BJM BRITISH JOURNAL of MANAGEMENT
BRITISH ACADEMY OF MANAGEMENT
British Journal of Management, Vol. 0, 1–20 (2021)
DOI: 10.1111/1467-8551.12494

Equity Crowdfunding Founder Teams: Campaign Success and Venture Failure

Jerry Coakley [1], Aristogenis Lazos[2] and José M. Liñares-Zegarra [1]
[1]Essex Business School, University of Essex, Wivenhoe Park, Colchester, CO4 3SQ, UK
(E-mail: jmlina@essex.ac.uk)[2]Audencia Business School, Nantes, France (E-mail: alazos@audencia.com)
Corresponding author email: jcoakley@essex.ac.uk

This paper examines whether solo founders are more likely to succeed in an initial equity crowdfunding (ECF) campaign and are subsequently less likely to fail than founder teams for a large sample of initial ECF campaigns conducted on the three largest UK platforms: Crowdcube, Seedrs and SyndicateRoom. The results show that solo founders have a lower probability of conducting successful initial ECF offerings than founder teams, and are also more likely to fail thereafter. The implication that founder teams enjoy more success is due to the fact that the quality of their human capital may likely attract professional investors who can act as a certification effect. Likewise, the monitoring role of professional investors helps to minimize moral hazard concerns and thus lowers the likelihood of failure for ECF founder teams. The results also establish that founder team human capital characteristics are significant determinants of initial ECF campaign outcomes and venture failure.

Introduction

Mike Wright was a pioneering researcher and recognized expert in many aspects of the nature, role and financing of high-risk entrepreneurial ventures. He made many seminal contributions to the new forms of entrepreneurial finance – collectively known as alternative finance – as exemplified by the Bruton, Khavul, Siegel and Wright (2015) et al. (2007) overview of recent research in this field. Equity crowdfunding (ECF) is an excellent example of the latter, as it provides a new and accessible source of outside equity for small, young, unlisted startups. Beauhurst (2019) reports that ECF in the UK raised funds worth £271m in 2018, or an annual increase of 24.6% on the previous year, and that ECF platforms have also increasingly begun to finance later-stage ventures.[1] This can be seen as one response to the second-stage equity gap – the shortfall between the amount of (risk) capital that would be invested under conditions of competitive markets with full information and the amount of capital actually invested – a concept that Wright pioneered with other colleagues (Wilson, Wright and Kacer, 2018).

Early and growth-stage startups and ventures are unquoted companies characterized by extreme information asymmetries.[2] The founder

The authors wish to thank Geoffrey Wood for encouraging us to contribute a paper for the BJM Special Issue PDW in Honor of Mike Wright (June 2020) and to the other organisers Douglas Cumming and Pawan Budhwar. They are also grateful to the discussant Simon Parker and to an anonymous reviewer whose comments substantially improved the original version of the paper. They gratefully acknowledge Economic and Social Research Council (ESRC) funding under grant number ES/L011859/1.

[1]See https://thisisoliver.co/2019/02/05/uk-equity-crowdfunding-continues-its-growth-as-startup-investing-drops/
[2]Mike Wright has made many seminal contributions in this area, especially but not only in the context of (academic) spinoffs (Knockaert *et al.*, 2011; Vanaelst *et al.*, 2006) and technological entrepreneurship (Mosey and Wright 2007; Wright *et al.*, 2007).

team – which may comprise just one person – and its human capital can be used to signal quality when seeking outside funding. Only a few ECF studies examine human capital and how it may affect ECF campaign success (Barbi and Mattioli, 2019; Piva and Rossi-Lamastra, 2018).[3] Other studies show that the founding team has very persistent effects over the lifespan of a venture, including on its strategy, success and survival (Agarwal, Braguinksy and Ohyama, 2020; Fern, Cardinal and O'Neill, 2012; Greenberg and Mollick, 2018).

Greenberg and Mollick (2018) posit that the composition of the founding team is perhaps the most influential decision made at the outset by new startups. They interpret the literature as increasingly focusing on founding teams rather than sole founders. They note that coordination costs and incentive problems may arise for startups formed by a team rather than a sole founder. The empirical results on sole founder versus founder team are mixed. Early studies find that solo founders outperform teams (Almus and Nerlinger, 1999; Cooper, Gimeno-Gascon and Woo, 1994), while some recent studies stress the potential for disagreements, conflicts and disputes within teams (Agarwal, Braguinksy and Ohyama, 2020; Yang and Aldrich, 2012). Greenberg and Mollick (2018) find that solo founders outperform founder teams in terms of survival and do no worse in terms of revenue generation using a sample of reward-based crowdfunding campaigns on Kickstarter. However, other studies support the superiority of founder teams (e.g. Lazear, 2005; Levine, Bernard and Nagel, 2017).

ECF campaigns involve larger target capital amounts and are subject to more extreme information asymmetries than reward-based crowdfunding campaigns (Coakley and Lazos, 2021). Thus, ventures seek to signal their quality to potential investors by various means, such as prior external funding or incubators (Ralcheva and Roosenboom, 2020). In this context, investments by business angels (BAs) and venture capitalists (VCs) can act as an important certification effect for other investors. Zhang *et al*. (2018) highlight the growing role of professional (institutional) investors and estimate that their contribution to UK ECF campaign investment increased from 5% in 2015 to 25% in 2016 and 48% in 2017.[4] Coakley and Lazos (2021) stress the role of the co-investment model – where professional investors invest alongside the crowd – as one of the keys for the growth and success of the UK ECF market.

Greenberg and Mollick (2018) used revenue generation for their finding that solo founders are more successful than founder teams in reward-based crowdfunding. Since startup financial accounts are sketchy, success in ECF studies is typically measured by startups reaching (exceeding) their target capital in both initial and seasoned (follow-on) campaigns (Coakley, Lazos and Linares-Zegarra, 2021). Barbi and Mattioli (2019) argue that founding team human capital is probably the most important aspect that investors pay attention to when considering funding a company. Others have argued that it is more important for early and growth-stage ventures than for older companies (Colombo and Grilli, 2005; Unger *et al*., 2011). However, we are unaware of any empirical study of this within the ECF literature.

Thus, the first contribution of this paper is to use a large sample of ECF campaigns to test Greenberg and Mollick's (2018) proposition that solo founders outperform founder teams in terms of both initial ECF campaign success and the probability of subsequent failure. Note, however, that several entrepreneurial studies stress the importance of founder teams for professional investors whose investments can act as a certification effect for other investors. Crowdcube, the first and largest UK ECF platform, was aware of this at the outset by granting voting rights only to those (professional) investors who contributed at or above a minimum investment threshold such as £10k (Cumming *et al*., 2019b). Gompers *et al*. (2020) find that VC investors view the management team as more important than business-related characteristics like product or technology in deal (project) selection. Capizzi (2015) studies factors that affect BA returns from the Italian market and finds that the most important characteristic BAs look for when deciding to invest in a firm is its management team. Bernstein, Korteweg and Laws (2017) find that the average BA investor is highly

[3]Mochkabadi and Volkmann (2018), in their wide-ranging review of the ECF literature, make only three mentions of the term 'management team', which illustrates the need for further research on this area.

[4]Large investment by professional investors leads to potential cascading or herding by crowd investors (Sun, Coakley and Girardone, 2021; Vismara, 2018).

responsive to information about the founding team, but information about the traction and identity of current investors has less effect.

The paper's second contribution is to examine the impact of founder human capital characteristics on initial ECF success and firm failure. While ECF campaign success and ECF firm failure have been studied (Coakley, Lazos and Linares-Zegarra, 2021; Hornuf, Schwienbacher and Stenzhorn, 2018; Signori and Vismara, 2018), none of these studies examines the impact of founders. This requires finding proxies for these characteristics, which is not straightforward due to the limited publicly available information of ECF firms. We follow Barbi and Mattioli's (2019) and Piva and Rossi-Lamastra's (2018) view that past experience and educational level are the most salient elements of human capital. We construct two proxies for experience. On the one hand, founder team tenure heterogeneity is given by the tenure range of its members. This can be considered as part of startup-specific (entrepreneurial) human capital that represents the breadth of experience garnered at startup.[5] On the other hand, founder team age heterogeneity, given by its members' age range, can be interpreted as a proxy for general experience.[6] Firms whose founders have advanced degrees are more likely to receive funding (Gimmon and Levie, 2010), or to be chosen by professional investors (Hsu, 2007; Zacharakis and Meyer, 2000). We use an advanced degree variable to capture higher educational level achievement and skills, which are not firm-specific.

