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Equity Crowdfunding in Germany and the UK: Follow-up Funding and Firm Failure

Abstract

Today, startups often obtain financing via the Internet through many small contributions of non-sophisticated investors. Yet little is known about whether these startups can ultimately build enduring businesses. In this article, we hand-collected data from 14 different equity crowdfunding (ECF) portals and 426 firms that ran at least one successful ECF campaign in Germany or the United Kingdom. We empirically analyze different factors affecting follow-up funding and firm failure. The findings show that German firms that received ECF stood a higher chance of obtaining follow-up funding through business angels or venture capitalists, but also had a higher likelihood of failure. The number of senior managers, subsequent successful ECF campaigns, and the number of venture capital investors all had a positive impact on obtaining post-campaign financing, while firm age had a negative impact. Subsequent successful ECF campaigns were significant predictors decreasing firm failure.

JEL-Codes: G240, M130.

Keywords: equity crowdfunding, follow-up funding, firm survival.

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INTRODUCTION

During the past decade, equity crowdfunding (ECF) has provided a new way for non-sophisticated investors to finance startup firms via the Internet by making many small contributions. While only a few years ago this new way of financing was largely considered a niche phenomenon, in many countries it has now become an ordinary source of early-stage financing for startup firms. In the United Kingdom (UK), for example, the ECF market has even reached the size of the early-stage business angel (BA) and venture capital (VC) market (Zhang, Baeck, Ziegler, Bone, & Garvey, 2016). ECF has also recently received considerable attention in the academic literature. Until now, most research has focused on the success factors of ECF campaigns (Ahlers, Cumming, Guenther, & Schweizer, 2015; Hornuf & Schwienbacher, 2018a, 2018b; Ralcheva & Roosenboom, 2016; Vismara, 2017; Vulkan, Åstebro, & Sierra, 2016) and the determinants of crowd engagement (Agrawal, Catalini, & Goldfarb, 2015; Block, Hornuf, & Moritz, 2018b; Hornuf & Neuenkirch, 2017; Vismara, 2016). Little is known, however, about the ability of crowdfunded firms to build enduring businesses. This article extends the existing literature by investigating the determinants of follow-up funding and firm failure after an ECF campaign has taken place. We focus on Germany and the UK because they are among the largest crowdfunding markets in the world (Dushnitsky, Guerini, Piva, & Rossi-Lamastra, 2016).[1]

In a recent contribution, Signori and Vismara (2018) investigate follow-up funding and firm failure by calculating the return on investments for 212 successful ECF campaigns that obtained financing on Crowdcube. They find that 10 percent of the firms failed, while 30 percent obtained one or more seasoned equity offerings, from a private equity injection, from another ECF round on Crowdcube, or by being the target of a merger or acquisition. The evidence shows that the presence of non-executive directors, granted patents, and tax incentives are associated with post-campaign success. Moreover, the presence of professional investors is a good predictor of firm survival. Hornuf and Schmitt (2016) analyze the success and failure of crowdfunded firms in Germany and the UK and find that more firms in Germany than the UK managed a crowd-exit through a significant VC round, but somewhat fewer firms ultimately failed in the UK. Regarding follow-up funding, the entrepreneurial finance literature mainly focuses on VC investments.

To attain evidence with regard to our research questions, we hand-collected data on 426 firms that ran at least one successful ECF campaign on 12 ECF portals in Germany,

[1] For a comparison with the United States, see Abrams (2017).

which cover almost the entire market, and the two leading portals in the UK. The data were collected permanently from August 1, 2011, to September 30, 2016, to reduce missing variable bias due to the deletion of information by platform operators after a campaign has taken place. We focus on a large set of potential determinants of follow-up funding and firm failure, including the characteristics of the management team, the possession of trademarks and patents, and the characteristics of the ECF campaign, while considering a large set of control variables. Moreover, we run a mediation model to test whether follow-up financing operates as a mediator between the explanatory variables and firm failure.

We provide evidence that British firms have a lower chance of obtaining follow-up funding through BAs/VCs but have a relatively higher likelihood of surviving three years after the ECF campaign than German firms. Our findings with respect to follow-up funding reveal that the number of senior management team members, the number of subsequent successful ECF campaigns, and the number of VC investors are significant predictors increasing BA/VC follow-up funding after a successful ECF campaign. By contrast, firm age is negatively correlated with follow-up funding. Regarding firm failure, we find that the number of subsequent successful campaigns has a negative effect. Our findings remain robust to sensitivity checks for the Cox proportional hazards model using accelerated failure time models in the form of exponential and Weibull regressions. The results from the mediation model indicate that follow-up funding is a significant but economically weak mediator.

By identifying criteria predicting follow-up funding and firm failure in ECF, we aid the crowd and professional investors in making better investment decisions. Moreover, by reducing the degree of uncertainty surrounding ECF investments and by allowing investors to base their investment decisions on empirical evidence, our research helps reduce the prejudice against ECF among traditional investors. Making the factors that contribute to the success and failure of ECF more salient not only benefits various investor types but also helps stabilize and establish a new market segment of entrepreneurial finance. In this way, our results more generally add to the recent literature in entrepreneurial finance (Block, Colombo, Cumming, & Vismara, 2018a; Block, Fisch, & van Praag, 2017). Moreover, follow-up funding and especially firm survival are important factors that help policy makers evaluate whether ECF is an efficient and worthwhile form of financing. If firms that have a positive net present value now, for the first time, receive capital through the crowd, ECF is a potentially welfare-enhancing activity. Helping portal managers and investors differentiate lemons from potentially enduring businesses might also foster economic growth and employment.

The rest of this article proceeds as follows: in the next section, we provide a brief definition of ECF. Then, we outline the theoretical framework of our study and develop hypotheses. Next, we introduce the variables used in the regression, describe the data sources, and explain the method applied to identify the determinants of follow-up funding and firm failure. After this, we present our descriptive and multivariate results. The final section delineates the findings, links them to the existing literature streams, and summarizes our contributions to the relevant policy debate.

ECF

ECF is a sub-category of crowdfunding, which differs substantially from other forms such as donation-based or reward-based crowdfunding. Donation-based crowdfunding often involves the funding of artistic or philanthropic projects. Under this model, backers donate funds without receiving specific compensation. Altruistic motives and feelings of warm glow therefore play a crucial role when backers support projects. Conversely, under the reward-based model of crowdfunding, backers are promised tangible or intangible perks (e.g., a coffee mug, having their name posted in the credits of a movie). In addition, backers finance a product or service that the venture must develop for their consumption at a later point in time. Under the ECF model, backers expect financial compensation. Until now, the extent of altruistic and financial motives of investors in ECF was largely under-researched. It seems unlikely, however, that investors expect financial returns from ECF to contribute to their personal savings plans or even retirement savings portfolios.

To persuade the crowd to finance a startup via an ECF platform, entrepreneurs in some jurisdictions offer equity shares in a limited liability company (LLC). In the UK, common equity shares are offered on portals such as Crowdcube or Seedrs. In contrast, startups in Germany do not offer common equity shares, because transferring LLC shares requires the costly service of a notary. German firms engaging in ECF therefore draft financial contracts in the form of profit-participating loans or silent partnerships that mimic the future cash flows of the firm and are only paid out after the investment contract expires or a new investor buys a substantial fraction of the firm. ECF is also different from marketplace lending or loan-based crowdfunding, in which investors finance loans and receive a pre-determined periodic interest payment in return.

Startups that want to raise capital in an ECF campaign negotiate the valuation of the firm with the portal and decide how much capital they want to raise. The portal provides a boilerplate financial contract that establishes the financial relationship between the startup and the crowd. Most portals allocate funds under one of two models: all-or-nothing or

keep-it-all (Cumming, Leboeuf, & Schwienbacher, 2017). Under the all-or-nothing model, which is the predominant model in Germany and the UK, founders set a funding goal and keep nothing unless this goal is reached. Many campaigns set the funding goal at 50,000 EUR. If the funding goal cannot be reached during the funding period, the potential investors receive the capital they had previously pledged back. By contrast, in the US, reward-based crowdfunding portals such as Indiegogo run a keep-it-all model, and startups can decide whether to keep the money pledged regardless of whether the funding goal was reached or not. Furthermore, most portals in Germany and the UK allocate shares under a first-come, first-served model, in which the startups set a funding limit and stop selling shares when the funding limit is reached.

Finally, it should be mentioned that most startups that raise capital through ECF avoid legal disclosure requirements by using the exemptions from the national prospectus regime. This is achieved by raising overall amounts of less than 2,500,000 EUR in Germany and 5,000,000 EUR in the UK (Hornuf & Schwienbacher, 2017).

