0.897	(0.442)	**	− 0.810	(0.415)	*
d_patentable	1.278	(0.450)	***	1.457	(0.394)	***
No. of observations	284			284		
McFadden's R^2	0.367			0.453		
Percent of correct predictions	91.41%			90.49%		

Robust standard errors are in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

are computed setting all other variables at their mean values (median values for dummy variables).

The positive and significant coefficient of *business_education* and the non-significant coefficients of *industry_related_education* and *other_education* indicate that, as we expected, entrepreneurs with business education are more likely to succeed in equity crowdfunding than both entrepreneurs with industry-related education (H5 is supported) and entrepreneurs with other education (H1 is supported). Similarly, the sign and significance of the coefficient of *ln_entrepreneurial_experience* compared to the coefficients of the remaining variables capturing entrepreneurs' work experience provide evidence in favour of a more positive effect on entrepreneurs' success in equity crowdfunding of entrepreneurial experience than industry-specific work experience (H6 is supported) and other work experience (H3 is supported). Conversely, as the coefficients of both *industry_related_education* and *ln_industry_specific_work_exp* are not significant at conventional confidence levels, we do not find support for H2 and H4.

4.2 Robustness checks

To ensure the reliability of our results, we perform a series of robustness checks. First, we replace our dependent variable with alternative measures of entrepreneurs' success in crowdfunding. As we mentioned in Sect. 3, we use the share of target capital raised by the focal entrepreneur and the number of investors that made pledges as dependent variables in a Tobit regression and a Poisson model, respectively. The estimates of these models (reported in Table 3) indicate that the coefficients of the explanatory variables are in line with those reported in Table 2, despite that the significance of some coefficients is reduced. In particular, the positive effect of *ln_entrepreneurial_experience* is only close to significance when the share of target capital raised is considered (see model 1), while the positive effect of *business_education* is slightly significant when the dependent variable is the number of investors (see model 2).

Second, we check whether the effects of human capital signals on entrepreneurs' success in equity crowdfunding

Table 3 The antecedents of entrepreneurs' success in equity crowdfunding: alternative success measures

	Model 1 (dep. var: target_capital_share)			Model 2 (dep. var: investor_number)		
Constant	2.603	(2.021)		− 2.145	(2.539)	
business_education	0.110	(0.055)	**	0.106	(0.060)	*
industry_related_education	0.056	(0.045)		0.075	(0.044)	*
other_education	− 0.007	(0.046)		− 0.021	(0.066)	
ln_entrepreneurial_experience	0.201	(0.130)		0.407	(0.111)	***
ln_industry_specific_work_exp	0.039	(0.106)		− 0.192	(0.168)	
ln_other_work_exp	− 0.101	(0.096)		− 0.010	(0.109)	
ln_LinkedIn_connections	0.344	(0.122)	***	0.437	(0.156)	***
d_female	− 0.398	(0.264)		0.153	(0.205)	
n_entrepreneurs	0.006	(0.100)		0.060	(0.082)	
d_heterogeneous_education	− 0.110	(0.264)		0.141	(0.326)	
d_heterogeneous_experience	0.104	(0.301)		− 0.246	(0.237)	
ln_target_capital	− 0.451	(0.176)	**	− 0.124	(0.183)	
other_documents	0.152	(0.092)		0.073	(0.092)	
d_high_tech	− 0.672	(0.314)	**	− 0.171	(0.514)	
d_patentable	0.557	(0.426)		1.567	(0.417)	***
No. of observations	284			284		
McFadden's R^2	0.140			0.448		

Robust standard errors are in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

depend on the length of entrepreneurs' education and work experience. To this end, we replace *business_education*, *industry_related_education* and *other_education* with three dummies equalling one when the focal entrepreneur had at least one (graduate or post-graduate) degree in economics and management fields (*d_business_education*), in fields related to the start-up industry (*d_industry_related_education*) and in other fields not related to the start-up industry (*d_other_education*), respectively. We also replace *ln_entrepreneurial_experience*, *ln_industry_specific_work_exp* and *ln_other_work_exp* with dummies capturing whether the focal entrepreneur had any prior work experiences (i) as an entrepreneur (*d_entrepreneurial_experience*), (ii) in the same industry of the start-up for which she is searching for funding on line (*d_industry_specific_work_exp*) and (iii) in other industries (*d_other_work_exp*), respectively. The estimates of model 1 in Table 4 reveal that both *d_business_education* and *d_entrepreneurial_experience* have positive coefficients, but the latter coefficient is only weakly significant. We thus conclude that while the obtainment of any degree titles in economics and management fields is a very effective signal of start-up quality, having gained some entrepreneurial experience is not. The amount of entrepreneurial experience does matter and increases the effectiveness of this human capital signal.

Third, we check whether the human capital signals associated to entrepreneurs' work experience have a non-linear relationship with entrepreneurs' success in equity crowdfunding. One may indeed think that the benefit of one additional year of work experience is much higher at the beginning of an individual's career than later on. We thus include in the estimates *sq_entrepreneurial_experience*, the quadratic term of *ln_entrepreneurial_experience* (model 2 in Table 4), and *sq_industry_specific_work_exp*, the squared value of *ln_industry_specific_work_exp* (model 3 in Table 4). The coefficients of both quadratic terms are not significant, and the χ^2 test at the bottom of the table indicates that *ln_industry_specific_work_exp* and its quadratic term are not jointly significant. Thus, we conclude that, as we have shown in Sect. 4.1, the effect of entrepreneurial experience is linear, while the impact of industry-specific experience is negligible.