Our empirical analysis employs data from 1,291 initial campaigns conducted on the Big 3 UK ECF platforms – Crowdcube, Seedrs and SyndicateRoom – and establishes two main sets of results. The first reveals that solo ventures are less likely to conduct successful initial ECF offerings and are more likely to experience a failure event relative to ventures with founder teams. The finding that solo founders perform worse and are more likely to fail is contrary to Greenberg and Mollick's (2018) results. Our different results may be linked to the distinct due diligence processes between ECF and reward-based crowdfunding platforms that Cumming, Johan and Zhang (2019a) highlight. Due diligence involves ECF platforms and professional investors both interviewing the founding term and conducting checks on a range of issues from the founders' background to the details of the venture accounts in an effort to reduce potential adverse selection problems. Our results can be linked to signalling theory (Spence, 1973), which has been used to explain ECF campaign success (Ahlers *et al*., 2015; Vismara, 2016). The general idea is that teams possess the requisite sets of skills and experience that help them meet the multifarious challenges in ECF (Lazear, 2005; Levine, Bernard and Nagel, 2017), which in turn acts as a signal of quality for investors and for professional investors in particular.

Our second set of results relate to our human capital proxies. Our proxies for academic expertise (proxying for higher educational attainment), firm-specific and general experience are positively related to successful initial ECF offerings, and also suggest some evidence of a negative relationship with venture failure. These human capital results are consistent with those of Barbi and Mattioli's (2019) study of successful campaigns on Crowdcube and Piva and Rossi-Lamastra's (2018) study of the Italian ECF market. Both establish that entrepreneur education and experience affect campaign outcomes, even if they do not focus specifically on team composition. Our human capital proxy findings can also be linked to the evidence on heterogeneous teams adduced by Chemmanur and Paeglis (2005) in their initial public offering study.

The rest of this paper is organized as follows. The next section discusses and formulates the hypotheses to be tested. The third section gives details of our data and empirical methodology. The fourth section reports the results of multivariate analysis, while the fifth section concludes.

Background literature and hypothesis development

This paper employs a signalling theory framework (Spence, 1973) that has been used successfully to explain the ECF phenomenon (Ahlers *et al*., 2015; Vismara, 2016). A good signal has to be observable and costly to imitate to be effective in reducing

[5]See Arozamena and Centeno (2006) and Bougheas and Georgellis (2004) for the role of tenure in specific human capital.

[6]See Becker (1964) for differences between general and specific human capital.

information asymmetry, and only high-quality signallers are able to send effective signals (Connelly *et al*., 2011). Ahlers *et al*. (2015) is the first ECF study that employs signalling theory to explain campaign success. They find that retained equity and making more information available about a firm's risks can reduce information asymmetry and increase the likelihood of success. In a similar vein, Vismara (2016) finds that there is a negative (positive) association between equity (entrepreneurs' social capital) and offering success. Ralcheva and Roosenboom (2016) extend these studies by focusing on certification effects in ECF. Their findings reveal that external validation in the form of grants, the presence of a professional investor and patents acts as a certification effect that positively affects campaign success. Johan and Zhang (2020) argue that entrepreneurs use data and textual information to signal startup quality. We conjecture that heterogeneous and highly educated founders may serve as effective signals that reduce information asymmetry and increase the likelihood of campaign success.

Human capital is highlighted in several ECF studies and it has been shown to affect offering success. Barbi and Mattioli (2019) study the UK market and their findings reveal that education, experience and gender affect success. Piva and Rossi-Lamastra (2018) find that entrepreneur education and experience affect campaign outcomes in the Italian ECF market. In a study that focuses on post-campaign life, Signori and Vismara (2018) study factors that affect the likelihood of a firm conducting at least one follow-on (crowdfunding or other) campaign and firm failure. They find that no ECF firm backed by a professional investor failed. Hornuf, Schwienbacher and Stenzhorn (2018) study post-campaign life, focusing on the UK and German ECF market. They argue that the number of VCs and senior managers increases the likelihood of follow-on funding, whereas UK firms are less likely to conduct follow-ons. Their findings highlight the role of human capital and the involvement of VCs in firm survival.

There is evidence that teams may perform better in ECF because they may signal startup quality with high potential. Baeck *et al*. (2014) conduct a survey and report that team members may be more important than the project itself, highlighting the signalling role team members can play. Ahlers *et al*. (2015) find that team size may be an effective signal as it is positively associated with campaign success from a set of Australian offerings. Barbi and Mattioli (2019) focus on human capital and document a positive association between team size and total ECF amount raised, employing a sample of successful Crowdcube offerings. In summary, the evidence suggests that solo founders may not possess as much appropriate human capital as founder teams for ECF success and, as a result, this may act as a less effective signal for solo startup quality. High-quality signallers underpin effective signals. However, Greenberg and Mollick (2018) find that solo founder reward-based crowdfunding campaigns perform better in terms of revenue generation, but they do not test whether they are more successful than teams in raising funding during initial ECF campaigns. This leads to the following hypothesis:

H1: ECF ventures with solo founders are more likely to conduct a successful initial ECF campaign than ventures with founder teams.

There is rather less evidence on ECF firm failure. Signori and Vismara's (2018) finding that no ECF firm backed by a professional investor failed may be explained by angel and VC investors actively monitoring startup performance and thus reducing moral hazard concerns. In addition, angels typically offer business advice. This has a positive implication for founder teams, as professional investors tend to focus more on founder teams than solo founders (Graham, 2006). Greenberg and Mollick (2018) find that solo founders outperform founder teams in reward-based crowdfunding in terms of lower failure rates. This motivates the following hypothesis:

H2: ECF ventures with solo founders are less likely to fail than ventures with founder teams.

Team size of itself is not necessarily informative about the human capital characteristics of the founders. ECF teams operate in a funding environment where ECF is the most complex type of crowdfunding, as Wilson and Testoni (2014) argue. This is because the team has to persuade a large number of individual investors with different characteristics and backgrounds. Thus, since trying to convince the crowd about the viability of the venture in ECF campaigns is a complex task, founder teams can use their human capital quality to signal potential venture success. Here we follow Barbi and Mattioli (2019) and Piva and Rossi-Lamastra (2018) in employing experience

and education as proxies for human capital. More specifically, we employ tenure heterogeneity as a proxy for firm-specific (entrepreneurship) experience, age heterogeneity as a proxy for general experience, and advanced degree as a proxy for skills which are non-specific to the firms. This leads to the following hypothesis:

H3: Initial ECF campaign success is positively associated with team human capital characteristics.

Teams possess a set of diverse skills which could affect the likelihood of firm failure. Again, we conjecture that ventures run by teams with human capital proxies – like high levels of firm-specific and general experience and academic expertise – are less likely to fail. They can also be linked to team heterogeneity. Jin *et al*. (2017) document a positive association between team heterogeneity and venture performance from a rich dataset of more than 8,000 observations. Therefore, heterogeneous ECF teams may possess the requisite diverse skills to enable their ventures to prosper rather than fail. This suggests the following hypothesis:

H4: ECF firm failure is inversely associated with team human capital characteristics.

Data and methodology

Data

Our empirical results are based on a sample of 1,291 successful and unsuccessful ECF campaigns launched on the three major UK platforms (Crowdcube, Seedrs and SyndicateRoom) spanning the period 2013–2018. The data end in 2018, as SyndicateRoom changed from being a crowdfunding platform to become a fund management firm specializing in startups in 2019. Existing studies highlight that finding data on founders is difficult (Roberts and Eesley, 2011). Survivorship bias may be present, since it is very often difficult to collect data on firms that operate on the date at which they are collected (Yang and Aldrich, 2012). Data unavailability may be one of the reasons why results are segmented in entrepreneurial finance (Cumming and Vismara, 2017).

Initial ECF campaign data are obtained from TAB – formerly Crowdsurfer – which is part of Eikon app database and described as the most comprehensive source of intelligence.[7] The registration number – which is a unique identifier for a UK firm – is used to match TAB data with founder data from UK Companies House (a government agency acting as the official registrar of UK firms).[8] Thus, we use UK Companies House to collect data on founders to obtain the largest dataset possible. This has been deployed in other ECF studies, such as Signori and Vismara (2018). We identify a founding team member to be one listed as Director at UK Companies House.[9]

Variables

Dependent variables. The set of dependent variables capturing campaign success are those that have been used by existing studies. *Ln*(*Amount*) captures the logged total amount raised in the initial ECF campaign. We also use a dummy that takes value 1 if a campaign reaches its target, and 0 otherwise. The other campaign success proxy employed is *Overfunding*, which aims to capture those offerings that are overfunded. It takes value 1 if the total amount raised is greater than the target, and 0 otherwise. The *Failure* variable is a dummy that takes value 1 if the startup has defaulted or is in administration or liquidation, and 0 otherwise (Signori and Vismara, 2018). The alternative dependent variable for the Cox and Weibull models is the time to fail. This is the difference in days between launch date and failure date for failed campaigns, and launch date and 19 December 2019 for surviving firms.