THEORY AND HYPOTHESES

Theoretical Considerations

Little is known about the determinants that affect follow-up funding and firm failure in ECF. While human capital theory and organizational ecology offer general insights into the determinants of firm survival (Brüderl, Preisendörfer, & Ziegler, 1992), the financial contracting and the allocation mechanism of shares in ECF are new and therefore might lead to unexpected and atypical outcomes. Our hypotheses and empirical analysis therefore inevitably remain original and exploratory to some extent. In this article, we test whether the factors affecting follow-up funding and firm failure known from the BA/VC financing literature are important in ECF as well. Furthermore, we investigate whether the specific features of an ECF campaign determine the likelihood that startups ultimately build enduring businesses or not. Before we outline our hypotheses, it should be noted that whether a startup can build an enduring business generally depends on two factors. First, startups capable of sending effective signals (see Spence, 1973) to potential investors should receive more capital and, as a result, also have a lower probability of firm failure (see also Block et al., 2018b). Second, regardless of whether firms can send effective signals, some firms might be inherently more valuable and thus have a lower probability of failure. However, if investors cannot observe the firm value, in some cases these firms will lack the necessary capital and therefore have a higher probability of failure.

Hypotheses

We hypothesize that the management team has an impact on both follow-up funding and firm failure. We differentiate our hypothesis about the management team according to differences in its size and the team members' average age.

In their meta-study, Unger, Rauch, Frese, and Rosenbusch (2011) show that a lack of human capital is one of the most important factors influencing the performance of a firm. Starting a business as a sole founder can be quite difficult and cumbersome, due to a lack of competences and capacity constraints. According to Kazanjian (1988), startups often face problems when starting a new business, especially with regard to fundraising and marketing activities and the development of new technology. Empirical research on startups therefore indicates a positive relationship between management team size and firm performance. Eisenhardt and Schoonhoven (1990) investigate organizational growth among new technology-based ventures and find that larger management teams are linked to higher growth. They argue that as the team becomes larger, more opportunities arise for specialization in decision-making and entrepreneurial activities. Because management team members can specialize in certain activities, some tasks can be accomplished more quickly. Ahlers et al. (2015) examine the impact of venture quality on fundraising success in an ECF context. They use the number of board members as a proxy for the human capital of the firm and show that board size affects both crowd participation and the overall funding amount of an ECF campaign. We thus expect that a larger management team has a positive effect on firm performance and, thus, follow-up funding.

Empirical evidence suggests that not only the human capital but also the likelihood of firm failure affect follow-up funding. Delmar and Shane (2006) analyze the effect of founding team experience and new venture performance on firm survival. They claim that larger teams have more accumulated human capital and resources. Furthermore, larger teams benefit from variation in experience, which may lead to more innovative solutions to problem. Furthermore, their findings suggest that team experience is one of the key determinants of entrepreneurial success. Thus, we expect a larger management team to have a positive effect on firm performance and reduce the likelihood of firm failure.

Hypothesis 1a. After a successful ECF campaign has taken place, management team size increases the firm's probability of receiving follow-up funding.

Hypothesis 1b. After a successful ECF campaign has taken place, management team size decreases the probability of firm failure.

According to human capital theory, age comes with experience. Older managers often have more industry and leadership experience, which allows them to create a more successful company (McGee, Dowling, & Megginson, 1995). In a conjoint experiment with 51 VCs from Munich, Berlin, and Vienna, Franke, Gruber, Harhoff, and Henkel (2008) show that fund managers evaluate older startup teams more positively in general. Conversely, VCs rate management teams of only young members lower. Moreover, young workers have lesser or uncertain skills and abilities, which are not typically resolved until they have gained sufficient job experience (Johnson, 1978). This can lead to higher employer-to-employer turnover among young workers (Bjelland, Fallick, Haltiwanger, & McEntarfer, 2011), which in turn affects a firm's human capital stock and consequently the probability of obtaining follow-up funding, leading to firm failure. By providing a more stable human capital environment and having more experience, an older management team can help the firm receive follow-up funding and may also reduce the probability of firm failure.

Hypothesis 2a. After a successful ECF campaign has taken place, a higher average age of the management team increases the firm's probability of receiving follow-up funding.

Hypothesis 2b. After a successful ECF campaigns has taken place, a higher average age of the management team increases the probability of firm failure.

The patents and trademarks a firm owns can also affect the prospects for follow-up funding. Not only do patents and trademarks allow the startup to protect its intellectual property and brand, but they also provide an effective signal to potential investors about the firm's innovativeness and brand value. The impact of patents and trademarks should thus be positive for follow-up funding and reduce the likelihood of firm failure.

Firms may overcome information asymmetries between investors and entrepreneurs by using patents and trademarks as an effective signal about their quality. Hsu and Ziedonis (2013) use a sample of 370 US semiconductor startups and find that patents have a positive effect on firm evaluation by VCs. In the context of biotechnology, Haeussler, Harhoff, and Mueller (2014) show that patent applications are positively related to follow-up VC investments. In addition, patents reveal that the firm was able to create an innovation and might do so again in the future (Farre-Mensa, Hegde, & Ljungqvist, 2017).

However, patent applications can be a time-consuming process, and innovative startups may still be in the process of filing for a patent. Because this process does not always lead to success, filed patents do not necessarily constitute an effective signal. Nevertheless, Zhou, Sandner, Martinelli, and Block (2016) show that startups that filed for both patents and trademarks obtained higher valuations by VCs. Block, De Vries, Schumann, and Sandner (2014) report that especially in early funding rounds, (1) trademark applications are valuable for VCs and lead to higher firm valuations, and (2) the impact on the valuation by trademarks is even higher than that by filed patents. They claim that this finding might be due to the higher success rate of trademark applications. De Vries, Pennings, Block, and Fisch (2017) show that startups are more likely to file trademarks than patents when entering the market. Given the lack of granted patents, BAs/VCs might base their funding decisions on firms' trademarks or the potential to ultimately own a filed patent. Moreover, while during the patent application stage it is still unclear whether the patent will be granted, filed trademarks confer exclusion rights that are immediately and directly applicable and valid. Overall, we conjecture that filed and granted patents and trademarks lead to a higher chance of receiving follow-up investments by BAs/VCs.[2]

Regarding firm failure, we expect that firms that own patents or at least filed for a patent are more innovative and ultimately more successful. That is, the patent protection allows them to reap monopoly profits from their intellectual property during the duration of the patent. Farre-Mensa et al. (2017) show that startups with patents have an 80 percent higher sales growth five years after they filed the first patent application and higher-quality follow-on innovation. As a result, their ability to build an enduring business should also be greater. A similar rationale might hold for trademarks, which allow firms to make use of a valuable brand and be more successful. Block et al. (2014) argue that trademarks not only have a signaling effect on investors but also have protection value for the firm. That is, trademarks protect the firm's brand and therefore allow for a higher chance of survival. This notion is confirmed by Helmers and Rogers (2010), who find that trademarks and patents lead to a lower probability of firm failure. We therefore expect that the patents and trademarks of an ECF startup reduce the likelihood of firm failure.

[2] By contrast, Ahlers et al. (2015) show that in an ECF campaign, whether a patent was granted to the firm does not significantly affect funding success in terms of number of investors or funding amount. However, they note that a possible explanation for this finding is that their proxy for intellectual capital, measured by whether at least one patent was granted, is rather crude, as it ignores both the number of patents granted and the patent quality.

Hypothesis 3a. After a successful ECF campaign has taken place, ownership of patents and trademarks increases the firm's probability of receiving follow-up funding.

Hypothesis 3b. After a successful ECF campaign has taken place, ownership of patents and trademarks decrease the probability of firm failure.

Crowd participation in an ECF campaign can provide important insights into the quality and ultimate success of the startup (Ahlers et al., 2015; Hornuf & Schwienbacher, 2018b). The more people invest in the firm and spend a large amount of money, the more others believe in the quality and prospects of the startup. If a 'wisdom of the crowd' exists in crowdfunding, as Mollick and Nanda (2015) suggest, crowd support is a good predictor for follow-up funding and firm survival. Moreover, firms that obtained more funding through an ECF campaign are in better financial shape than firms that received less money during an ECF campaign. Therefore, we hypothesize that funding success during an ECF campaign results in a higher chance of follow-up funding by BAs/VCs and, thus, a lower chance of firm failure.

Whether a successful ECF campaign positively affects follow-up funding is not yet established in the literature. However, empirical findings from the literature on reward-based crowdfunding provide some insights. This literature evidences that successful crowdfunding allows for certification effects and thus positively influences the decision of a VC to fund the startup. Kaminski, Hopp, and Tykvova (2016) show that reward-based crowdfunding campaigns lead to subsequent VC investments.[3] Colombo and Shafi (2016) provide evidence that firms with external financing before their crowdfunding campaign receive follow-up funding even when they perform badly and deliver their product late. Drover, Wood, and Zacharakis (2017) investigate the impact of crowdfunding on the VC screening process and find that the crowd can exert highly influential certification effects. In summary, we expect that high crowd participation correspondingly predicts interest of BAs/VCs.

Finally, by running a survey among entrepreneurs who ran a Kickstarter campaign, Stanko and Henard (2017) show that the number of backers in reward-based crowdfunding positively affects the product-market performance of the venture after the campaign.