Fourth, we check whether the quality of the education has an impact on signal effectiveness. We might

Table 4 The antecedents of entrepreneurs' success in equity crowdfunding: alternative explanatory variables

		Model 1			Model 2			Model 3			Model 4		
a_0	Constant	1.575	(2.509)		2.072	(2.480)		2.132	(2.431)		2.082	(2.630)	
a_1	d_business_education	0.658	(0.220)	***	–			–			–		
a_2	d_industry_related_education	− 0.430	(0.384)		–			–			–		
a_3	d_other_education	− 0.144	(0.252)		–			–			–		
a_4	d_entrepreneurial_experience	0.539	(0.321)	*	–			–			–		
a_5	d_industry_specific_work_exp	0.287	(0.305)		–			–			–		
a_6	d_other_work_exp	0.015	(0.497)		–			–			–		
a_7	business_education	–			0.279	(0.065)	***	0.277	(0.066)	***	–		
a_8	industry_related_education	–			0.025	(0.051)		0.030	(0.051)		–		
a_9	other_education	–			0.065	(0.051)		0.067	(0.052)		0.072	(0.052)	
a_{10}	ln_entrepreneurial_experience	–			0.552	(0.388)		0.392	(0.138)	***	0.375	(0.134)	***
a_{11}	ln_industry_specific_work_exp	–			0.031	(0.152)		0.401	(0.386)		0.033	(0.142)	
a_{12}	ln_other_work_exp	–			− 0.191	(0.137)		− 0.197	(0.140)		− 0.220	(0.149)	
a_{13}	sq_entrepreneurial_experience	–			− 0.067	(0.114)		–			–		
a_{14}	sq_industry_specific_work_exp	–			–			− 0.148	(0.121)		–		
a_{15}	business_education_qs	–			–			–			0.211	(0.092)	**
a_{16}	business_education_noqs	–			–			–			0.394	(0.074)	***
a_{17}	industry_related_education_qs	–			–			–			0.014	(0.081)	
a_{18}	industry_related_education_noqs	–			–			–			0.043	(0.049)	
a_{19}	ln_LinkedIn_connections	0.674	(0.204)	***	0.635	(0.207)	***	0.616	(0.200)	***	0.642	(0.206)	***
a_{20}	d_female	− 0.096	(0.297)		− 0.006	(0.233)		0.003	(0.238)		0.027	(0.218)	
a_{21}	n_entrepreneurs	− 0.021	(0.100)		0.029	(0.095)		0.027	(0.096)		0.027	(0.099)	
a_{22}	d_heterogeneous_education	− 0.040	(0.383)		− 0.123	(0.390)		− 0.120	(0.390)		− 0.056	(0.350)	
a_{23}	d_heterogeneous_experience	0.534	(0.424)		0.439	(0.394)		0.447	(0.389)		0.263	(0.353)	
a_{24}	ln_target_capital	− 0.660	(0.242)	***	− 0.707	(0.237)	***	− 0.702	(0.232)	***	− 0.714	(0.249)	***
a_{25}	other_documents	0.120	(0.106)		0.167	(0.111)		0.167	(0.111)		0.196	(0.108)	*
a_{26}	d_high_tech	− 0.987	(0.430)	**	− 0.835	(0.416)	**	− 0.845	(0.421)	**	− 0.808	(0.418)	*
a_{27}	d_patentable	1.469	(0.374)	***	1.431	(0.402)	***	1.422	(0.402)	***	1.480	(0.394)	***
	No. of observations	284			284			284			284		
	McFadden's R^2	0.426			0.454			0.456			0.466		
	Percent of correct predictions	90.14%			90.85%			91.20%			91.20%		
	χ^2: $a_{10} = a_{13} = 0$	–			8.56(2)**			–			–		
	χ^2: $a_{11} = a_{14} = 0$	–			–			1.56(2)			–		
	χ^2: a_{16}–$a_{15} = 0$	–			–			–			2.26(1)		

The robust standard errors are in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

indeed expect that the number of years that entrepreneurs spent to obtain graduate or post-graduate degrees in higher quality universities has a stronger impact on success in crowdfunding than the years spent in lower quality universities (for a similar argument in the venture capital literature, see, e.g. Roure and Maidique 1986). We thus distinguish between universities listed among the top 800 universities in the world according to the QS ranking and universities not included in the list. Then, we split both *business_education* and *industry_related_education* into two variables each, by separately computing the number of years an entrepreneur spent in the top 800 universities (*business_education_qs* and *industry_related_*

education_qs) and in other universities (*business_education_noqs* and *industry_related_education_noqs*). The estimates of model 4 in Table 4 indicate that both *business_education_qs* and *business_education_noqs* do have a positive impact on entrepreneurs' success in equity crowdfunding. Quite surprisingly, the magnitude of the effect of the latter variable is larger; however, the difference between the effects of the two variables is not significant as the χ^2 test at the bottom of Table 4 indicates.