[7]See https://www.crowdfundinsider.com/2017/08/120175-tab-dashboard-incorporated-eikon-thomson-reuters/

[8]All firms listed in the UK are obliged by British legislation annually to file their accounts at Companies House. This government agency makes available information on each founder team member, such as date of appointment, resignation and date of birth.

[9]This proxy may not be appropriate in the case of outside directors. Existing studies indicate that outside directors are usually appointed after the Series A financing stage and early-stage investors usually serve as outside directors (Venugopal and Yeramilli, 2019). Furthermore, issuing equity for ECF firms is usually the last resort (Walthoff-Borm, Schwienbacher and Vanacker, 2018). Blaseg, Cumming and Koetter (2020) argue that pecking-order theory holds in ECF and they present some evidence that German firms turn to ECF after they have been unsuccessful at raising equity from professional investors. This makes it less likely for ECF firms to have directors other than founding members.

Explanatory variables. The first explanatory variable is solo founder and takes the value 1 for startups with a solo founder, and 0 otherwise. The other set of explanatory variables involve human capital proxies. *Tenure heterogeneity*, used as a proxy for firm-specific experience, is defined as the tenure range of the founder team on the ECF campaign public launch day. *Age heterogeneity*, used as a proxy for general experience, is the age range of team members. The final human capital proxy is *Advanced degree*, which is a dummy variable with value 1 for a founder holding the title of Doctor or Professor, and 0 otherwise.

Control variables. A set of control variables is used to account for observed heterogeneity. Firm age is used since extant studies show that it is negatively associated with campaign success. We use a dummy variable called startup, which takes the value 1 if firm age is equal to or less than 5 years, and 0 otherwise (Steigertahl, Mauer, and Say (2018). Vulkan, Åstebro and Sierra (2016) report a negative (positive) relation between the goal (funders) of a campaign and the probability of a successful ECF campaign. Therefore, startup status, target capital and funders are also used as control variables.

Equity is used as control variable, based on previous studies suggesting a negative relationship between equity offered and campaign success (Vismara, 2016). Year dummies, location (i.e. if the firm is based in London), pre-money valuation and diversification are also used as control variables. Bapna (2017) conducts a randomized field experiment and finds that product matters for campaign success. Different products may be offered across different industry groups, and therefore a full set of industry dummies are used in all our empirical models.

Methodology

The paper employs three success proxies as dependent variables in Eqs (1) to (3) below, where a solo-founder dummy is the variable of interest. The amount (raised) is used as dependent variable in Eq. (1), which is estimated via ordinary least squares (OLS). Equations (2) and (3) involve estimating probit models, where success and overfunding (amount to goal > 1) dummies are the dependent variables. To study firm failure, the paper employs the probit (Eq. (4)) and Cox and Weibull (Eq. (5)) hazard models, as in Hornuf, Schwienbacher and Stenzhorn (2018). The advantage of hazard models is that they take into account the time to an event.

Solo founder:

$$Ln\,(Amount) = \mathrm{a}_1 + \beta_1 Solo\_founder + \Gamma_1 Controls + \varepsilon_1 \quad (1)$$

$$Success_{dummy} = \mathrm{a}_2 + \beta_2 Solo\_founder + \Gamma_2 Controls + \varepsilon_2 \quad (2)$$

$$Overfunding_{dummy} = \mathrm{a}_3 + \beta_3 Solo\_founder + \Gamma_3 Controls + \varepsilon_3 \quad (3)$$

$$Failure_{dummy} = \mathrm{a}_4 + \beta_4 Solo\_founder + \Gamma_4 Controls + \varepsilon_4 \quad (4)$$

$$h_1(\mathrm{t}|\mathrm{x}) = h_{01}\,(t) \exp[\beta_{01} Solo\_founder + \Gamma_{01} Controls] \quad (5)$$

Similar methods are employed when human capital proxies are used as variables of interest. These include *Tenure heterogeneity*, *Age heterogeneity* and *Advanced degree*. The same set of controls is employed in all equations.

Human capital:

$$Ln\,(Amount) = a_6 + \beta_6 Human\_capital + \Gamma_6 Controls + \varepsilon_6 \quad (6)$$

$$Success_{dummy} = a_7 + \beta_7 Human\_capital + \Gamma_7 Controls + \varepsilon_7 \quad (7)$$

$$Overfunding_{dummy} = a_8 + \beta_8 Human\_capital + \Gamma_8 Controls + \varepsilon_8 \quad (8)$$

$$Failure_{dummy} = a_9 + \beta_9 Human\_capital + \Gamma_9 Controls + \varepsilon_9 \quad (9)$$

$$h_2(\mathrm{t}|\mathrm{x}) = h_{02}\,(t) \exp[\beta_{02} Human\_capital + \Gamma_{02} Controls] \quad (10)$$

Empirical results

This section first reports basic descriptive statistics for our sample of 1,291 successful and unsuccessful ECF campaigns. It then presents and discusses the key results of our multivariate empirical analysis.

Descriptive statistics

Table 1 reports the definitions of the variables employed in the empirical analysis. The key independent variables of interest are the solo-founder dummy and three human capital proxies. Table 2 presents the basic descriptive statistics for all variables.

Solo founders account for 34% of our sample. This is slightly higher than the corresponding 28% in Greenberg and Mollick's (2018) sample, implying that solo ventures are more popular in an ECF setting. The average team tenure heterogeneity and age heterogeneity are 1.2 and 9.2 years, respectively. Some 7% of the sample holds an advanced degree. However, since more than half of founders work in the IT and technology sector, this may signal industry-specific expertise. The average premoney valuation of sample firms is £3.17m, and 79% of them are equal to or less than 5 years old. The sample is geographically concentrated, with 46% of firms located in London, which is consistent with Beauhurst (2019). They are mainly undiversified (i.e. with a strong focus on a single sector). The average target capital is £0.32m and the average equity offered is around 14%.

We conduct an equality of means test for all variables for solo founders and teams. Table 3 summarizes the results.

There are significant differences between solo founders and teams for the majority of variables. Teams are associated with higher success rates and total amount raised. They are also more likely to be overfunded and are less likely to fail. All the test results are significant at the 1% level, which offers preliminary evidence that goes against H1 and H2. Teams also set higher targets, enjoy higher valuations for their startups and more funders for their campaigns.

Next, we test for the presence of multicollinearity among the variables by reporting their correlation coefficients. The results are summarized in Table 4. The table shows no high correlation between the variables employed, except for the case of correlations between funders and campaign outcomes and human capital, which are to be expected. For this reason, we analyse human capital characteristics separately in the following sections.

Success and failure

This subsection focuses on initial campaign success and the performance of the venture after the initial ECF campaign, and specifically whether it fails. First, we study the effect of solo founder on three separate proxies for campaign success. Models (1) to (3) employ the OLS model, in which the total amount raised or *Ln*(*Amount*) is the dependent variable. The remaining six models employ the probit model, where a success and overfunding dummy are the dependent variables. Three versions of the model with each dependent variable are estimated. The first has sole founder as the only explanatory variable, the second includes only the control variables, while the third includes all variables in the previous two regressions. Hereafter the discussion focuses on regression models (3), (6) and (9), which include solo founder and the full set of controls. All three sets of regressions include both campaign year and industry fixed effects. Table 5 summarizes the results.

The results indicate that the solo-founder coefficient is significantly negative at the 1% level in models (3), (6) and (9). Solo-founder firms are negatively related to the natural logarithm of amount of capital raised, the probability of launching a successful initial campaign and the probability of being overfunded. Thus, solo founders are less likely to raise more capital and succeed in an initial ECF campaign. In other words, they underperform founder teams.

These results strongly reject H1, that solo founders are more likely to run successful initial ECF campaigns. They are broadly consistent with the positive association documented in Ahlers *et al*. (2015) between team size and campaign success. However, the finding that solo founders underperform relative to founder teams runs contrary to Greenberg and Mollick's (2018) findings, albeit we are using a different performance metric in a different crowdfunding setting.