[3] Ryu and Kim (2017) show that a successful reward-based crowdfunding campaign reduces the likelihood of receiving follow-up funding by VCs but increases the chance of receiving corporate VC relative to independent VC funding.

Greater sales performance generally helps the firm survive. Moreover, the larger the investor community, the more people are interested in the success of the firm and advertise the product by word-of-mouth marketing. Crowd investors who are convinced about the product promote the firm via their social and business networks. Consequently, we expect that higher crowd participation during the ECF campaign leads to a lower probability of firm failure.

Hypothesis 4a. High crowd participation in an ECF campaign increases the firm's probability of receiving follow-up funding.

Hypothesis 4b. High crowd participation in an ECF campaign decreases the probability of firm failure.

DATA AND METHOD

Data

For the period from August 1, 2011, to September 30, 2016, we hand-collected data on 426 firms (285 from the UK and 141 from Germany) that ran at least one successful ECF campaign. Our dataset consists of all successful campaigns of the UK market leaders Crowdcube and Seedrs at that time and all successful German ECF campaigns on 12 platforms.[4] We merged the information about the ECF campaign characteristics with additional information about firm characteristics from Bureau van Dijk (BvD) Orbis and Zephyr; Thomson Reuters Eikon; and Crunchbase, the German company register (Unternehmensregister) and the UK Companies House. In addition to the traditional LLCs, four partnership companies were seeking capital through ECF but were excluded from our sample because the number was too small to retrieve any meaningful analysis from them.

Variables

The collected information allowed us to construct different variables that operationalize our theoretical concepts and offer insights into follow-up funding and firm survival. Appendix Table A1 describes the measurement of all variables in detail. Note that we constructed all variables before or at the time the ECF campaign ended and, therefore, before the survival period started.

[4] The German platforms are Bergfürst, Berlin Crowd, BestBC, Companisto, DUB, Fundsters, Geldwerk1, Innovestment, Mashup/Conda, Mezzany, My Business Backer, Seedmatch, and Venturate.

Dependent Variables. We use four different dependent variables in our study. The first variable measures whether a firm received *follow-up funding by BAs/VCs*. This variable is a dummy variable that equals 1 if the respective firm received additional funding by outside BAs/VCs after a successful ECF campaign and 0 otherwise. We collected information about financing rounds from BvD Orbis and Zephyr, Thomson Reuters Eikon, and Crunchbase. We also systematically searched for additional information about follow-up funding on the websites of the ECF portals, funded firms, and investing VCs and supplemented our dataset accordingly. To exclude rumors about additional funding and to identify only actual equity investment by investors, we matched all BA/VC deals with the shareholder list from Orbis and considered only the BA/VC deals for which a shareholder entry for the corresponding firm could be verified.

To identify BAs/VCs, we checked the Orbis shareholder list. We considered investors VCs if we found a company website of the shareholder with clear information about its investment activity as a VC. We deem a shareholder as a BA if the respective shareholder is a private person who invested in at least two other companies. This threshold is identical to that Agrawal et al. (2015) apply to define family and friend investors. Given that there is no legal definition of what constitutes a 'business angel' in Germany or the UK, what we identify as a BA might be considered what the US Code of Federal Regulations defines as a 'sophisticated investor'—"one who alone, or with his purchaser representative(s), has such knowledge and experience in financial and business matters that he is capable of evaluating the merits and risks of the prospective investment" (17 C.F.R. § 230.506). We regard private individuals on the shareholder list as more sophisticated investors because they are not crowd investors and, in Germany, for example, must involve a professional notary to obtain ownership of the firm's shares. Therefore, they are more likely to think at least once about the firm valuation and were informed about the benefits and risks of the prospective investment by the notary. We thus consider them more sophisticated and 'BA like' than ordinary crowd investors.

This approach of identifying BAs/VCs allows us to identify their investments not only after the ECF but also before the ECF campaign started, which we use as an additional control variable. Moreover, because investors in the startup might receive first-hand information from the firm and thus do not need to rely on signals in the same way as outside investors do, we only count investments by outside BAs/VCs that did not engage in the startup before the ECF campaign as a follow-up funding event in our duration analysis. In other words, if a new investment round takes place, we only consider this a funding

event if an outside BA/VC became a shareholder of the firm. We treat the date of registering the investor on the shareholder list as the time of the investment.

The second dependent variable measures whether a *firm failure* occurred. This variable is a dummy variable that equals 1 if the firm went into insolvency, was liquidated, or was dissolved and 0 otherwise. We collected data from the German company register (Unternehmensregister) and the UK Companies House.

In a next step, we investigate not only whether follow-up funding or firm failure occurred but also the precise timing of these two events. The third variable therefore measures the *time until follow-up funding by BAs/VCs* after the firm's first successful ECF campaign. The data sources are the same as those for the dummy variable *follow-up funding* (i.e., BvD Orbis and Zephyr, Thomson Reuters Eikon, and Crunchbase). Again, we identify the date of registering the investor on the shareholder list as the time of the investment.

The fourth dependent variable captures the *time until firm failure*—that is, the time the firm went insolvent, was liquidated, or was dissolved—at time *t* after the firm's first successful ECF campaign. Again, we collected the data from the German company register (Unternehmensregister) and UK Companies House and use the announcement date of the insolvency or liquidation as the failure event. In some cases, insolvency proceedings were not initiated because of a lack of assets, and the firm was liquidated right away.

Explanatory Variables. To test Hypotheses 1 and 2, that the management team affects follow-up funding and firm failure, we collected information about the senior management to investigate the impact of size (*number of senior management team members*) (H1) and average age (*average age of senior management*) (H2). A senior management team is defined as the number of members in the management team (i.e., CEO, managing partners, and managing directors). Arguably, in the case of startups that apply for financing in an ECF campaign, the management team most likely consists of the founders of the firm, but this information is not available to us. The source of the management team variable is Orbis.

As noted previously, trademarks and patents may provide a signal of firm quality. To test Hypothesis 3, we consider three different variables. In line with Block et al. (2014), we treat the *number of granted trademarks* as an indicator of startup quality. We also include the *number of granted patents* and, following Haeussler et al. (2014), the *number of filed patents*. As it is less difficult to receive a granted trademark than a granted patent (Block et al., 2014), we assume that the *number of granted trademarks* has a weaker effect on follow-up funding and firm failure, followed by granted patents. The *number of filed*

patents is likely to have the weakest effect on follow-up funding and firm failure, as these are even less reliable indicators than granted patents. For example, in the application stage, a patent has not yet gained its exclusion right; thus, in this stage, it is still unclear whether a patent application will result in a granted patent. Furthermore, because any firm can apply for a patent, the *number of filed patents* might only provide a weak signal of the firm's strength, quality, and future potential. The source for trademarks is Orbis and for patents the European Patent Office database PATSTAT and Orbis.

For Hypothesis 4, we collected several variables measuring the signaling quality of the ECF campaign. When presenting their project on an ECF platform, entrepreneurs often face the challenge of demonstrating the firm's quality while they are still in a startup phase. We consider four major ECF campaign characteristics that might signal the startup quality to BA/VC investors after an ECF has taken place: *number of subsequent successful campaigns*, *total amount of capital raised through ECF*, *total amount of the funding target*, and *total number of investors* at the respective ECF campaign. Note that in case the respective firm ran more than one ECF campaign, the *number of subsequent successful campaigns* is a time-varying variable that changes with any successful ECF campaign.

Furthermore, we use the *ratio of amount raised to the funding target* to test for the effect of overshooting the campaign target. If a firm does not set its funding targets correctly or properly estimate how much money it can collect through ECF, BAs/VCs might assess the firm and its founders as incapable of making proper projections about the value of the firm. Moreover, we include the variable *business valuation*, which measures the valuation that was determined by the startup and platform at the time of the ECF campaign. Given that for pre-seed startup firms no other valuation is available, this variable constitutes the best available proxy for a proper business valuation. We collected all these variables from the ECF portal websites.

Control Variables. We also use a rich set of additional control variables to account for unobserved heterogeneity. First, we control for country-specific factors and define a dummy variable that is equal to 1 if the firm is incorporated in the UK and 0 if it is incorporated in Germany. This variable measures the differential effect on follow-up funding and firm failure when running an ECF campaign in the UK (*UK firm*).

Second, the legal capital of a firm could be an important predictor of follow-up funding and of firm failure. We therefore include a dummy variable that equals 1 if no minimum capital requirements exist for the respective legal form of the startup seeking ECF (*LLC form with no minimum capital requirement*) and 0 otherwise. In Germany, no

minimum capital requirement exists for the LLC in the form of the Unternehmergesellschaft (haftungsbeschränkt) and in the UK for the Limited Company.