Fifth, we include additional variables in the list of controls. Model 1 in Table 5 adds the number of days elapsed between the launch and the conclusion of the crowdfunding campaign launched by the focal entrepreneur (*campaign_duration*). We insert this control because several contributions on success drivers in crowdfunding include campaign duration among the determinants of crowdfunding success, despite obtaining mixed results (for a review, see Butticè et al. 2017). The estimates of this additional model run on 281 observations because in our dataset duration is not available for 2 campaigns launched by 4 sample entrepreneurs. The coefficient of *campaign_duration* is not significant, and the coefficients of the explanatory variables are in line with the results discussed in the previous section. Model 2 in Table 5 adds a series of controls for the quality of the business plan information that the entrepreneurs posted on the crowdfunding platform. Prior studies include the soundness of the business plan financials and the market growth potential among external investors' selection criteria (e.g. Prowse 1998; Sudek 2006). Accordingly, we insert in the estimates *d_financials* and *d_market*. *d_financials* is a dummy equalling 1 if the entrepreneurs provided figures for revenue/EBITDA and cash management, 0 otherwise (for a similar measure see Lukkarinen et al. 2016), while *d_market* equals 1 if the entrepreneurs provided some evaluations of the market potential of the idea. The

Table 5 The antecedents of entrepreneurs' success in equity crowdfunding: inclusion of additional control variables

	Model 1			Model 2		
Constant	2.085	(2.478)		2.154	(2.552)	
business_education	0.283	(0.064)	***	0.287	(0.069)	***
industry_related_education	0.026	(0.051)		0.017	(0.044)	
other_education	0.071	(0.053)		0.077	(0.052)	
ln_entrepreneurial_experience	0.364	(0.112)	***	0.352	(0.130)	***
ln_industry_specific_work_exp	0.026	(0.150)		− 0.010	(0.129)	
ln_other_work_exp	− 0.204	(0.142)		− 0.206	(0.130)	
ln_LinkedIn_connections	0.634	(0.220)	***	0.638	(0.214)	***
d_female	− 0.013	(0.234)		0.006	(0.223)	
n_entrepreneurs	0.036	(0.094)		0.075	(0.114)	
d_heterogeneous_education	− 0.100	(0.403)		− 0.114	(0.389)	
d_heterogeneous_experience	0.366	(0.360)		0.300	(0.377)	
ln_target_capital	− 0.706	(0.244)	***	− 0.720	(0.224)	***
other_documents	0.167	(0.106)		0.172	(0.122)	
d_high_tech	− 0.815	(0.414)	**	− 0.797	(0.436)	*
d_patentable	1.440	(0.391)	***	1.331	(0.439)	***
campaign_duration	0.000	(0.004)		–		
d_financials	–			− 0.022	(0.602)	
d_market	–			0.171	(0.440)	
No. of observations	281			258		
McFadden's R^2	0.451			0.457		
Percentage of correct predictions	90.75%			89.53%		

Robust standard errors are in parentheses

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

inclusion of these variables reduces the size of the sample from the initial 284 observations to 258 because business plan information is available only for 117 campaigns out of the 160 launched by sample entrepreneurs. Both *d_financials* and *d_market* are not significant in our estimates, and their inclusion has negligible effects on the results discussed before.

5 Discussion and conclusion

A general argument in the entrepreneurial finance literature is that entrepreneurs encounter difficulties in raising equity finance for their start-ups because external investors are unable to directly observe the quality of these start-ups. Consequently, investors make their investment decisions relying on *observable* attributes of both the entrepreneurs and the start-ups that *signal* unobserved start-up quality. A well-established stream within the research that uses the signalling theory to explain entrepreneurs' attraction of external financing (e.g. Elitzur and Gavious 2003; Janney and Folta 2003; Busenitz et al. 2005) explicitly considers entrepreneurs' human capital as a signal of start-up quality (see, e.g. Baum and Silverman 2004; Hsu 2007; Gimmon and Levie 2010 among the many others). Taking stock from this debate, the present paper studies the effect of diverse human capital signals (namely, business education, industry-related education, other education, entrepreneurial experience, industry-specific work experience, and other work experience) on entrepreneurs' success in equity crowdfunding.

Overall, our results are in line with our theoretical arguments: the effectiveness of human capital signals in reducing the information asymmetries faced by crowdfunding investors—and ultimately in driving entrepreneurs to crowdfunding success—depends on both the signal fit with start-up quality and the signal ambiguity. The human capital signals that have both a good fit with start-up quality and low ambiguity—namely, business education and entrepreneurial experience—do matter for entrepreneurs' success. Conversely, the signals that have worse fit (i.e. other education and other work experience) and those that have a good fit, but high ambiguity (i.e. industry-related education and industry-specific work experience) do not contribute to entrepreneurs' success in equity crowdfunding.

Our paper offers several contributions to scholarly debate on equity crowdfunding. First, it depicts a comprehensive picture of human capital signals in this context. As aforementioned, several works on equity crowdfunding use signalling theory to explain how and why actions taken and attributes shown by entrepreneurs help them in raising equity finance from the crowd of Internet users. However, this literature stream under-remarks entrepreneurs' human capital signals. This appears rather surprising. On the one hand, the entrepreneurial finance literature features human capital signals as crucial for the attraction of equity finance from external investors (e.g. MacMillan et al. 1985; Muzyka et al. 1996). On the other hand, human capital signals probably are much more important for crowdfunding investors than for traditional ones, like venture capitalists. Indeed, when evaluating entrepreneurs in search for funds for their start-up, the former investors face higher uncertainty, and thus higher information asymmetries, than the latter ones. Entrepreneurs resort to equity crowdfunding even in the nascent stage of their venture to raise the (usually limited) amount of money needed to start business activities, while venture capitalists typically invest later, when uncertainty is lower (Gifford 1997). Moreover, the quality of start-ups for which entrepreneurs search for equity on the Internet is likely more variable than the quality of start-ups in search for venture capital due to the smaller costs of access to the former financing mechanism. While in equity crowdfunding, entrepreneurs make an open call for funding to an unknown crowd of Internet users; when searching for venture capital financing, entrepreneurs must identify potential investors in advance thus incurring higher search costs. The opportunity costs associated to venture capital financing are higher as well. In contrast with crowdfunding platforms, venture capitalists conduct due diligence assessments that are extremely time consuming, and thus costly, for entrepreneurs (Tyebjee and Bruno 1984). The lower costs of access to equity crowdfunding may induce also entrepreneurs running low-quality start-ups, which have low probabilities to be funded by venture capitalists, to resort to this alternative financing mechanism.