Next, we study whether solo founders are more or less likely to fail. The results are summarized in Table 6. Models (1) to (3) employ the probit method, with a failure dummy as the dependent

Table 1. Variable definitions

Variable name	Description	Data source
Dependent variables		
Ln(Amount raised)	Natural logarithm of total amount (£) raised in the initial campaign.	TAB
Success	Dummy = 1 if a firm reaches or exceeds its target before the campaign closes, and 0 otherwise.	TAB
Overfunding	Dummy = 1 if the ratio amount to goal > 1, and 0 otherwise.	TAB
Failure	A binary variable that takes value 1 if a firm has defaulted or if it is in administration or liquidation, and 0 otherwise.	TAB
Independent variables		
Human capital		
Solo founder	Dummy = 1 for firms with solo founder, and 0 otherwise.	UK Companies House
Tenure heterogeneity	The tenure range in years for team members at campaign start. Proxy for entrepreneurial experience.	UK Companies House
Age heterogeneity	Age range of team members at campaign start. Proxy for general experience.	UK Companies House
Advanced degree	Dummy = 1 if at least one of the founders holds the title of Doctor or Professor, and 0 otherwise.	UK Companies House
Firm-level characteristics		
Firm valuation	Pre-money valuation (£m) prior to the crowdfunding campaign.	TAB
Startup	Dummy = 1 if firm age $\leq$ 5 years at campaign start.	UK Companies House
London	Dummy = 1 if firm operates in London.	UK Companies House
Diversification	The number of 4-digit SIC codes associated with a firm.	UK Companies House
Campaign characteristics		
Equity offered	The proportion (%) of equity offered.	TAB
Ln(Funders)	Natural logarithm of the number of investors at the end of the campaign.	TAB
Target capital	Minimum amount of capital (£m) to be raised in the initial campaign.	TAB

Table 2. Descriptive statistics

Variable	N	Mean	SD	P25	Median	P75	Min	Max
Ln(Amount raised)	1,291	11.82	1.63	11.14	11.96	12.9	3.4	15.79
Success	1,291	0.59	0.49	0	1	1	0	1
Overfunding	1,291	0.55	0.50	0	1	1	0	1
Firm failure	1,291	0.2	0.4	0	0	0	0	1
Human capital								
Solo founder	1,288	0.34	0.47	0	0	1	0	1
Tenure heterogeneity	1,288	1.2	2.46	0	0	1.36	0	26.42
Age heterogeneity	1,288	9.19	11.49	0	3.8	15.09	0	64.88
Advanced degree	1,288	0.07	0.26	0	0	0	0	1
Firm-level characteristics								
Firm valuation (£m)	1,172	3.17	5.52	0.72	1.35	3.37	0.08	68.6
Startup	1,291	0.79	0.41	1	1	1	0	1
London	1,291	0.46	0.5	0	0	1	0	1
Diversification	1,277	1.18	0.52	1	1	1	1	4
Campaign characteristics								
Equity offered (%)	1,232	14.12	8.26	8.94	12.5	18.42	0.08	67.75
Ln(Funders)	1,291	4.52	1.31	3.71	4.63	5.38	0	8.07
Target capital (£m)	1,291	0.32	0.39	0.1	0.2	0.4	0	6

This table reports the number of observations along with the mean, minimum, maximum, standard deviation, 25th, 50th and 75th percentiles of variables employed in this study. The sample involves initial offerings conducted on Crowdcube, Seedrs and SyndicateRoom and spans the period from January 2013 to December 2018.

Table 3. Equality of means test between solo founders and teams

	Teams (mean)	Solo founder (mean)	Test for equality of means
Ln(Amount raised)	12.07	11.31	0.76***
Success	0.63	0.5	0.13***
Overfunding	0.59	0.47	0.12***
Firm failure	0.18	0.24	−0.07***
Human capital			
Tenure heterogeneity	1.8	0	1.80***
Age heterogeneity	13.83	0	13.83***
Advanced degree	0.11	0.01	0.09***
Firm-level characteristics			
Firm valuation (£m)	3.52	2.31	1.22***
Startup	0.77	0.82	−0.05**
London	0.46	0.44	0.02
Diversification	1.19	1.15	0.04
Campaign characteristics			
Equity offered (%)	14.12	14.16	−0.04
Ln(Funders)	4.61	4.33	0.28***
Target capital (£m)	0.37	0.23	0.14***

This table reports the results of an equality of means test. The teams column reports the average values of teams, whereas the solo founders column reports the average values for solo founders. The last column reports their difference, along with their significance levels. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. The sample involves initial offerings conducted on Crowdcube, Seedrs and SyndicateRoom and spans the period from January 2013 to December 2018.

variable. Models (4) to (9) employ the Cox and Weibull hazard models, that take account of the time to failure. Hazard ratios are reported for these models.

The findings reveal positive and significant marginal effects (probit models) and hazard ratios higher than 1 (Cox and Weibull hazard models) at the 1% level. The robust finding is that solo-founder campaigns are more likely to fail. Solo-founder offerings exhibit a higher hazard ratio of time to fail of around 34% compared to those of founder teams in models (6) and (9). These findings roundly reject H2 that solo-founder campaigns are less likely to fail. This may partly be due to the monitoring activities of professional investors in most ECF campaigns with founder teams. They also lend support to existing studies, which indicate that teams possess a wider set of skills that makes it more likely for them to survive (Levine, Bernard and Nagel, 2017). They are also broadly consistent with the meta-analysis study of Jin *et al*. (2017), in which a positive association is documented between team size and venture success.

Our results are contrary to the positive association between solo founders and firm survival documented by Greenberg and Mollick (2018) for a sample of reward-based crowdfunding campaigns on Kickstarter. Cumming, Johan and Zhang (2019a) find that ECF platforms are more likely to conduct due diligence (including background checks on the entrepreneurial team) to avoid adverse selection problems compared to donation- and reward-based platforms. Moreover, BAs and VCs are not as heavily involved in reward-based campaigns as they are in UK ECF campaigns. Zhang *et al*. (2018) found that the average share of professional investors' contribution to ECF campaigns had reached an average of 48% in 2017, and so acted as a certification effect for other investors. This supports the concept of the wisdom of the crowd (Astebro *et al*., 2019; Mollick and Nanda, 2015) in explaining the higher success of founder team ECF campaigns. The results on lower probability of founder team firm failure link with Signori and Vismara's (2018) finding that founder teams with a professional investor are less likely to fail. This is consistent with professional investors playing a monitoring role to minimize moral hazard concerns.

Propensity score matching. Endogeneity is an important concern in any study in management and business research (Abdallah, Goergen and O'Sullivan, 2015). We note that our sample includes data on both successful and unsuccessful ECF campaigns, which should be helpful in ameliorating sample selection concerns. However, our study may still be potentially biased

Table 4. Correlation matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Ln(Amount raised)	(1)	1.000														
Success	(2)	0.489*	1.000													
Overfunding	(3)	0.492*	0.919*	1.000												
Firm failure	(4)	−0.176*	−0.068	−0.106*	1.000											
Solo founder	(5)	−0.229*	−0.114*	−0.110*	0.080*	1.000										
Tenure heterogeneity	(6)	0.214*	0.050	0.056	−0.078*	−0.344*	1.000									
Age heterogeneity	(7)	0.271*	0.096*	0.092*	−0.069	−0.569*	0.423*	1.000								
Advanced degree	(8)	0.151*	0.036	0.041	−0.046	−0.174*	0.221*	0.231*	1.000							
Firm valuation (£m)	(9)	0.389*	0.054	0.070	−0.129*	−0.112*	0.224*	0.185*	0.063	1.000						
Startup	(10)	−0.183*	0.039	0.004	0.051	0.058	−0.482*	−0.145*	−0.128*	−0.244*	1.000					
London	(11)	0.070	0.042	0.052	−0.008	−0.006	−0.050	−0.058	−0.129*	0.023	0.084*	1.000				
Diversification	(12)	0.033	−0.025	−0.035	0.014	−0.024	−0.042	0.015	0.048	−0.002	0.006	0.016	1.000			
Equity offered (%)	(13)	0.117*	−0.004	−0.014	−0.022	0.004	−0.045	0.027	0.054	−0.305*	0.042	−0.081*	0.029	1.000		
Ln(Funders)	(14)	0.538*	0.534*	0.546*	−0.130*	−0.090*	0.015	0.060	−0.067	0.300*	−0.026	0.097*	0.033	−0.089*	1.000	
Target capital (£m)	(15)	0.527*	0.035	0.038	−0.129*	−0.155*	0.230*	0.243*	0.156*	0.526*	−0.223*	0.041	0.023	0.112*	0.187*	1.000

This table reports correlation values of variables employed in this study. * denotes statistical significance at the 1% level. The sample involves initial offerings conducted on Crowdcube, Seedrs and SyndicateRoom and spans the period from January 2013 to December 2018.