Third, young firms are more likely to have higher sensitivity to financial market conditions, which explains part of the differences in dynamics and characteristics between young and older firms (Cooley & Quadrini, 2001; Ouimet & Zarutskie, 2014). Hadlock and Pierce (2010) show that young firms have a higher chance of encountering constraints when accessing external capital. They are further characterized by higher exit rates and an increased risk of failure (Dune et al., 1989; Haltiwanger et al., 2012; Ouimet & Zarutskie, 2014). We therefore control for the firm's age at the end of the first ECF campaign.

Fourth, Bellucci, Borisov, and Zazzaro (2010) find that female entrepreneurs face tighter credit availability. Similarly, Alsos, Isaksen, and Ljunggren (2006) report survey evidence that women receive significantly less equity and debt capital, which also negatively affects the growth rates of their businesses. Thus, female founders in ECF might find it more difficult to obtain follow-up funding. We therefore include the variable *share of female founders*, which measures the share of female senior management in the firm.

Fifth, heterogeneity in employee qualities promotes decision making. For startups, more employees mean that there are more human resources to support the startup (Eisenhardt & Schoonhoven, 1990). We therefore include *number of employees* as an alternative proxy for the firm's human capital.

Sixth, follow-up funding and firm failure might also depend on (1) the geographic area (i.e., metropolitan, where customer density and the likelihood of VC firms are higher) and (2) investor type (institutional vs. private) (Cumming & Dai, 2010; Guenther et al., 2016). For example, VCs tend to be clustered in London and Munich. Funding dynamics and firm failure for firms located in these areas might differ from those of firms in rural areas. In addition, Hornuf and Schmitt (2016) analyze whether specific investor groups are more likely to invest in geographically close investments and find evidence that ECF investors exhibit a local bias. To address the issue of geographic distance, we included a dummy variable to control for city-specific factors that equals 1 if the firm is in a city with more than a million inhabitants and 0 otherwise. The information about firm location came from Orbis and firm websites.

Seventh, Hochberg, Ljungqvist, and Lu (2007) find that syndicate VCs' performance is generally better and their portfolio companies have a higher chance of exit through an IPO than portfolio companies of VCs without a network. VC networks allow their members to improve their quality by sharing information and expertise. They can reduce the asymmetry problem of startup firms seeking ECF (Agrawal, Catalini, &

Goldfarb, 2016). We therefore count the number of BA and VC investors the firm had before the ECF campaign.

Finally, we also control for the timing of the campaign on the platform by including year dummies. Firms that received ECF from more popular portals might also have higher chances of receiving follow-up funding. We therefore include a large platform dummy that equals 1 if the ECF campaign took place on Crowdcube, Companisto, Innovestment, Seedmatch, or Seedrs and 0 otherwise.

Method

The main objective of this study is to evaluate whether startups can build enduring businesses after a successful ECF campaign. We therefore analyze the effect of the explanatory variables outlined previously on follow-up funding and firm failure. First, we investigate the determinants of follow-up funding. As a starting point, we estimate a probit model that identifies factors influencing the probability of *whether* a startup firm will receive follow-up funding or not. Thereafter, we examine *when* the follow-up funding takes place by performing a Cox proportional hazards model. The duration model examines the duration until the first follow-up funding after a startup received ECF.

Second, we investigate a firm's capacity to build an enduring business by analyzing the probability of firm failure after an ECF campaign. Again, we initially estimate a probit model that determines *whether* a firm failure occurred, followed by a Cox proportional hazards model that investigates *when* this event occurred. Our observation period starts after the end of the first successful ECF campaign and lasts until failure or right-censoring as of September 30, 2016. The advantage of the Cox proportional hazards model is that it does not require the specification of the time dependence distribution of the hazard. Furthermore, the model allows for right-censored data and time-varying explanatory variables. As a robustness check, we estimate two exponential and Weibull accelerated failure time models. Regardless of the model used, we cluster standard errors by industry, which allows us to account for industry-specific effects.

RESULTS

Descriptive Statistics

Table 1 presents the summary statistics for the 426 firms in our sample. In total, these firms ran 505 successful campaigns, 346 of which took place in the UK and 159 in Germany.

Overall, 64 firms obtained follow-up financing, and 25 firms went insolvent, were liquidated, or were dissolved.[5] Most of the campaigns were run by firms operating in the information and communication industry (ICT) (31%), the wholesale and retail business industry (16%), or manufacturing (14%). Every fourth firm received funding from a VC, and more than three of 10 firms received funding from a BA. The average firm ran slightly more than one successful ECF campaign. Thus, only a small proportion of firms had a subsequent successful campaign. The average senior manager in the team was 43 years of age, and the team consisted of three individuals on average. Only a few firms filed or were granted patents; however, half the firms owned a trademark. Tables A2–A4 in the Appendix provide a comprehensive overview of filed and granted patents as well as granted trademarks in our sample by industry. We find that patents were more frequently filed and granted in the manufacturing industry than in all other sectors. Trademarks were frequent in all industries in general but, again, were most prevalent in the manufacturing industry.

Regarding campaign characteristics, the average number of investors in an ECF campaign was 320, the average amount raised was 461,899 EUR,[6] and the average funding target was 2.8 EUR million. Finally, the average business valuation was 375,591 EUR.

[Table 1 around here]

Follow-up Funding

Table 2 presents our findings for follow-up funding. Column (1) presents the probit model and columns (2)–(4) the duration models. We report average marginal effects for the probit model and hazard ratios for the duration models. The coefficients for the Cox proportional hazards model and accelerated failure time models represent hazard ratios, which give the hazard at one level of the explanatory variable relative to the hazard of the explanatory variable that is one unit lower. For example, the hazard for *number of subsequent successful campaigns* can be interpreted as the hazard of follow-up funding or firm failure if a startup ran two ECF campaigns instead of one campaign. Hazard ratios should be interpreted as multiplicative effects or semi-elasticities, which implies that in the duration analysis, all

[5] Note that the 64 firms receiving follow-up funding ran in total 82 campaigns. Furthermore, one firm that failed ran two campaigns.

[6] To ensure comparability of campaigns from Germany and the UK, we use the EUR/GBP exchange rate as of the date of the campaign end to convert campaign characteristics of UK issues into EUR.

estimates less than 1 must be interpreted as a negative effect, while estimates greater than 1 reveal a positive relationship.

[Table 2 around here]

Binary Outcome Regression Results. In a first step, we present the binary outcome setting, analyzing the firm's probability of obtaining follow-up funding after its first successful ECF campaign. We categorize the variables of interest in line with our hypotheses in three categories: senior management team (Hypotheses 1 and 2), trademarks and patents (Hypothesis 3), and ECF campaign characteristics (Hypothesis 4).

The management variables are in accordance with Hypothesis 1a, though we find no evidence for Hypothesis 2a. With respect to Hypothesis 1a, one additional individual in the senior management team increases the firm's probability of obtaining follow-up funding by 2.2 percent. This finding is in line with those of Eisenhardt and Schoonhoven (1990) and Ahlers et al. (2015), who find that larger management teams have more accumulated experience and human capital. In contrast with Hypothesis 2a, that a higher average age of the management team has a negative impact on follow-up funding, we find no such relationship in our data. Thus, BAs/VCs neither appreciate nor condemn younger managers who might have hands-on knowledge about trending markets but lack leadership experience.

The trademark and patent variables are not significant predictors of follow-up funding in the probit model. This contrasts with Hypothesis 3a but is in line with Ahlers et al.'s (2015) findings. The finding that patents do not have a significant influence could be due to the sectorial distribution of the startups in our dataset as outlined previously. That is, patents are generally an uncommon signal in ICT or wholesale and retail business, in which most of our ECF firms operate. Moreover, in segments such as ICT, firms often set open standards to allow other firms to design products that are interoperable with their products and services (Soininen, 2007). Soininen (2007) also argues that the inventions of ECF firms may simply not be worth patenting.

Finally, we investigate Hypothesis 4a to determine whether high crowd participation during an ECF campaign affects the probability that a firm later receives follow-up funding. The regression results in Table 2 show that the ratio of the amount raised to funding target

has a negative but weak (10% significance) effect on the average probability of obtaining follow-up funding after the first successful ECF campaign. Thus, we find only weak evidence that firms that set the funding goal too low provide a negative signal about their projection capabilities to prospective BAs/VCs. An increase of the ratio by one unit decreases the probability that the firm receives follow-up funding by 15.2 percent.

Duration Analysis of Follow-up Funding. We now turn to the duration analysis to investigate the time until a firm receives follow-up funding by a BA/VC after a successful ECF campaign. In a first step, we show a Nelson–Aalen cumulative hazard graph, which measures the chance of receiving follow-up funding after a successful ECF campaign.[7] Figure 1 shows the Nelson–Aalen estimates, categorized by country, with 95 percent confidence intervals.