To the best of our knowledge, only Ahlers et al. (2015) study human capital as a signal in equity crowdfunding, but they frame it within a general discussion of the possible signals (including social capital and intellectual capital) that entrepreneurs can send, without going in depth into it. Conversely, we put entrepreneurs' human capital at core of our analysis on the drivers of success in equity crowdfunding. We acknowledge that,

when launching a crowdfunding campaign, an entrepreneur may possess human capital in diverse fields of education and areas of expertise. In other words, her human capital is a *set of signals* for uninformed crowdfunding investors: focusing just on one of them—like the possession of an MBA title, as in Ahlers et al. (2015)—offers a partial perspective. Then, in theoretically discussing and empirically showing the effectiveness of the diverse signals in this set, we bridge the equity crowdfunding debate on signals with the mainstream signalling theory, which states that signals are heterogeneous along several characteristics (Connelly et al. 2011). In particular, we focus attention on two prominent signal characteristics—signal fit and signal ambiguity. Finally, we choose to have the entrepreneur, who launches the crowdfunding campaign (alone or with other teammates) to fund her start-up, as the unit of analysis in our econometric estimates. Such an approach is rarely adopted by crowdfunding scholars (see Giudici et al. 2017 for an exception), but it allows to fully appreciate the role of *each* entrepreneur's human capital as a signal of the start-up quality and its impact on the crowdfunding success. In so doing, we also contribute to conversations on the role of entrepreneurs' individual characteristics in equity crowdfunding success, which, to date, have mainly revolved around gender (Mohammadi and Shafi 2017), geographical location (Günther et al. 2017) and social contacts (Vismara 2016a).

Second, by making a fine-grained assessment of the role of entrepreneurs' human capital in equity crowdfunding, we can compare and contrast our results with those of studies on other financing mechanisms, where scholars analyse the role of entrepreneurs' human capital. For instance, we find a (strong) positive effect of entrepreneurial experience on equity crowdfunding success. Conversely, studies on venture capital financing find mixed evidence: some works detect that entrepreneurial experience reduces the probability to obtain venture capital (Shane and Stuart 2002), while others document a positive impact (Hsu 2007). This odd evidence likely results from differences between equity crowdfunding investors and venture capitalists. The former are non-professionals, who likely know that they cannot offer entrepreneurs much support in addition to the provision of financial resources (Skoglund and Stiernblad 2013). The fact that an entrepreneur has already gained experience in running other ventures may reassure crowdfunding investors that she possesses the skills needed to run her start-up and thus is a powerful signal. Conversely, venture capitalists are professional investors able to coach backed entrepreneurs (see, e.g. Gorman and Sahlman 1989; MacMillan et al. 1989; Bygrave and Timmons 1992; Sapienza 1992; Barney et al. 1996; Sapienza et al. 1996; Kaplan and Strömberg 2004), help them in hiring professional managers (Hellmann and Puri 2002; Bottazzi et al. 2008) and provide access to wide networks of contacts with potential customers, suppliers, alliance partners and providers of specialized services (Lindsey 2002; Colombo et al. 2006; Hsu 2006). Hence, when making their investment decisions, these investors likely consider the skills that entrepreneurs have gained through past entrepreneurial experiences as less salient.

Third, the paper uses the methodological approach consisting in extracting information from textual sources in the equity crowdfunding context. This approach is finding an increasing consensus by entrepreneurial finance scholars (e.g. in studies on IPOs, see Arnold et al. 2010 for a review). Crowdfunding researchers mainly use it by scanning the texts of reward and donation projects, for instance for identifying cues of prosocial behaviour (Allison et al. 2015) or linguistic styles (Parhankangas and Renko 2017). We contend that textual information is particularly important in driving investment decisions in equity crowdfunding and thus such an approach is highly appropriate for studying entrepreneurial success in this realm. In equity crowdfunding, investors enter start-ups' capital and invest sizable amounts; therefore, the consequences of wrong investment decisions are likely more severe than in reward and donation crowdfunding. Hence, investors have a strong incentive to use all the textual information at their disposal when making investment decisions.