Table 5. Solo founder and initial ECF campaign success

Dependent variables:	Ln(Amount raised)			Success (D = 1)			Overfunding		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Solo founder	−0.653***		−0.365***	−0.116***		−0.063***	−0.110***		−0.059**
	(−6.32)		(−7.64)	(−3.51)		(−2.96)	(−3.23)		(−2.43)
Firm valuation (£m)		0.025***	0.027***		−0.006***	−0.007***		−0.006***	−0.007***
		(3.71)	(3.51)		(−3.26)	(−4.49)		(−3.03)	(−4.31)
Startup		−0.299***	−0.281***		−0.007	−0.008		−0.039**	−0.039**
		(−4.97)	(−5.25)		(−0.42)	(−0.54)		(−2.26)	(−2.56)
London		0.094	0.096		0.012	0.015		0.017	0.020
		(1.35)	(1.34)		(0.59)	(0.75)		(0.89)	(1.09)
Diversification		0.026	0.017		−0.044***	−0.044***		−0.059***	−0.059***
		(0.56)	(0.30)		(−3.16)	(−3.12)		(−4.26)	(−4.18)
Equity offered (%)		0.027***	0.028***		−0.000	−0.000		0.001	0.001
		(8.06)	(7.93)		(−0.37)	(−0.35)		(0.66)	(0.71)
Ln(Funders)		0.492***	0.482***		0.199***	0.197***		0.223***	0.221***
		(6.30)	(6.28)		(16.11)	(18.21)		(13.79)	(15.18)
Target capital (£m)		1.328***	1.268***		0.022	0.013		−0.025	−0.031
		(9.08)	(8.81)		(0.71)	(0.50)		(−0.72)	(−0.97)
Campaign year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,286	1,155	1,153	1,281	1,149	1,147	1,284	1,152	1,150
(Pseudo) R-squared	0.198	0.535	0.546	0.141	0.421	0.426	0.099	0.362	0.366
Log likelihood (intercept only)	−2,452.426	−2,125.093	−2,119.754	−867.702	−766.983	−765.544	−883.409	−786.212	−784.804
Log likelihood	−2,298.830	−1,667.725	−1,649.730	−745.348	−444.193	−439.633	−795.605	−501.301	−497.724
AIC	4,609.660	3,359.450	3,325.460	1,502.696	912.386	905.265	1,603.210	1,026.603	1,021.449
BIC	4,640.616	3,420.073	3,391.112	1,533.629	972.946	970.849	1,634.157	1,087.194	1,087.066
Estimation method	OLS	OLS	OLS	probit	probit	probit	probit	probit	probit

This table reports the estimated coefficients on the relationship between solo founder and initial ECF campaign success. Models (1) to (3) employ the OLS method, in which the logarithm of total amount is the dependent variable; t statistics are reported in parentheses. Models (4) to (6) and (7) to (9) employ the probit method, in which a success and overfunding dummy are the dependent variables, respectively. Average marginal effects and pseudo R^2 are reported for these models; z statistics are reported in parentheses. Significance levels are denoted as * when $p < 0.10$, ** when $p < 0.05$ and *** when $p < 0.01$. The sample spans the period from January 2013 to December 2018 from a set of initial Crowdcube, Seedrs and SyndicateRoom campaigns. All regressions include a constant term. Standard errors are clustered at industry level.

Table 6. Solo founder and firm failure

Dependent variables:	Failure (D = 1)			Time to fail			Time to fail		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Solo founder	0.064***		0.052***	1.387***		1.347***	1.377***		1.339***
	(4.95)		(4.06)	(4.15)		(3.02)	(3.84)		(2.89)
Firm valuation (£m)		−0.002	−0.016**		0.893**	0.899**		0.891**	0.897**
		(−0.58)	(−2.51)		(−2.08)	(−2.11)		(−2.09)	(−2.11)
Startup		−0.026	−0.041		1.051	1.028		1.046	1.023
		(−0.87)	(−1.35)		(0.20)	(0.12)		(0.17)	(0.09)
London		0.002	0.006		1.057	1.062		1.050	1.055
		(0.07)	(0.20)		(0.28)	(0.32)		(0.25)	(0.28)
Diversification		0.021	0.024		1.139	1.157		1.144	1.163
		(0.94)	(1.12)		(0.73)	(0.83)		(0.74)	(0.85)
Equity offered (%)		−0.002	−0.004**		0.985	0.984		0.984	0.984
		(−1.57)	(−2.34)		(−1.35)	(−1.47)		(−1.35)	(−1.46)
Ln(Funders)		−0.024**	−0.020**		0.898*	0.904*		0.896*	0.901*
		(−2.48)	(−2.14)		(−1.90)	(−1.76)		(−1.92)	(−1.78)
Target capital (£m)		−0.091	0.008		0.861	0.926		0.875	0.941
		(−1.42)	(0.19)		(−0.32)	(−0.18)		(−0.27)	(−0.14)
Campaign year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,258	1,129	1,127	1,260	1,138	1,137	1,260	1,138	1,137
Pseudo R-squared	0.110	0.132	0.146	0.019	0.028	0.030	–	–	–
Log likelihood (intercept only)	−634.191	−542.347	−538.976	−1,507.860	−1,241.221	−1,234.550	−679.355	−575.513	−573.615
Log likelihood	−564.589	−470.976	−460.077	−1,479.044	−1,205.910	−1,197.789	−653.086	−541.523	−538.214
AIC	1,141.179	965.952	946.153	2,990.087	2,439.819	2,427.577	1,338.172	1,119.047	1,118.428
BIC	1,172.002	1,026.301	1,011.509	3,072.309	2,510.337	2,508.156	1,420.394	1,209.713	1,224.187
Estimation method	probit	probit	probit	Cox hazard	Cox hazard	Cox hazard	Weibull hazard	Weibull hazard	Weibull hazard

This table reports results on the relationship between solo founder and firm failure. Models (1) to (3) employ the probit method in which a failure dummy is the dependent variable. Average marginal effects are reported for these models; z statistics are reported in parentheses. Models (4) and (9) employ the Cox and Weibull hazard function and report the hazard ratios along with the z statistics in parentheses, in which the hazard function of time to fail is the dependent variable. Significance levels are denoted as * when $p < 0.10$, ** when $p < 0.05$ and *** when $p < 0.01$. The sample spans the period from January 2013 to December 2018 from a set of initial Crowdcube, Seedrs and SyndicateRoom campaigns. All regressions include a constant term. Errors are clustered at industry level.

Table 7. Propensity score matching: average treatment effect on the treated of being a solo founder on the likelihood of initial campaign success and firm failure

	Initial campaign outcomes		Firm failure (D = 1)
	Success (D = 1)	Overfunding	
Panel A: One match per observation			
ATET	−0.147***	−0.140***	0.082**
	(−3.71)	(−3.49)	(2.56)
N	1,169	1,169	1,169
Panel B: Three matches per observation			
ATET	−0.129***	−0.129***	0.072**
	(−3.80)	(−3.71)	(2.55)
N	1,169	1,169	1,169
Panel C: Five matches per observation			
ATET	−0.128***	−0.123***	0.069***
	(−3.89)	(−3.65)	(2.59)
N	1,169	1,169	1,169

This table shows the computation of the average treatment effect on the treated (ATET). That is the effect, on average, of being a solo-founder firm on the likelihood of being successful or failing. We match solo-founder firms with one, three and five corresponding team-based firms based on pre-money valuation, startup status, location (London), campaign goal and campaign year. A logistic model was used to predict each firm's propensity score. Abadie and Imbens robust standard errors are used; z statistics are reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

if, *ex-ante*, solo founders are less likely to be successful or more likely to fail than founder teams with comparable characteristics. We follow Rosenbaum and Rubin (1983) in using propensity score matching (PSM) as a means of addressing such concerns. This method has been employed in other ECF studies to confront endogeneity (Vismara, 2019; Walthoff-Borm, Schwienbacher and Vanacker, 2018).

Matching restricts inference to the sample of solo founders (the treatment group) and teams (the control group). The treatment group is matched with the control group on the basis of a propensity score that is a function of a firm's observable characteristics. We match firms based on the nearest neighbour available. Propensity scores are estimated via a logit model utilizing firms' observable characteristics: pre-money valuation, startup status, location (London), campaign funding goal and campaign year. We match solo-founder firms with one, three and five corresponding (nearest-neighbour) firms with a founder team.[10] To verify the quality of matching, Appendix Figure A2 shows the distribution of the propensity score for both groups before and after matching, and suggests that the matches are satisfactory.

We present the average treatment effect on the treated (ATET) in Table 7. We observe that ATETs are significantly negative for the case of initial campaign success and overfunding, while they are significantly positive for venture failure. For example, consider the results in Panel A. On average, the effect of being a solo founder decreases (increases) the likelihood of success (failure) by around 14% (8.2%) compared with what would have occurred if these firms had founder teams. These results are consistent with those obtained previously.