[Figure 1 around here]

We find a consistent increase in the hazard of receiving funding after the first ECF campaign in Germany. German firms in our sample have a 50 percent chance to receive follow-up funding by an outside BA/VC 36 months after the first campaign. For UK firms, the chance is only slightly above 20 percent. The hazard rate function is the steepest during the first 0–18 months. It follows that the chance of receiving follow-up funding by an outside BA/VC is highest right after the end of the campaign. For the following 19–36 months, the chance increases only by a small degree. Of note, the estimate of the cumulative hazard rate function is smaller for the UK. This is in line with the finding from the Cox proportional hazards regressions in Table 2, column 2, which indicates that the chances of follow-up funding are significantly lower for ECF firms incorporated in the UK than for firms in Germany. As the results are based on the output using hazard ratios, running an ECF campaign in the UK decreases the rate of follow-up funding by 49.9 percent relative to running the campaign in Germany.

In accordance with the binary outcome setting presented in Table 2, column 1, the number of senior management team members also has a positive effect on the rate of follow-up funding. The results reveal that if the senior management team increases by one individual, the hazard of follow-up funding increases by 22.2 percent. Thus, we cannot

[7] In contrast with the Kaplan–Meier estimates, the advantage of using the Nelson–Aalen cumulative hazard function is that repeated events, such as several BA/VC investments in one firm, can be considered.

reject Hypothesis 1b, which is in line with the human capital literature outlined previously.

With respect to Hypothesis 3a, which states that the ownership of patents and trademarks increases follow-up finding because they provide a signal for the innovativeness and brand of the firm, we find no significant effects. Again, this could be because ECF firms largely operate in industries in which patents are not of importance (see also Appendix Tables A2–A4).

Hypothesis 4a, which states that high crowd participation has a positive influence on the probability of follow-up funding, is only partially confirmed. The number of subsequent successful campaigns has a positive effect on the probability of the rate of follow-up funding. One additional successful ECF campaign increases the hazard of obtaining follow-up funding by 75.2 percent. This shows that repeated interactions with the crowd through a follow-up ECF campaign provide a positive signal about the governance of the startup and explain subsequent investments by BAs/VCs. However, we find no evidence that the *total amount of capital raised* through ECF or the *total number of investors* are significant predictors of follow-up funding.

The control variables indicate that previous BA/VC investments have a positive and significant effect on outside follow-up funding, while firm age decreases the chances of receiving such funding. As a robustness check, we apply accelerated failure time models with an exponential distribution and a Weibull distribution. Table 2, columns 3 and 4, reports the results. Using these slightly different estimators hardly affects our results.

Firm Failure

This section depicts the regression results that focus on determinants affecting firm failure. We first analyze a binary outcome setting and then proceed with the survival analysis. All results are depicted in Table 3. As previously noted, column 1 shows the average marginal effects of the probit regression; columns 2–4 show the results from the survival analyses and report hazard ratios.

Binary Outcome Regression Results. Before assessing the duration until firm failure, we first estimate a probit model that measures whether a firm failed or not. The probit model estimates the probability that the firm went insolvent, was liquidated, or was dissolved. Table 3, column 1, presents the findings from the binary outcome model.

[Table 3 around here]

In contrast with our expectations in Hypotheses 1b and 2b, senior management team size and the average age of the management team do not show a significant effect in our probit model. Regarding the effect of trademarks and patents on firm failure (Hypothesis 3b), we find that granted patents are a significant predictor, with one more granted patent increasing the likelihood of firm failure by 1.7 percent. The reason for this somewhat unintuitive finding could be that the few firms owning a patent represent a selective sample that got rejected by other professional investors. These firms might therefore have a lower quality, because they are more likely to have been rejected by BAs/VCs before turning to ECF. Filed patents and granted trademarks are not significant predictors of firm failure, which is in line with the presumption that they only provide weak signals of firm quality.

Next, we test Hypothesis 4b, whether crowd participation affects firm failure. The number of subsequent successful campaigns is significant and has a negative effect on firm failure. The average marginal effect indicates that an additional successful campaign decreases the probability of firm failure by 5.0 percent. This confirms our previous findings that campaign success of follow-up ECF campaigns can explain investments by BAs/VCs. It is also in line with Kaminski et al. (2016), who show that reward-based crowdfunding campaigns increase the likelihood of subsequent VC investments.

Survival Analysis. Before proceeding with the survival analysis, we present the Kaplan–Meier curves of the survival rates of ECF funded firms, which we show in Figure 2. The chance of failure is higher for German firms than for UK firms. After 36 months, the chance of failure is 5 percent for UK firms and 24 percent for German firms.

The findings from estimating the Cox proportional hazards model shown in Table 3, column 2, confirm the result of the Kaplan–Meier curves. When we hold all other variables constant, an ECF campaign run in Germany has an 8.6 percent higher probability of failure than a campaign run in the UK. This finding is particularly noteworthy because ECF portals in Germany broker mezzanine financial instruments, such as subordinated profit-participating loans (partiarische Darlehen), silent partnerships (stille Beteiligungen), and non-securitized participation rights (Genussrechte). These contracts mimic the returns of equity shares, but come with little or no control rights, which could have an impact on the management of the startup (Klöhn, Hornuf, & Schilling, 2018). By contrast, startups running ECF campaigns on UK portals offer real equity shares that come with the traditional control rights of an LLC attached. Assuming that our UK firm dummy captures these differences, our results show that control by the crowd is important for firm performance.

[Figure 2 around here]

We now turn to a more sophisticated analysis to evaluate the correlations among the explanatory variables and the event of firm failure. The explanatory variables are again categorized in three categories: senior management team (Hypotheses 1 and 2), trademarks and patents (Hypothesis 3), and ECF campaign characteristics (Hypothesis 4). In contrast with follow-up funding, the management variables have no effect on firm survival.

Next, we focus on the impact of trademarks and patents on firm failure. As outlined in Hypothesis 3b, we argue that trademarks and patents reduce the hazard of firm failure. However, we do not find evidence in support of this hypothesis. Thus, while granted patents are a good predictor of whether firms fail at all, they preform less well in predicting the exact failure time.

In line with Hypothesis 4b, we expect crowd participation to reduce the hazard of firm failure. For the Cox proportional hazards model in Table 3, column 2, we find a significant effect of the variables *number of subsequent successful campaigns* and *business evaluation* on firm failure. The number of subsequent successful campaigns thus not only has an effect on whether a firm fails but also predicts the precise timing of the failure. One more subsequent successful ECF campaign decreases firm failure by 14.3 percent. Furthermore, an increase in the *business evaluation* of the funded firm by 1 million EUR increases the rate of firm failure by 3.9 percent. However, this effect is only weakly significant at the 10-percent level.

Except for the UK firm dummy, none of our control variables are statistically significant at conventional levels. As a robustness check, columns 3 and 4 of Table 3 show the accelerated failure time models with an exponential and Weibull distribution. The Weibull model displays similar results for the explanatory variables *number of subsequent successful campaigns* and *business evaluation*.

Does Follow-up Funding Affect Firm Survival?

An alternative explanation of our results on firm failure is that follow-up funding mediates the effects of the explanatory variables on firm failure. In other words, only by affecting follow-up funding can our explanatory variables predict firm failure. Robb and Robinson (2014) explore the capital structure choices that startups face during their first year of

operation. They find that to a large extent, firms rely on external debt to build enduring businesses. Applying this finding to ECF, we argue that startup capital and future capital injections are crucial for firm survival.

If follow-up financing has a mediating effect, this would imply that some of the effect of the explanatory variable on the dependent variable would pass through the mediator variable. In other words, there would be an indirect effect, which is included in the coefficient of the explanatory variable if the mediator variable *follow-up funding* is not included in the model. Therefore, we analyze whether follow-up funding has a mediating effect on firm failure. This method serves to shed light on the relationship between the explanatory variable, follow-up funding, and firm failure.

Performing a mediation involves calculating several regression models. Let x denote the explanatory variable of interest, y the dependent variable (i.e., *firm failure*), and m the mediator variable (i.e., *follow-up funding*). First, x is regressed on y, and the regression coefficient of x should be significant. If there is no significant relationship between x and y, the conditions for a mediation model are not met. If the explanatory variable is significant, then x is regressed on m. Again, x should exhibit a significant effect. As we show, for the Cox proportional hazards model, the only explanatory variable for which these assumptions hold is the *number of subsequent successful campaign*. If x is a significant predictor of m, we estimate a third and final model in which both x and m are regressed on y. The regression coefficient of m must be significant, and in the third model, the coefficient of x is smaller than that in the first model. If these conditions are met, there is a significant mediation.

We performed the first step of the mediation analysis by estimating the effect of the explanatory variables on firm failure (see Table 3, column 2). We find that for the Cox proportional hazards model, the only explanatory variable that has a significant effect on firm failure is the *number of subsequent successful ECF campaigns*. Furthermore, when regressing the explanatory variable *number of subsequent successful ECF campaigns* on the mediator variable *follow-up funding*, we again find a significant relationship (see also Table 2, column 2). Thus, the necessary conditions for estimating a mediation model of follow-up funding on firm failure are met.