As any other studies, this paper has limitations that open up avenues for future research. First, in this work, we focused on four main human capital dimensions. Despite their prominence as signals for equity crowdfunding investors, other human capital-related aspects may matter in this context. For instance, we considered the length of an entrepreneur's graduate and postgraduate studies in different fields, but we disregarded whether she attended entrepreneurship courses or what her graduation mark(s) was (were). Likewise, when exploring the effects of entrepreneur's work experience, we disregard several potentially interesting aspects. Was the entrepreneur an executive or a technician? Did she enjoy a high degree of autonomy,

which might be useful in the entrepreneurial profession? Did she work for a large corporation whose name could immediately attract investors' attention? (for a throughout discussion of these issues, see Burton et al. 2002). Similarly, we did not explore the diverse contents and outcomes of the entrepreneurial experience, e.g. an entrepreneur might have created ventures that grew large and were acquired or ventures that failed. As we noted in the hypothesis section, investors may recognize that entrepreneurs learn also from failure, but it is hard to deny that prior successful entrepreneurial experiences likely are more effective signals than unsuccessful ones. Hence, we welcome future works that collect additional data on entrepreneurs' human capital and study their effects on entrepreneurs' success in equity crowdfunding.

Second, despite in this paper we champion the idea that the human capital of each entrepreneur is a signal to crowdfunding investors, we recognize that the success in equity crowdfunding of entrepreneurs, who run their start-ups in teams, may depend on the human capital of their teammates as well. In this paper, we neither empirically investigate nor theoretically discuss the effects of complementarities among teammates' human capital; we just include in the empirical analysis two controls for competence heterogeneity among the entrepreneurs involved in the same start-up. We recognize that this is a shortcoming of our research as both prior studies on venture financing and anecdotal evidence acknowledge that equity capital providers observe the balance of competences and skills within the entrepreneurial team when making their investment decisions. To address this issue, we could have excluded from the econometric analyses the solo entrepreneurs and included interactive terms between our explanatory variables and additional variables capturing the human capital of the remaining entrepreneurs in the team. Performing such analyses was out of the scope of our paper, but we encourage scholars to make further steps along this direction.

Third, the paper focuses on the direct effects of human capital signals. However, it would be interesting to study the moderating factors, which make such signals more or less effective in reducing information asymmetries and thus determining entrepreneurs' success in crowdfunding. For instance, the signalling literature highlights the importance of *observability*, i.e. the extent to which receivers are able to notice the signals (Connelly et al. 2011, p. 45). In the equity crowdfunding context, human capital signals may be more or less observable to investors depending on where the information on entrepreneurs' human capital is located, be it on the crowdfunding platform or in other Internet pages. Thus, an interesting research question is the following one: does the location of information about entrepreneurs' human capital moderate the impact of these signals on entrepreneurs' success in equity crowdfunding? Furthermore, the literature on signals in entrepreneurial finance acknowledges the importance of social capital (e.g. Hsu 2007) and affiliations with third parties (e.g. Plummer et al. 2016) in securing funds for start-ups. It would be interesting to study whether and how these factors interact with human capital signals in determining entrepreneurs' success in crowdfunding.

Fourth, it is reasonable to expect that the effectiveness of a signal depends crucially on the receiver investors' characteristics. An investor who has worked in a specific industry is probably better able to attach a meaning to the work experience that an entrepreneur gained in that industry. As it happens for most papers on crowdfunding (for a notable exception, see Günther et al. 2017), here we lack in-depth information about investors. In line with the approach that Park and Patel (2015) use for subscribers of IPOs, we implicitly assume that crowdfunding investors are bounded rational and uncomfortable with ambiguous signals. However, future contributions should gather information on investors' characteristics and study their interplay with human capital signals sent by entrepreneurs in search for equity finance online. In so doing, these studies will also contribute to the call for more research on the effects of the existence of diverse signals and diverse receivers in context of high information asymmetries (Bergh et al. 2014).

Fifth, we recognize the signalling effect of entrepreneurs' human capital, but we do not disentangle this effect and the "productive one" (Hoenig and Henkel 2015). Entrepreneurs' human capital is a resource that has a productive value, and entrepreneurs in search for equity funding may leverage it to attract investors. For instance, entrepreneurs with an education in economics and management fields may be better able to understand the peculiarities of different sources of finance and different investors and, thus, may manage crowdfunding campaigns better. Hence, the relationship between entrepreneurs' business education and success in crowdfunding that our analyses revealed may be, at least partially, explained by this productive effect. As it happens in most existing studies in the entrepreneurial

finance literature, the data we could gather preclude ceteris paribus comparisons and, thus, do not allow to separate the signalling and productive effects. Nonetheless, we welcome future studies that succeed in this endower.

Sixth, we use data on the entrepreneurs that launched equity crowdfunding campaigns before 2014 through SiamoSoci, a platform that hosted mainly Italian entrepreneurs funded by Italian investors. Using data on the first campaigns launched through SiamoSoci has clear advantages. SiamoSoci was the first equity platform created in Italy, a country where equity crowdfunding attracted a lot of interest (indeed, Italy has been the first country to regulate equity crowdfunding). Moreover, being our data not so recent, they refer to an emerging stage of the equity crowdfunding phenomenon, when investors were still ignorant on this new financing mechanism and had limited knowledge on how to manage information on the platform. Thus, in this period, information asymmetries between investors and entrepreneurs probably were particularly high and the role of signals particularly salient. Hence, our setting is particularly suitable for studying the effect of human capital signals. However, one should be cautious to generalize our results. Future studies may enrich our analyses by focusing on equity crowdfunding platforms created in other countries and on entrepreneurs that launched the campaigns to finance their start-ups in different stages of evolution of the equity crowdfunding phenomenon.