The role of human capital proxies

This section studies the relationship between human capital proxies and campaign success/firm failure. We follow a similar approach to that in Table 5, and the results are summarized in Table 8.

The results suggest a significantly positive association at the 1% level between tenure heterogeneity and the amount raised, a success dummy and an overfunding dummy in models (1), (4) and (7),

[10]Stata 16's 'teffects overlap' routine was used to produce density plots to check whether the overlap assumption is violated. Appendix Figure A1 in the online supporting information displays the estimated density of the predicted probabilities that an untreated firm is assigned to treatment and the estimated density of the predicted probabilities that a treated firm is assigned to treatment. Consistent with the overlap assumption, the estimated density plots have considerable mass in the regions where they overlap, little mass around 0 and little mass around 1. Thus, there is no evidence that the overlap assumption is violated.

Table 8. Human capital and initial ECF campaign success

Dependent variables:	Ln(Amount raised)			Success (D = 1)			Overfunding		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tenure heterogeneity	0.059***			0.020***			0.019***		
	(3.87)			(3.99)			(3.49)		
Age heterogeneity		0.016***			0.002**			0.003***	
		(8.70)			(2.03)			(2.69)	
Advanced degree			0.545***			0.117***			0.145***
			(5.74)			(4.86)			(4.57)
Firm valuation (£m)	0.025***	0.024***	0.027***	−0.007***	−0.007***	−0.007***	−0.008***	−0.008***	−0.007***
	(3.93)	(3.49)	(3.44)	(−3.76)	(−4.18)	(−4.11)	(−3.96)	(−4.42)	(−3.92)
Startup	−0.137**	−0.250***	−0.263***	0.045***	−0.003	−0.001	0.011	−0.034*	−0.032**
	(−2.73)	(−3.72)	(−5.37)	(2.89)	(−0.16)	(−0.09)	(0.65)	(−1.84)	(−2.19)
London	0.098	0.115	0.126	0.014	0.016	0.022	0.020	0.023	0.028
	(1.41)	(1.56)	(1.63)	(0.61)	(0.73)	(1.08)	(0.97)	(1.11)	(1.52)
Diversification	0.039	0.019	0.011	−0.040***	−0.044***	−0.048***	−0.056***	−0.059***	−0.063***
	(0.81)	(0.32)	(0.21)	(−2.73)	(−2.95)	(−3.30)	(−3.61)	(−3.74)	(−4.36)
Equity offered (%)	0.028***	0.027***	0.027***	−0.000	−0.001	−0.000	0.001	0.001	0.001
	(8.21)	(9.19)	(8.25)	(−0.27)	(−0.44)	(−0.32)	(0.82)	(0.61)	(0.73)
Ln(Funders)	0.493***	0.488***	0.499***	0.201***	0.199***	0.201***	0.225***	0.223***	0.225***
	(6.30)	(6.33)	(6.03)	(16.36)	(16.86)	(15.89)	(14.05)	(14.57)	(13.33)
Target capital (£m)	1.280***	1.240***	1.264***	0.014	0.014	0.006	−0.031	−0.032	−0.040
	(8.72)	(9.06)	(9.47)	(0.49)	(0.50)	(0.26)	(−0.95)	(−1.02)	(−1.39)
Campaign year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,153	1,153	1,153	1,147	1,147	1,147	1,150	1,150	1,150
(Pseudo) R-squared	0.540	0.547	0.542	0.433	0.424	0.426	0.371	0.366	0.368
Log likelihood (intercept only)	−2,119.754	−2,119.754	−2,119.754	−765.544	−765.544	−765.544	−784.804	−784.804	−784.804
Log likelihood	−1,656.486	−1,647.908	−1,654.483	−434.152	−440.910	−439.789	−493.639	−497.559	−495.805
AIC	3,338.971	3,321.817	3,334.966	894.305	907.819	905.577	1,013.277	1,021.119	1,017.609
BIC	3,404.623	3,387.468	3,400.617	959.888	973.403	971.161	1,078.895	1,086.736	1,083.227
Estimation method	OLS	OLS	OLS	probit	probit	probit	probit	probit	probit

This table reports the estimated coefficients of the relationship between human capital and initial ECF campaign success. Models (1) to (3) employ the OLS method in which the logarithm of total amount is the dependent variable; t statistics are reported in parentheses. Models (4) to (6) and (7) to (9) employ the probit method in which a success and overfunding dummy are the dependent variables, respectively. Average marginal effects and pseudo R^2 are reported for these models; z statistics are reported in parentheses. Significance levels are denoted as * when $p < 0.10$, ** when $p < 0.05$ and *** when $p < 0.01$. The sample spans the period from January 2013 to December 2018 from a set of initial Crowdcube, Seedrs and SyndicateRoom campaigns. All regressions include a constant term. Standard errors are clustered at industry level.

Table 9. Human capital and firm failure

Dependent variables:	Failure (D = 1)			Time to fail			Time to fail		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tenure heterogeneity	−0.009**			0.965*			0.970		
	(−2.54)			(−1.87)			(−1.54)		
Age heterogeneity		−0.002***			0.989**			0.990*	
		(−2.69)			(−2.04)			(−1.89)	
Advanced degree			−0.056			0.715			0.723
			(−1.41)			(−1.18)			(−1.10)
Firm valuation (£m)	−0.016**	−0.017**	−0.016**	0.899**	0.895**	0.895**	0.897**	0.893**	0.893**
	(−2.44)	(−2.50)	(−2.35)	(−1.96)	(−2.09)	(−2.09)	(−1.97)	(−2.11)	(−2.11)
Startup	−0.059*	−0.044	−0.043	0.971	1.028	1.030	0.975	1.023	1.023
	(−1.75)	(−1.36)	(−1.37)	(−0.12)	(0.11)	(0.13)	(−0.10)	(0.09)	(0.10)
London	0.004	0.004	0.003	1.059	1.049	1.053	1.053	1.042	1.047
	(0.13)	(0.13)	(0.11)	(0.30)	(0.25)	(0.27)	(0.27)	(0.21)	(0.24)
Diversification	0.020	0.024	0.023	1.140	1.161	1.153	1.145	1.165	1.158
	(0.93)	(1.09)	(1.08)	(0.74)	(0.85)	(0.82)	(0.75)	(0.85)	(0.83)
Equity offered (%)	−0.004**	−0.004**	−0.004**	0.985	0.984	0.985	0.984	0.984	0.984
	(−2.32)	(−2.30)	(−2.23)	(−1.36)	(−1.44)	(−1.37)	(−1.36)	(−1.43)	(−1.37)
Ln(Funders)	−0.022**	−0.021**	−0.022**	0.897*	0.898*	0.892**	0.895*	0.896*	0.890**
	(−2.28)	(−2.20)	(−2.50)	(−1.90)	(−1.86)	(−2.14)	(−1.90)	(−1.86)	(−2.16)
Target capital (£m)	0.002	0.012	−0.000	0.879	0.963	0.886	0.890	0.972	0.899
	(0.05)	(0.27)	(−0.01)	(−0.29)	(−0.09)	(−0.26)	(−0.25)	(−0.06)	(−0.22)
Campaign year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,127	1,127	1,127	1,137	1,137	1,137	1,137	1,137	1,137
Pseudo R-squared	0.144	0.145	0.143	0.028	0.029	0.029	–	–	–
Log likelihood (intercept only)	−538.976	−538.976	−538.976	−1,234.550	−1,234.550	−1,234.550	−573.615	−573.615	−573.615
Log likelihood	−461.440	−461.069	−461.952	−1,199.380	−1,198.518	−1,199.060	−539.794	−538.991	−539.446
AIC	948.880	948.137	949.903	2,430.760	2,427.036	2,428.120	1,115.587	1,117.982	1,124.892
BIC	1,014.235	1,013.492	1,015.259	2,511.338	2,502.579	2,503.662	1,206.238	1,218.705	1,240.724
Estimation method	probit	probit	probit	Cox hazard	Cox hazard	Cox hazard	Weibull hazard	Weibull hazard	Weibull hazard

This table reports results on the relationship between human capital and firm failure. Models (1) to (3) employ the probit method, in which a failure dummy is the dependent variable. Average marginal effects are reported for these models; z statistics are reported in parentheses. Models (4) and (9) employ the Cox and Weibull hazard function and report the hazard ratios along with the z statistics in parentheses, in which the hazard function of time to fail is the dependent variable. Significance levels are denoted as * when $p < 0.10$, ** when $p < 0.05$ and *** when $p < 0.01$. The sample spans the period from January 2013 to December 2018 from a set of initial Crowdcube, Seedrs and SyndicateRoom campaigns. All regressions include a constant term. Errors are clustered at industry level.

respectively. A possible explanation may be that this variable sends a strong positive signal about startup-specific experience to potential investors that may reduce information asymmetries and increase the likelihood of campaign success. Age heterogeneity is significantly positive at the 5% level or better in models (2), (5) and (8), respectively. Finally, advanced degree is significantly positive at the 1% level, respectively, in models (3), (6) and (9), respectively. These results strongly support H3 that initial ECF campaign success is positively associated with founder team human capital characteristics.