Appendix Table A5 reports the results of the mediation analysis and indicates the average indirect, average direct, and the percentage of the total effect mediated. We

employed a bootstrapping approach to estimate the mediation model, thereby controlling for the additional covariates described previously. Test results indicate that the total effect mediated is 0.003 percent. This effect is statistically significant at the 5-percent level. We find that mediation is taking place, but the share being mediated is economically small, and thus we can directly interpret the effect of our explanatory variable *number of subsequent successful campaigns* on firm failure.

LIMITATIONS AND AVENUES FOR FURTHER RESEARCH

Research on ECF is still nascent, and many important research questions remain unanswered. While we contribute to the literature by analyzing predictors of follow-up funding and firm failure after an ECF campaign has taken place, our study also has clear limitations.

First, other institutional and legal factors might lead to differences in the size and significance of our coefficients for Germany and the UK. For example, in 2015, the UK ECF market was already 10 times larger than the German market (Dorfleitner, Hornuf, Schmitt, & Weber, 2017). The question therefore arises: What are the reasons for these differences, and how do they affect follow-up funding as well as firm failure? Potential explanations for the larger UK market might be tax advantages,[8] the benefit of London as a financial center,[9] and the possibility of real equity investment in the UK compared with the mezzanine financial instruments offered in Germany. The benefits of tax advantages might make investors less cautious and more inclined to invest in riskier startups, because only a fragment of their investment is lost in case of firm failure. The presence of London as a financial center might be an indicator of more financial sophistication among investors, which could affect both follow-up funding and firm failure. Furthermore, in the case of high information asymmetry, riskier firms tend to offer non-convertible debt rather than common equity and, in this way, provide a signal of their type (Stiglitz & Weiss, 1981). This mechanism is to some extent limited in Germany, because equity offers are virtually non-existent. The availability of debt and equity financing could therefore represent an advantage of the UK market, which results in a better selection process that manifests itself in higher firm survival rates. Finally, as a large number of firms obtain ECF in the UK,

[8] The UK provides two tax reliefs for investors. Both the Enterprise Investment Scheme and the Seed Enterprise Investment Scheme offer tax relief of up to 30 percent and 50 percent, respectively.

[9] Vulkan et al. (2016) show that approximately 38 percent of all pledges come from investors located in London.

even firms with lower growth expectations and a higher risk of failure could receive ECF. Moreover, with respect to follow-up funding, the overall VC market in the UK in 2016 was 4.8 billion USD compared with 1.9 billion USD in Germany.[10] This raises the question whether a funding gap exists at seed and pre-seed phases of startup financing and whether ECF fills this gap or whether ECF campaigns are the result of a negative selection of unworthy startups. If a funding gap exists, the lack of early-stage VC funding in Germany might suggest that an important funding gap can be closed. However, if all worthy firms obtain early-stage VC funding, firm failure in ECF might be higher because the worst ventures are financed by the crowd.

Second, we focus only on successful ECF campaigns, because we have no data on unsuccessful ECF campaigns of UK firms. As such, it could be argued that our study faces a sample selection problem due to incorrect randomization; that is, before examining whether campaigns receive follow-up financing or face insolvency or liquidation, we need to examine which characteristics lead to ECF success in the first place and then control for these factors in the second place when investigating follow-up funding and firm failure. In the case of Germany, however, we could gather data on unsuccessful campaigns, and therefore we ran a Heckman selection model, which helps correct for selection bias. The Heckman correction consists of two stages. In the first stage, we analyze determinants that influence a successful first round on ECF platforms, and in the second stage, we investigate the effect of our explanatory variables on (1) follow-up funding and (2) firm failure. The results for *follow-up funding by BAs/VCs* and *firm failure* appear in Appendix Tables A6 and A7. In both settings, we show that after controlling for sample selection, the unobservables are not correlated with the unobservables in the second stage.

CONCLUSION

This study provides first evidence of the determinants of follow-up funding and firm failure of startups that have received financing through an ECF campaign. Using hand-collected data from 14 different ECF portals and 426 firms that ran at least one successful ECF campaign in Germany or the UK, we provide evidence that German firms stand a higher chance of obtaining follow-up funding through BAs/VCs and have a relatively higher likelihood of failure than their British counterparts. The reason for this might be due to differences in the financial instruments used or the governance features of the platforms. Given that ECF portals in Germany broker mezzanine financial instruments that mimic the

[10] Source: PitchBook database.

returns of equity shares, but come with little or no control rights for investors, the management of the startup might have more leeway when making decisions. Furthermore, we find that the number of senior management team members, the number of subsequent successful ECF campaigns, and the previous number of VC investors have a positive effect on firms' likelihood to obtain follow-up financing. By contrast, firm age has a negative impact. The number of subsequent successful ECF campaigns also reduces the chances of firm failure.

Our study adds to extant literature in several ways. First, follow-up funding and especially firm failure are important factors that can help policy makers evaluate whether ECF is an efficient and worthwhile form of financing. Second, we identify selection criteria for crowd and professional investors such as BAs/VCs, which adds to the recent literature in entrepreneurial finance. Third, our findings might reduce the prejudice among traditional investors as they reduce the degree of uncertainty of ECF investments.

However, further research is necessary to illuminate the welfare implications of ECF. Whereas we compare the determinants of follow-up funding and firm failure in two countries, further research might compare crowdfunded firms with firms that have received other sources of financing. Doing so might enable researchers to learn about the relative advantage of an ECF campaign on building an enduring business. While BAs/VCs have traditionally supported their portfolio firms with advice and their network, ECF could provide a fuzzy signal of early demand and a large crowd of motivated backers willing to support the venture. Therefore, research should analyze the determinants of ECF on firm sales and profits. Finally, little is known about the screening process of ECF platforms and their role in the selection of valuable startups. How the screening process and platform selection criteria determine startups' chances of building an enduring business could also be subject to further empirical investigations. We hope such issues will be explored further as more data become available.

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FIGURE 1

Nelson–Aalen Estimates of the Cumulative Hazard Rate Function to Display the Time until the First Follow-up Funding by a BA or VC Investor after a Successful ECF Campaign, Categorized by Germany and UK, with 95 Percent Confidence Intervals

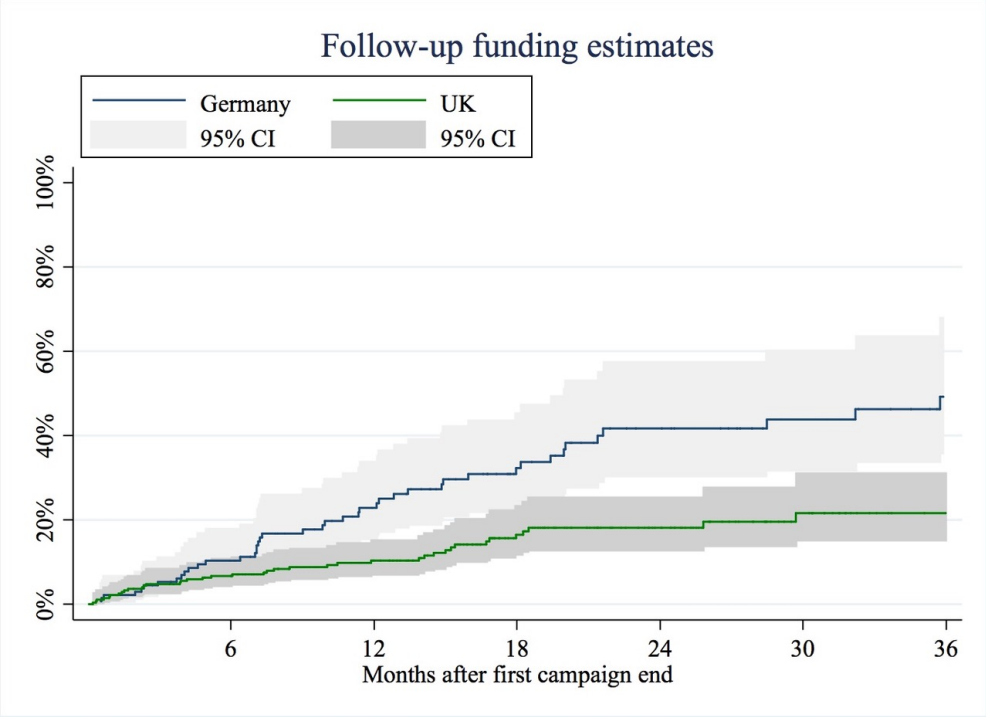

FIGURE 2

Kaplan-Meier Survival Estimates Comparing the Failure of German and UK Firms after a Successful ECF Campaign, with 95 Percent Confidence Intervals