Finally, our sample is small and contains only few successful entrepreneurs. Repeating our analyses on larger samples would offer further support to our results. As equity crowdfunding is becoming more and more popular (Vulkan et al. 2016), data on larger numbers of crowdfunding campaigns will be available soon.

In spite of these limitations, our work offers interesting implications to entrepreneurs who search for equity finance on the Internet and for managers of equity crowdfunding platforms. First, we advise entrepreneurs to put online information about their educational attainments and work experience: showing a high level of human capital does payoff. This holds particularly true for the entrepreneurs who have a degree in economics and management and/or have already run other ventures in the past, because these human capital dimensions are crucial in the entrepreneurial profession. According to our findings, these are indeed signals with a good fit with start-up quality and low ambiguity and, thus, are effective in reducing the information asymmetries faced by crowdfunding investors. Our study also suggests entrepreneurs to try to reduce the ambiguity about their prior work experiences as employees and the education obtained in other fields by making explicit the linkages between their education/work history and the activities of the start-ups for which they are searching for equity funding. Second, our research advices crowdfunding platform managers to design the project pages of their platforms so as to make information on entrepreneurs' human capital immediately accessible to crowdfunding investors. In so doing, platform managers should also work to reduce the room for ambiguity, for instance, by forcing entrepreneurs to provide human capital information in a structured, "fill-in-the blank" format, like it happens for some information of IPO prospects.

References

Agrawal, A., Catalini, C., & Goldfarb, A. (2011). Friends, family, and the flat world: the geography of crowdfunding. NBER Working Paper.

Agrawal, A., Catalini, C., & Goldfarb, A. (2014). Some simple economics of crowdfunding. *Innovation Policy and the Economy, 14*(1), 63–97.

Ahlers, G. K., Cumming, D., Günther, C., & Schweizer, D. (2015). Signaling in equity crowdfunding. *Entrepreneurship Theory and Practice, 39*(4), 955–980.

Allison, T. H., Davis, B. C., Short, J. C., & Webb, J. W. (2015). Crowdfunding in a prosocial microlending environment: examining the role of intrinsic versus extrinsic cues. *Entrepreneurship Theory and Practice, 39*(1), 53–73.

Arnold, T., Fishe, R. P., & North, D. (2010). The effects of ambiguous information on initial and subsequent IPO returns. *Financial Management, 39*(4), 1497–1519.

Barney, J. B., Busenitz, L. B., Fiet, J. O., & Moesel, D. D. (1996). New venture teams' assessment of learning assistance from venture capital firms. *Journal of Business Venturing, 4*, 257–272.

Baucus, M. S., & Mitteness, C. R. (2016). Crowdfrauding: avoiding Ponzi entrepreneurs when investing in new ventures. *Business Horizons, 59*(1), 37–50.

Baum, J., & Silverman, B. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology start-ups. *Journal of Business Venturing, 19*, 411–436.

Becker-Blease, J. R., & Sohl, J. E. (2015). New venture legitimacy: the conditions for angel investors. *Small Business Economics, 45*(4), 735–749.

Behrens, J., Patzelt, H., Schweizer, L., & Bürger, R. (2012). Specific managerial human capital, firm age, and venture capital financing of biopharmaceutical ventures: a contingency approach. *Journal of High Technology Management Research, 23*, 112–121.

Bergh, D. D., Connelly, B. L., Ketchen, D. J., & Shannon, L. M. (2014). Signalling theory and equilibrium in strategic management research: an assessment and a research agenda. *Journal of Management Studies, 51*(8), 1334–1360.

Block, J. H., Colombo, M. G., Cumming, D. J., & Vismara, S. (2017). New players in entrepreneurial finance and why they are there. *Small Business Economics*. https://doi.org/10.1007/s11187-016-9826-6.

Bottazzi, L., Da Rin, M., & Hellmann, T. (2008). Who are the active investors? Evidence from venture capital. *Journal of Financial Economics, 89*, 488–512.

Bourgeois III, L. J., & Eisenhardt, K. M. (1988). Strategic decision processes in high velocity environments: four cases in the microcomputer industry. *Management Science, 34*(7), 816–835.

Burton, M. D., Sørensen, J. B., & Beckman, C. M. (2002). Coming from good stock: career histories and new venture formation. In: *Social structure and organizations revisited* (pp. 229–262). Emerald Group Publishing Limited.

Busenitz, L. W., Fiet, J. O., & Moesel, D. D. (2005). Signaling in venture capitalist—new venture team funding decisions: does it indicate long-term venture outcomes? *Entrepreneurship Theory and Practice, 29*(1), 1–12.

Butticè, V., Franzoni, C., Rossi-Lamastra, C., & Rovelli, P. (2017). The road to crowdfunding success: a review of extant literature. Forthcoming.

Bygrave, W., & Timmons, J. (1992). *Venture capital at the crossroads*. Boston: Harvard Business School Press.

Carmeli, A. (2004). Strategic human capital and the performance of public sector organizations. *Scandinavian Journal of Management, 20*(4), 375–392.

Carpentier, C., & Suret, J. M. (2015). Canadian business angel perspectives on exit: a research note. *International Small Business Journal, 33*(5), 582–593.

Certo, S. T. (2003). Influencing initial public offering investors with prestige: signaling with board structures. *Academy of Management Review, 28*(3), 432–446.

Cohen, B. D., & Dean, T. J. (2005). Information asymmetry and investor valuation of IPOs: top management team legitimacy as a capital market signal. *Strategic Management Journal, 26*(7), 683–690.