We also investigate the effects of human capital proxies on venture failure. We follow a similar approach to that in Table 6 for campaign failure, and the results are summarized in Table 9.

The results suggest that tenure heterogeneity is negatively related to firm failure. The probit coefficient is negative and significant at 5% [model (1)] and the Cox hazard ratio is lower than 1 and significant at 10% (model 4). Age heterogeneity exhibits a similar pattern, suggesting an inverse relationship between age heterogeneity and venture failure [models (2), (5) and (8)]. Finally, advanced degree has no significant effect on firm failure. The marginal effects and hazard ratios are insignificant in models (3), (6) and (9).

Overall, our findings provide some empirical evidence in support of H4. ECF firm failure (time to fail) is inversely associated with team human capital characteristics, except for the advanced degree variable, where the probit and hazard ratios are statistically insignificant across models. They lend support to the argument presented in Wilson and Testoni (2014) that ECF is the most complex type of crowdfunding, given that heterogeneous teams perform better when they have to face complex tasks (Carpenter, 2002). The findings are consistent with the meta-analysis study of Jin *et al*. (2017), in which diversity positively affects venture success. Finally, they are also consistent with Choi *et al*. (2021), in which human capital affects general startup performance in the US market.

Conclusions

This study extends the existing ECF literature by focusing on the relations between founder team structure (solo founders vs. teams), human capital characteristics, initial ECF campaign success and firm failure, using campaign and ECF firm data from Crowdcube, Seedrs and SyndicateRoom for the period from January 2013 to December 2018. It investigates for the first time whether solo founders outperform teams in terms of enjoying a greater degree of success in ECF campaigns and subsequently being less likely to fail, as argued by Greenberg and Mollick (2018) for their reward-based crowdfunding sample. Our results indicate that solo ventures are less likely to conduct successful initial campaigns and, moreover, that such ventures are more likely to fail afterwards. These are novel findings that could be explained by the fact that founder teams may be more likely to attract professional investors like BAs that act as a certification effect for crowd investors (Vismara, 2018). Our study also investigates the effect of human capital characteristics on ECF initial campaign success and firm failure. The results reveal that heterogeneity and holding an advanced degree may be effective signals that can reduce information asymmetry and increase the likelihood of success. This extends existing studies that focus on human capital in ECF (Barbi and Mattioli, 2019; Piva and Rossi-Lamastra, 2018). Our findings also provide some evidence that founder human capital characteristics matter for firm failure.

Our study suggests that founder teams outperform solo ventures in equity crowdfunding and, thus, that equity crowdfunding is distinct in this respect from reward-based crowdfunding. The theoretical implication of our study is that founder teams enjoy more success because the quality of their human capital can allay information asymmetries by attracting professional investors, where the latter act as a certification effect for other investors. Likewise, the monitoring role of professional investors helps to minimize moral hazard concerns and thus lower the likelihood of failure for ECF founder teams. As for practical implications, our findings suggest that platforms could improve their due diligence process by focusing more on the human capital of the founder team. This may help create a sustainable and flourishing ECF market that could help in filtering out lemons (Akerlof, 1970).

As with any study, ours comes with limitations. One interesting topic for further study may be how the interpretation of solo founder and human capital signals varies across different investors. Signals may be interpreted differently across crowd members (Vanacker and Forbes, 2016), while others

have suggested that investment behaviour is heterogeneous in ECF campaigns (e.g. Wallmeroth, 2019). It may also be interesting to investigate Vismara's (2019) distinction between experienced and inexperienced investors. He argues that the former follow a market logic whereas the latter follow a community logic.

References

Abdallah, W., M. Goergen and N. O'Sullivan (2015). 'Endogeneity: how failure to correct for it can cause wrong inferences and some remedies', *British Journal of Management*, **26**, pp. 791–804.

Agarwal, R., S. Braguinksy and A. Ohyama (2020). 'Centers of gravity: the effects of shared leadership and stability in top management teams on firm growth and industry evolution', *Strategic Management Journal*, **41**, pp. 467–498.

Ahlers, G. K., D. Cumming, C. Gunther and D. Schweizer (2015). 'Signalling in equity crowdfunding', *Entrepreneurship Theory and Practice*, **39**, pp. 955–980.

Akerlof, G. A. (1970). 'The market for "lemons": quality uncertainty and the market mechanism', *Quarterly Journal of Economics*, **84**, pp. 488–500.

Almus, M. and E. A. Nerlinger (1999). 'Growth of new technology-based firms: which factors matter?', *Small Business Economics*, **13**, pp. 141–154.

Arozamena, L. and M. Centeno (2006). 'Tenure, business cycle and the wage-setting process', *European Economic Review*, **50**, pp. 401–424.

Astebro, T. B., M. F. Sierra, S. Lovo and N. Vulkan (2019). *Herding in Equity Crowdfunding*. Available at SSRN: https://ssrn.com/abstract=3084140 or http://doi.org/10.2139/ssrn.3084140. https://ssrn.com/abstract=3084140.

Baeck, P., L. Collins and B. Zhang (2014) Understanding alternative finance: The UK alternative finance industry report 2014. London UK Nesta.

Bapna, S. (2017). 'Complementarity of signals in early-stage equity investment decisions: evidence from a randomized field experiment', *Management Science*, **65**, pp. 459–954.

Barbi, M. and S. Mattioli (2019). 'Human capital, investor trust and equity crowdfunding', *Research in International Business and Finance*, **49**, pp. 1–12.

Becker, G. S. (1964). *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*. New York: Columbia University Press.

Beauhurst (2019). 'Herding in equity crowdfunding'. Available at https://ssrn.com/abstract=3084140

Bernstein, S., A. Korteweg and K. Laws (2017). 'Attracting early stage investors: evidence from a randomized field experiment', *Journal of Finance*, **72**, pp. 509–538.

Blaseg, D., D. Cumming and M. Koetter (2020). 'Equity crowdfunding: high quality or low quality entrepreneurs', *Entrepreneurship Theory and Practice*, DOI:10.1177/1042258719899427.

Bougheas, S. and Y. Georgellis (2004). 'Early career mobility and earning profiles of German apprentices: theory and empirical evidence', *Labour*, **18**, pp. 233–263.

Bruton, G. D., S. Khavul, D. Siegel and M. Wright (2015). 'New financial alternatives in seeding entrepreneurship: microfinance, crowdfunding and peer-to-peer innovations', *Entrepreneurship Theory and Practice*, **39**, pp. 9–26.

Capizzi, V. (2015). 'The returns of business angels and their major determinants', *Venture Capital: An International Journal of Entrepreneurial Finance*, **17**, pp. 271–298.

Carpenter, M. (2002). 'The implications of strategy and social context for the relationship between top management team heterogeneity and firm performance', *Strategic Management Journal*, **23**, pp. 275–284.

Chemmanur, T. J. and I. Paeglis (2005). 'Management quality, certification, and initial public offerings', *Journal of Financial Economics*, **76**, pp. 331–368.

Choi, J., N. Goldschlag, J. C. Haltiwanger and J. D. Kim (2021). 'Founding teams and startup performance', NBER Working Paper 28417.

Coakley, J. and A. Lazos (2021). Recent Developments in Equity Crowdfunding: A Review. *Review of Corporate Finance (FinTech Special Issue)*, **1**(2).

Coakley, J., A. Lazos and J. Linares-Zegarra (2021). 'Seasoned equity crowdfunded offerings', *Journal of Corporate Finance*, DOI:10.1016/j.jcorpfin.2020.101880.

Colombo Massimo G., Grilli Luca (2005) Founders' human capital and the growth of new technology-based firms: A competence-based view. *Research Policy*, **34** (6), 795–816. https://doi.org/10.1016/j.respol.2005.03.010.

Connelly, B., S. V. Certo, R. D. Ireland and C. Reutzel (2011). 'Signalling theory: a review and assessment', *Journal of Management*, **37**, pp. 39–67.

Cooper, A. C., F. J. Gimeno-Gascon and C. Y. Woo (1994). 'Initial human and financial capital as predictors of new venture performance', *Journal of Business Venturing*, **9**, pp. 371–395.