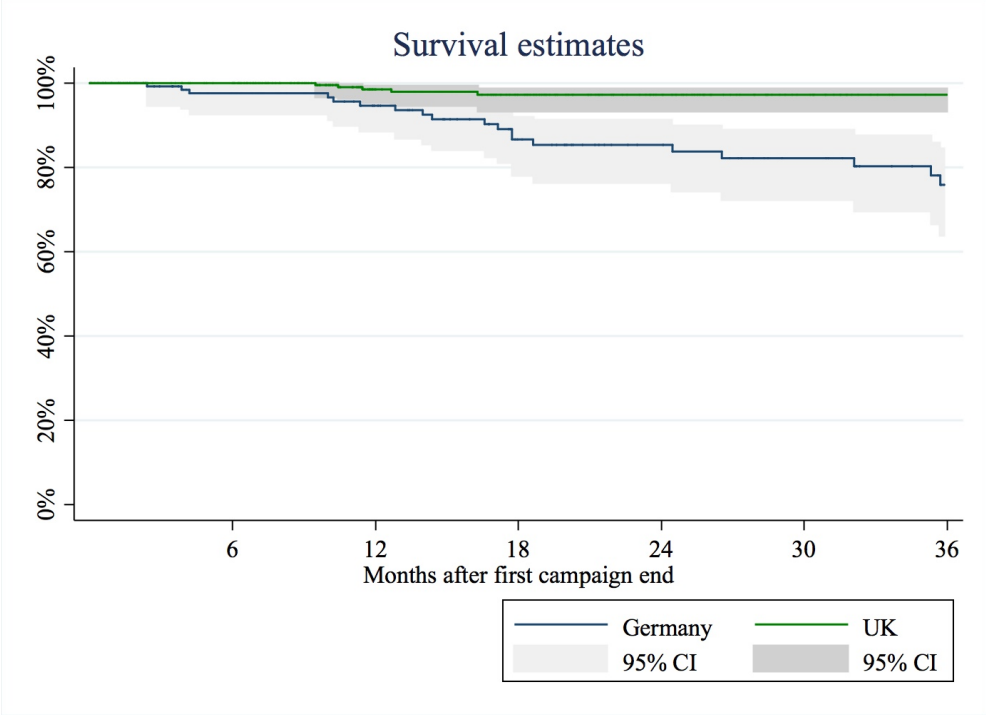

TABLE 1

Descriptive Statistics

Table provides summary statistics on the 426 firms and 505 campaigns and shows the mean, standard deviation, minimum value, and maximum value for all variables. The column 'Yes' indicates that a dummy variable takes the value of 1. Panel B presents the summary statistics, separately for the sub-samples of firms from Germany and the UK. The sample covers 426 firms that ran at least one successful ECF between September 24, 2011, and June 30, 2016. Variables reported are defined in Appendix Table A1. Amount raised, funding target, and business valuation are in EUR. We use the EUR/GBP exchange rate as of the date of the ending of the campaign. The last column reports the difference in means between German and UK firms. Significance of the differences in means is tested using a t-test. Significance levels: + p<0.10, * p<0.05, ** p<0.01 *** p<0.001.

	N	Mean	S.D.	Median	Minimum	Maximum	Yes	Difference in means UK minus Germany
Events								
Follow-up funding by BAs/VCs	426	0.150	0.358	0	0	1	64	-0.132***
Firm failure	426	0.059	0.221	0	0	1	25	-0.592***
Senior management team								
Number of senior management team members	426	3	2	2	1	12	.	2***
Average age of senior management	426	43	9	42	25	72	.	5***
Trademarks and patents								
Number of filed patents	426	0.110	0.617	0	0	8	.	-0.058
Number of granted patents	426	0.049	0.376	0	0	6	.	-0.064+
Number of granted trademarks	426	0.531	1.418	0	0	19	.	-0.553***
ECF campaign characteristics								
Number of subsequent successful campaigns	505	0.214	0.551	0	0	4	.	0.110**
Total amount of capital raised	505	461,899.80	808,182.00	203,559.00	140,614.00	8,642,694.00	.	-230,497.80**
Total amount of funding target	505	2,788,411.00	560,305.40	1,228,954.00	12,192.15	8,009,061.00	.	307,453.10***
Number of investors	505	320	383	200	120	3736	.	-132***
Business valuation	505	375,591.10	808,738.20	1,669,867.00	8,932.83	8,505,571.00	.	185,149.10**
Ratio of amount raised to funding target	505	0.668	0.285	0.711	0.033	1.112	.	0.405***
Controls Variables								
Number of VC investors	505	0.253	0.742	0	0	7	.	-0.034
Number of BA investors	505	0.343	1.042	0	0	12	.	-0.565***
UK firm	426	0.669	0.471	1	0	1	285	.
LLC form with no capital requirements	426	0.050	0.212	0	0	1	20	0
Age of the firm at end of first campaign	426	2	3	2	0	18	.	1**
Share of female senior management	426	0.152	0.284	0	0	1	.	0.113***
Number of employees	426	4.594	5.398	3	1	62	.	-3***
Firm located in a city with more than 1 million inhabitants	426	0.622	0.485	1	0	1	265	-0.206

TABLE 2

Follow-up Funding by BAs/VCs

Table shows results of the regressions on follow-up funding. Variable definitions are reported in Table A1 in the Appendix. The dependent variable in column (1) is whether the firm received follow-up funding by a BA/VC investor or not, and in columns (2)–(4) the duration until the firm received follow-up funding by a BA/VC investor. The method of estimation in column (1) is a probit model (coefficients reported are average marginal effects) and in columns (2)–(4) Cox, exponential, and Weibull models, respectively (coefficients reported are hazard ratios). Standard errors are clustered at the industry level and are reported in parentheses. Significance levels for coefficients: + p<0.10, * p<0.05, ** p<0.01 *** p<0.001.

		Duration Analysis		
	(1) *Probit*	(2) *Cox*	(3) *Exponential*	(4) *Weibull*
Senior management team				
Number of senior management team members	0.022***	1.222***	1.310***	1.253***
	(0.006)	(0.071)	(0.078)	(0.072)
Average age of senior management	-0.003	0.978	0.922***	0.974
	(0.002)	(0.016)	(0.017)	(0.017)
Trademarks and patents				
Number of filed patents	0.002	0.992	0.942	0.998
	(0.016)	(0.146)	(0.200)	(0.155)
Number of granted patents	-0.089+	0.534	0.522	0.510
	(0.047)	(0.306)	(0.451)	(0.301)
Number of granted trademarks	0.008	1.038	1.007	1.054
	(0.010)	(0.057)	(0.062)	(0.054)
ECF campaign characteristics				
Number of subsequent successful campaigns	0.016	1.752**	1.262	1.504*
	(0.023)	(0.360)	(0.232)	(0.271)
Total amount of capital raised	0.003	1.001	0.963	0.990
	(0.007)	(0.028)	(0.031)	(0.025)
Total amount of funding target	0.002	1.025	1.088**	1.044+
	(0.008)	(0.028)	(0.034)	(0.027)
Total number of investors	-0.009	0.973	0.949	0.974
	(0.007)	(0.041)	(0.054)	(0.040)
Business valuation	0.000	1.000	1.004	0.997
	(0.002)	(0.017)	(0.028)	(0.019)
Ratio of amount raised to funding target	-0.152+	0.369	0.021***	0.319
	(0.086)	(0.243)	(0.022)	(0.235)
Control variables				
Number of VC investors	0.047*	1.408*	1.469*	1.406*
	(0.022)	(0.203)	(0.225)	(0.203)
Number of BA investors	0.009	1.036	1.053	1.020
	(0.014)	(0.062)	(0.068)	(0.059)
UK firm	0.851***	0.499*	2.129*	0.520*
	(0.048)	(0.164)	(0.708)	(0.171)
LLC form with no capital requirements	0.017	1.119	0.736	1.073
	(0.018)	(0.178)	(0.199)	(0.193)
Age of the firm at the end of first campaign	-0.017**	0.840*	0.840+	0.840*
	(0.006)	(0.067)	(0.077)	(0.071)
Share of female senior management	0.020	1.008	1.222	0.989
	(0.052)	(0.506)	(0.582)	(0.475)
Number of employees	0.004	1.024+	1.009	1.022
	(0.003)	(0.013)	(0.015)	(0.014)
Firm located in a city bigger than 1 million inhabitants	0.038	1.411	1.191	1.388
	(0.036)	(0.464)	(0.405)	(0.480)
Largest portals dummy	*Yes*	*Yes*	*Yes*	*Yes*
Year dummies	*Yes*	*Yes*	*Yes*	*Yes*
Observations	505	505	505	505
Days at risk		253711	253711	253711
Number of follow-up funding events	82	82	82	82
Number of firms	426	426	426	426
Pseudo-R^2	0.212	0.091		
Log-likelihood	-176.425	-421.489	-291.686	-266.944

TABLE 3

Firm Failure

Table presents the results of the regressions on firm failure. Variable definitions are reported in Table A1 in the Appendix. The dependent variable in column (1) measures whether a firm failure occurred and in columns (2)–(4) the duration until firm failure. The method of estimation in column (1) is a probit model (coefficients reported are average marginal effects) and in columns (2)–(4) Cox, exponential, and Weibull models, respectively (coefficients reported are hazard ratios). Standard errors are clustered at the industry level and are reported in parentheses. Significance levels for coefficients: + p<0.10, * p<0.05, ** p<0.01 *** p<0.001.