Colombo, M. G., Grilli, L., & Piva, E. (2006). In search for complementary assets: the determinants of alliance formation of high-tech start-ups. *Research Policy, 35*, 1166–1199.

Colombo, M. G., Franzoni, C., & Rossi-Lamastra, C. (2015a). Cash from the crowd. *Science, 348*(6240), 1201–1202.

Colombo, M. G., Franzoni, C., & Rossi-Lamastra, C. (2015b). Internal social capital and the attraction of early contributions in crowdfunding. *Entrepreneurship Theory and Practice, 39*(1), 75–100.

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling theory: a review and assessment. *Journal of Management, 37*(1), 39–67.

Courtney, C., Dutta, S., & Li, Y. (2016). Resolving information asymmetry: signaling, endorsement, and crowdfunding success. *Entrepreneurship Theory and Practice, 41*(2), 265–290.

Drover, W., Busenitz, L., Matusik, S., Townsend, D., Anglin, A., & Dushnitsky, G. (2017). A review and road map of entrepreneurial equity financing research: venture capital, corporate venture capital, angel investment, crowdfunding, and accelerators. *Journal of Management*. https://doi.org/10.1177/0149206317690584.

Elitzur, R., & Gavious, A. (2003). Contracting, signaling, and moral hazard: a model of entrepreneurs, 'angels,' and venture capitalists. *Journal of Business Venturing, 18*(6), 709–725.

Epstein, L. G., & Schneider, M. (2008). Ambiguity, information quality, and asset pricing. *The Journal of Finance, 63*(1), 197–228.

EVCA (2013). EVCA annual report 2012–2013, European Venture Capital Association.

Feeser, H. R., & Willard, G. E. (1990). Founding strategy and performance: a comparison of high and low growth high tech firms. *Strategic Management Journal, 11*, 87–98.

Franke, N., Gruber, M., Harhoff, D., & Henkel, J. (2008). Venture capitalists' evaluations of start-up teams: trade-offs, knock-out criteria, and the impact of VC experience. *Entrepreneurship Theory and Practice, 32*(3), 459–483.

Gifford, S. (1997). Limited attention and the role of the venture capitalist. *Journal of Business Venturing, 12*(6), 459–482.

Gimeno, J., Folta, T. B., Cooper, A. C., & Woo, C. Y. (1997). Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative Science Quarterly, 42*, 750–783.

Gimmon, E., & Levie, J. (2010). Founder's human capital, external investment, and the survival of new high-technology ventures. *Research Policy, 39*(9), 1214–1226.

Giudici, G., Guerini, M., & Rossi-Lamastra, C. (2017). Reward-based crowdfunding of entrepreneurial projects: the effect of local altruism and localized social capital on proponents' success. *Small Business Economics*, 1–18.

Gorman, M., & Sahlman, W. A. (1989). What do venture capitalist do? *Journal of Business Venturing, 4*, 231–248.

Günther, C., Johan, S., & Schweizer, D. (2017). Is the crowd sensitive to distance?—how investment decisions differ by investor type. *Small Business Economics*, **forthcoming**. 10.13140/RG.2.2.29389.23523.

Hellmann, T., & Puri, M. (2002). Venture capital and the professionalization of start-up firms: empirical evidence. *Journal of Finance, 57*, 169–197.

Hoenig, D., & Henkel, J. (2015). Quality signals? The role of patents, alliances, and team experience in venture capital financing. *Research Policy, 44*(5), 1049–1064.

Hsu, D. H. (2006). Venture capitalists and cooperative start-up commercialization strategy. *Management Science, 52*, 204–219.

Hsu, D. H. (2007). Experienced entrepreneurial founders, organizational capital, and venture capital funding. *Research Policy, 36*(5), 722–741.

Hustedde, R. J., & Pulver, G. C. (1992). Factors affecting equity capital acquisition: the demand side. *Journal of Business Venturing, 7*(5), 363–374.

Janney, J. J., & Folta, T. B. (2003). Signaling through private equity placements and its impact on the valuation of biotechnology firms. *Journal of Business Venturing, 18*(3), 361–380.

Kahle, K. M., & Stulz, R. M. (2013). Access to capital, investment, and the financial crisis. *Journal of Financial Economics, 110*(2), 280–299.

Kaplan, S. N., & Strömberg, P. E. (2004). Characteristics, contracts, and actions: evidence from venture capitalist analyses. *The Journal of Finance, 59*(5), 2177–2210.

Lazear, E. P. (2004). Balanced skills and entrepreneurship. *American Economic Review, 94*(2), 208–211.

Lazear, E. P. (2005). Entrepreneurship. *Journal of Labor Economics, 23*(4), 649–680.

Lewis, B. W., Walls, J. L., & Dowell, G. W. (2014). Difference in degrees: CEO characteristics and firm environmental disclosure. *Strategic Management Journal, 35*(5), 712–722.

Lindsey, L., (2002). *The venture capital Keiretsu effect: an empirical analysis of strategic alliances among portfolio firms*. Working paper, Stanford University.

Lofstrom, M., Bates, T., & Parker, S. C. (2014). Why are some people more likely to become small-businesses owners than others: entrepreneurship entry and industry-specific barriers. *Journal of Business Venturing, 29*(2), 232–251.

Lukkarinen, A., Teich, J. E., Wallenius, H., & Wallenius, J. (2016). Success drivers of online equity crowdfunding campaigns. *Decision Support Systems, 87*, 26–38.