Cumming, D. J. and S. Vismara (2017). 'De-segmenting research in entrepreneurial finance', *Venture Capital: An International Journal of Entrepreneurial Finance*, **19**, pp. 17–27.

Cumming, D. J., S. Johan and Y. Zhang (2019a). 'The role of due diligence in crowdfunding platforms', *Journal of Banking & Finance*, **108**, pp. 105–661.

Cumming, D. J., M. Meoli and S. Vismara (2019b). 'Investor's choices between cash and voting rights: evidence from dual-class equity crowdfunding', *Research Policy*, **48**, art. 103740.

Fern, M. J., L. B. Cardinal and H. M. O'Neill (2012). 'The genesis of strategy in new ventures: escaping the constraints of founder and team knowledge', *Strategic Management Journal*, **33**, pp. 427–447.

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

Gompers, P., W. Gornall, S. N. Kaplan and I. A. Strebulaev (2020). 'How do venture capitalists make decisions?', *Journal of Financial Economics*, **135**, pp. 169–190.

Graham, P. (2006). 'The 18 mistakes that kill startups'. Accessed 01/06/2020. Available at http://www.paulgraham.com/startupmistakes.html

Greenberg, J. and E. Mollick (2018). 'Sole survivors: solo ventures versus founding teams'. Accessed 05/05/2020. Available at https://doi.org/10.2139/ssrn.3107898

Hornuf, L., A. Schwienbacher and E. Stenzhorn (2018). 'Equity crowdfunding in Germany and the UK: follow-up funding and firm failure', *Corporate Governance International Review*, **26**, pp. 331–354.

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

Jin, L., K. Madison, D. Kraiczy, F. W. Kellermanns and T. R. Crook (2017). 'Entrepreneurial team composition characteristics and new venture performance: a meta-analysis study, entrepreneurship', *Theory and Practice*, **41**, pp. 743–771.

Johan, S. and Y. Zhang (2018). 'Quality revealing versus overstating in equity crowdfunding', *Journal of Corporate Finance*, **65**, art. 101741.

Knockaert, M., D. Ucbasaran, M. Wright and B. Clarysse (2011). 'The relationship between knowledge transfer, top management team composition, and performance: the case of science-based entrepreneurial firms', *Entrepreneurship Theory and Practice*, **35**, pp. 777–803.

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

Levine, S. S., M. Bernard and R. Nagel (2017). 'Strategic intelligence: the cognitive capability to anticipate competitor behaviour', *Strategic Management Journal*, **38**, pp. 2390–2423.

Mochkabadi, K. and C. K. Volkmann (2018). 'Equity crowdfunding: a systematic review of the literature', *Small Business Economics*, **54**, pp. 75–118.

Mollick, E. and R. Nanda (2015). 'Wisdom or madness? Comparing crowd with expert evaluation in funding the arts', *Management Science*, **62**, pp. 1533–1841.

Mosey, S. and M. Wright (2007). 'From human capital to social capital: a longitudinal study of technology based academic entrepreneurs', *Entrepreneurship Theory and Practice*, **31**, pp. 909–936.

Piva, E. and C. Rossi-Lamastra (2018). 'Human capital signals and entrepreneurs' success in equity crowdfunding', *Small Business Economics*, **51**, pp. 667–686.

Ralcheva, A. and P. Roosenboom (2016). 'On the road to success in equity crowdfunding'. Accessed 28/05/2020. Available at https://ssrn.com/abstract=2727742.

Ralcheva, A. and P. Roosenboom (2020). 'Forecasting success in equity crowdfunding', *Small Business Economics*, **55**, pp. 39–56.

Roberts, E. B. and C. E. Eesley (2011). 'Entrepreneurial impact: the role of MIT', *Foundations and Trends in Entrepreneurship*, **7**, pp. 1–149.

Rosenbaum, P. R. and D. B. Rubin (1983). 'The central role of the propensity score in observational studies for causal effects', *Biometrika*, **70**, pp. 41–55.

Signori, A. and S. Vismara (2018). 'Does success bring success? The post-offering lives of equity-crowdfunded firms', *Journal of Corporate Finance*, **50**, pp. 575–591.

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

Steigertahl, L., R. Mayer and J. Say (2018). 'EU startup monitor'. Available at Accessed 28/05/2020. http://startupmonitor.eu/EU-Startup-Monitor-2018-Report-WEB.pdf

Sun, M., J. Coakley and C. Girardone (2021). *It Takes Two to Tango! New Angel–Crowd Equity Crowdfunding Dynamics*. Colchester: University of Essex.

Unger, J. M., A. Rauch, M. Frese and N. Rosenbusch (2011). 'Human capital and entrepreneurial success: a meta-analytical review', *Journal of Business Venturing*, **26**, pp. 341–358.

Vanaelst, I., B. Clarysse, M. Wright, A. Lockett, N. Moray and R. S'Jegers (2006). 'Entrepreneurial team development in academic spin-outs: an examination of team heterogeneity', *Entrepreneurship Theory and Practice*, 30, pp. 249–271.

Vanacker, T. and D. P. Forbes (2016). 'Disentangling the multiple effects of affiliate reputation on resource attraction in new firms', *Organization Science*, **27**, pp. 1525–1547.

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

Vismara, S. (2018). 'Information cascades among investors in equity crowdfunding', *Entrepreneurship Theory and Practice*, **42**, pp. 467–497.

Vismara, S. (2019). 'Sustainability in equity crowdfunding', *Technological Forecasting and Social Change*, **141**, pp. 98–106.

Venugopal, B. and V. Yeramilli (2019). *Outside Directors at Early Stage Startups*. Accessed 01/04/2020. Available at SSRN: https://ssrn.com/abstract=3320010 or https://doi.org/10.2139/ssrn.3320010.

Vulkan, N., T. Åstebro and M. F. Sierra (2016). 'Equity crowdfunding: a new phenomena', *Journal of Business Venturing Insights*, **5**, pp. 37–49.

Wallmeroth, J. (2019). 'Investor behaviour in equity crowdfunding', *Venture Capital: An International Journal of Entrepreneurial Finance*, **2**, pp. 273–300.

Walthoff-Borm, X., A. Schwienbacher and T. Vanacker (2018). 'Equity crowdfunding: first or last resort?', *Journal of Business Venturing*, **33**, pp. 513–533.

Wilson, K. E. and M. Testoni (2014). 'Improving the role of equity crowdfunding in Europe's capital markets'. Available at https://ssrn.com/abstract=2502280.

Wilson, N., M. Wright and M. Kacer (2018). 'The equity gap and knowledge based firms', *Journal of Corporate Finance*, **50**, pp. 626–649.

Wright, M., K. M. Hmieleski, D. S. Siegel and M. D. Ensley (2007). 'The role of human capital in technological entrepreneurship', *Entrepreneurship Theory & Practice*, **31**, pp. 791–806.

Yang, T. and H. E. Aldrich (2012). 'Out of sight but not out of mind: why failure to account for left truncation biases research on failure rates', *Journal of Business Venturing*, **27**, pp. 477–492.

Zacharakis, A. L. and G. D. Meyer (2000). 'The potential of actuarial decision models: can they improve the venture capital investment decision?', *Journal of Business Venturing*, **15**, pp. 323–346.

Zhang, B., T. Ziegler, L. Mammadova, D. Johanson, M. Gray and N. Yerolemou (2018). *The 5th UK Alternative Finance Industry Report*. Cambridge: Centre for Alternative Finance (CAFE), University of Cambridge.

Jerry Coakley is Professor of Finance at Essex Business School. His research focuses on behavioural corporate finance, FinTech, crowdfunding and entrepreneurship. He has published articles in peer-reviewed journals such as the *Economic Journal*, *Journal of Corporate Finance*, *Journal of Banking & Finance*, amongst others. He is an Associate Editor of the *European Journal of Finance*.

Aristogenis Lazos is a Research Fellow at Audencia Business School in Nantes, France. Before joining Audencia, he worked at the ESRC BLG Data Research Centre at the University of Essex. His research focuses on entrepreneurial finance, including alternative forms of finance such as equity crowdfunding. His research has been published in the *Journal of Corporate Finance*.

José M. Liñares-Zegarra is Senior Lecturer (Associate Professor) in Finance at Essex Business School. His research focuses on banking, FinTech and entrepreneurship. He has published articles in peer-reviewed journals such as the *Journal of Corporate Finance*, *Journal of Banking & Finance*, *Journal of Financial Services Research*, among others. He is an affiliated researcher at the Centre for Responsible Banking & Finance (CRBF) and Honorary Senior Lecturer at the University of St. Andrews (Scotland).

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Supporting information.