MacMillan, I. C., Siegel, R., & Subba Narasimha, P. N. (1985). Criteria used by venture capitalist to evaluate new venture proposals. *Journal of Business Venturing, 1*, 119–128.

MacMillan, I. C., Kulow, D. M., & Khoylian, R. (1989). Venture capitalists' involvement in their investments: extent and performance. *Journal of Business Venturing, 4*, 27–47.

Marvel, M. R. (2013). Human capital and search-based discovery: a study of high-tech entrepreneurship. *Entrepreneurship Theory and Practice, 37*(2), 403–419.

McGrath, R. G. (1999). Falling forward: real options reasoning and entrepreneurial failure. *Academy of Management Review, 24*(1), 13–30.

Mohammadi, A., & Shafi, K. (2017). Gender differences in the contribution patterns of equity-crowdfunding investors. *Small Business Economics*, forthcoming. https://doi.org/10.1007/s11187-016-9825-7.

Mollick, E. (2014). The dynamics of crowdfunding: determinants of success and failure. *Journal of Business Venturing, 29*(1), 1–16.

Muzyka, D., Birley, S., & Leleux, B. (1996). Trade-offs in the investment decisions of European venture capitalists. *Journal of Business Venturing, 11*, 273–287.

Ordanini, A., Miceli, L., Pizzetti, M., & Parasuraman, A. (2011). Crowd-funding: transforming customers into investors through innovative service platforms. *Journal of Service Management, 22*(4), 443–470.

Parhankangas, A., & Renko, M. (2017). Linguistic style and crowdfunding success among social and commercial entrepreneurs. *Journal of Business Venturing, 32*(2), 215–236.

Park, H. D., & Patel, P. C. (2015). How does ambiguity influence IPO underpricing? The role of the signalling environment. *Journal of Management Studies, 52*(6), 796–818.

Peterson, M.A. (2004). Information: hard and soft. Kellogg School of Management, Northwestern University Working Paper.

Plummer, L. A., Allison, T. H., & Connelly, B. L. (2016). Better together? Signaling interactions in new venture pursuit of initial external capital. *Academy of Management Journal, 59*(5), 1585–1604.

Prowse, S. (1998). Angel investors and the market for angel investments. *Journal of Banking & Finance, 22*(6), 785–792.

Ralcheva, A., & Roosenboom, P. (2016). On the road to success in equity crowdfunding. SSRN.

Robb, A., & Robinson, D. (2014). The capital structure decisions of new firms. *Review of Financial Studies, 27*, 153–179.

Robinson, P. B., & Sexton, E. A. (1994). The effect of education and experience on self-employment success. *Journal of Business Venturing, 9*(2), 141–156.

Roure, J. B., & Maidique, M. A. (1986). Linking prefunding factors and high-technology venture success: an exploratory study. *Journal of Business Venturing, 1*(3), 295–306.

Sapienza, H. J. (1992). When do venture capitalists add value? *Journal of Business Venturing, 7*, 9–27.

Sapienza, H. J., Manigart, S., & Vermeir, W. (1996). Venture capital governance and value added in four countries. *Journal of Business Venturing, 11*, 439–469.

Shane, S., & Stuart, T. (2002). Organizational endowments and the performance of university start-ups. *Management Science, 48*(1), 154–170.

Shepherd, D. A. (1999). Venture capitalists' assessment of new venture survival. *Management Science, 45*(5), 621–632.

Sitkin, S. B. (1992). Learning through failure: the strategy of small losses. *Research in Organizational Behavior, 14*, 231–266.

Skirnevskiy, V., Bendig, D., & Brettel, M. (2017). The influence of internal social capital on serial creators' success in crowdfunding. *Entrepreneurship Theory and Practice, 41*, 209–236.

Skoglund, E., & Stiernblad, M. (2013). The future of equity crowdfunding—is "the crowd" capable of good investment? Working paper.

Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics, 87*(3), 355–374.

Spence, M. (2002). Signaling in retrospect and the informational structure of markets. *American Economic Review, 92*(3), 434–459.

Spivack, A. J., McKelvie, A., & Haynie, J. M. (2014). Habitual entrepreneurs: possible cases of entrepreneurship addiction? *Journal of Business Venturing, 29*(5), 651–667.

Sudek, R. (2006). Angel investment criteria. *Journal of Small Business Strategy, 17*(2), 89–103.

Tyebjee, T. T., & Bruno, A. V. (1984). A model of venture capitalist investment activity. *Management Science, 30*(9), 1051–1066.

Vismara, S. (2016a). Information cascades among investors in equity crowdfunding. *Entrepreneurship Theory and Practice*. https://doi.org/10.1111/etap.12261.

Vismara, S. (2016b). Equity retention and social network theory in equity crowdfunding. *Small Business Economics, 46*(4), 579–590.

Vulkan, N., Åstebro, T., & Sierra, M. F. (2016). Equity crowdfunding: a new phenomenon. *Journal of Business Venturing Insights, 5*, 37–49.

Wang, M. T., & Degol, J. (2013). Motivational pathways to STEM career choices: using expectancy–value perspective to understand individual and gender differences in STEM fields. *Developmental Review, 33*(4), 304–340.

Zimmerman, M. A., & Zeitz, G. J. (2002). Beyond survival: achieving new venture growth by building legitimacy. *Academy of Management Review, 27*(3), 414–431.