		Duration Analysis		
	(1) *Probit*	(2) *Cox*	(3) *Exponential*	(4) *Weibull*
Senior management team				
Number of senior management team members	0.001	0.940	0.847	0.954
	(0.005)	(0.254)	(0.287)	(0.275)
Average age of senior management	0.001	1.004	0.928*	1.002
	(0.002)	(0.040)	(0.031)	(0.039)
Trademarks and patents				
Number of filed patents	-0.019	0.797	0.894	0.819
	(0.017)	(0.609)	(0.550)	(0.594)
Number of granted patents	0.017*	1.382	1.719	1.347
	(0.008)	(0.776)	(0.815)	(0.684)
Number of granted trademarks	-0.002	0.918	0.902	0.936
	(0.007)	(0.107)	(0.129)	(0.114)
ECF campaign characteristics				
Number of subsequent successful campaigns	-0.050*	0.143***	0.385	0.142**
	(0.025)	(0.080)	(0.345)	(0.088)
Total amount of capital raised	-0.001	0.864	0.831	0.846
	(0.004)	(0.136)	(0.160)	(0.144)
Total amount of funding target	0.001	1.211	1.294	1.224
	(0.004)	(0.168)	(0.254)	(0.189)
Total number of investors	-0.006	0.967	0.772*	0.964
	(0.005)	(0.091)	(0.100)	(0.096)
Business valuation	0.002	1.039+	1.062**	1.043+
	(0.001)	(0.022)	(0.020)	(0.024)
Ratio of amount raised to funding target	0.040	1.149	0.027**	1.159
	(0.042)	(0.793)	(0.036)	(0.881)
Control variables				
Number of VC investors	0.012	1.839+	2.189*	1.751
	(0.011)	(0.639)	(0.819)	(0.621)
Number of BA investors	0.002	1.107	1.076	1.111
	(0.008)	(0.138)	(0.161)	(0.158)
UK firm	-0.170***	0.086***	0.462	0.080***
	(0.020)	(0.026)	(0.318)	(0.024)
LLC form with no capital requirements	-0.021+	0.648	0.413*	0.597
	(0.012)	(0.239)	(0.176)	(0.231)
Age of the firm at the end of first campaign	-0.001	0.945	1.020	0.949
	(0.004)	(0.152)	(0.135)	(0.151)
Share of female senior management	-0.003	0.798	0.899	0.789
	(0.037)	(0.809)	(1.280)	(0.832)
Number of employees	-0.000	1.017	0.956	1.016
	(0.001)	(0.030)	(0.054)	(0.034)
Firm located in a city bigger than 1 million inhabitants	0.005	1.004	1.061	1.007
	(0.013)	(0.351)	(0.372)	(0.377)
Largest portals dummy	*Yes*	*Yes*	*Yes*	*Yes*
Year dummies	*Yes*	*Yes*	*Yes*	*Yes*
Observations	505	505	505	505
Days at risk	-	253711	253711	253711
Number of failures	26	26	26	26
Number of firms	426	426	426	426
Pseudo R^2	0.246	0.171	-	-
Log-likelihood	-77.271	-112.581	-98.994	-79.883

Appendix

TABLE A1

Table reports the definitions of variables. If variables capture a money amount, the EUR/GBP exchange rate as of the date of the ending of the campaign is used.

Variable	Description	Source
Dependent variables		
Follow-up funding by BAs/VCs	Dummy variable equal to 1 if the firm received follow-up funding after a successful ECF campaign and 0 otherwise	BvD Orbis, BvD Zephyr, Thomson Reuters Eikon, Crunchbase, press releases
Firm failure	Dummy variable equal to 1 if the firm went into insolvency, was liquidated, or was dissolved and 0 otherwise.	Unternehmensregister (GER), Companies House (UK)
Time until follow-up funding by BAs/VCs	Event until follow-up funding by BAs/VCs at time *t* after the firm's first successful ECF campaign.	BvD Orbis, BvD Zephyr, Thomson Reuters Eikon, Crunchbase, press releases
Time until firm failure	Event until firm failure at time *t* after the startup's first successful ECF campaign (i.e., the firm went insolvent, was liquidated, or was dissolved.	BvD Orbis, BvD Zephyr, Thomson Reuters Eikon, Crunchbase, press releases
Explanatory variables		
Management		
Number of senior management team members	Number of senior managers of the firm.	BvD Orbis
Average age of senior management	Average age of senior managers of the firm.	Age: BvD Orbis Share: Calculation by the authors
Trademarks and patents		
Number of filled patents	Number of filled patents by the firm.	BvD Orbis, PATSTAT
Number of granted patents	Number of granted patents owned by the firm.	BvD Orbis, PATSTAT
Number of trademarks	Number of trademarks owned by the firm.	BvD Orbis
Campaign characteristics		
Total amount of capital raised	Total amount of capital raised during an ECF campaign in Mio. EUR.	ECF portal
Total amount of funding target	Total amount of the funding target in an ECF campaign in Mio. EUR.	ECF portal
Total number of investors	Total number of ECF investors of the firm.	ECF portal
Business valuation	Pre-money valuation of the firm in Mio. EUR.	ECF portal
Ratio of funding to funding target	Ratio of funding to funding target.	Calculation by the authors
Number of subsequent successful campaigns	Number of subsequent successful ECF campaigns after the first successful campaign of the firm.	ECF portal
Control variables		
Firm characteristics		
UK firm	Dummy variable equal to 1 if the firm ran an ECF campaign in the UK and 0 otherwise.	ECF portal
Age of the firm at end of first campaign	Age of the firm at the end of first ECF campaign.	Foundation: BvD Orbis Age: Calculation by the authors
Legal form with no capital requirements	Dummy variable equal to 1 if the firm's legal form does not have capital requirements and 0 otherwise.	Unternehmensregister (GER), Companies House (UK)
Share of female senior management	Share of female senior managers of the firm.	Gender: BvD Orbis Share: Calculation by the authors
Number of employees	Number of employees at the time of the ECF campaign.	ECF portal
City with more than 1 million inhabitants	Dummy variable equal to 1 if the firm is located in a city with at least 1 million inhabitants and 0 otherwise.	BvD Orbis
Year dummies	Year dummies of ECF campaigns on the platform.	ECF portal
Largest portals	Dummy variable equal to 1 if the ECF campaign took place on one of the five largest platforms: Crowdcube (UK), Companisto (GER), Innovestment (GER), Seedmatch (GER), and Seedrs (UK).	ECF portal
Financials		
Number of VC investors	Current number of VC investors.	BvD Orbis, BvD Zephyr, Thomson Reuters Eikon, Crunchbase, press releases
Number of BA investors	Current number of BA investors.	BvD Orbis, BvD Zephyr, Thomson Reuters Eikon, Crunchbase, press releases

TABLE A2

Frequency distribution of industry and number of filed patents. Percentages in the column 'total' report the share of ECF campaigns where firms have filed for a patent by industry.

Industry	Number of filed patents							
	0	1	2	3	4	5	8	**Total**
Financial and insurance activities	16	.	.	.	.	.	.	**16**
								0%
ICT	157	2	2	.	.	1	.	**162**
								3%
Manufacturing	70	4	3	1	1	.	.	**79**
								13%
Wholesale and retail trade; repair of motor vehicles and motorcycles	79	1	.	.	.	.	.	**80**
								1%
Administrative and support service activities	40	2	.	1	.	.	.	**43**
								8%
Professional, scientific and technical activities	30	2	.	.	1	.	1	**34**
								13%
Other service activities	23	1	.	.	.	.	.	**24**
								4%
Others	67	.	.	.	.	.	.	**67**
								0%
Total	482	12	5	2	2	1	1	**505**
								6%

TABLE A3

Frequency distribution of industry and number of granted patents. Percentages in the column 'total' report the share of ECF campaigns where firms own a patent by industry.

Industry	Number of granted patents					
	0	1	2	3	6	**Total**
Financial and insurance activities	16	.	.	.	.	16
						0%
ICT	159	3	.	.	.	162
						2%
Manufacturing	73	3	1	1	1	79
						8%
Wholesale and retail trade; repair of motor vehicles and motorcycles	78	1	1	.	.	80
						3%
Administrative and support service activities	43	.	.	.	.	43
						0%
Professional, scientific and technical activities	33	1	.	.	.	34
						3%
Other service activities	24	.	.	.	.	24
						0%
Others	67	.	.	.	.	67
						0%
Total	493	8	2	1	1	**505**
						2%

TABLE A4

Frequency distribution of industry and number of granted trademarks. Percentages in the column 'total' report the share of ECF campaigns where firms own a trademark by industry.

Industry	Number of granted trademarks									
	0	1	2	3	4	5	7	10	19	**Total**
Financial and insurance activities	11	5	.	.	.	.	.	.	.	16
										31%
ICT	131	16	12	2	.	1	.	.	.	162
										19%
Manufacturing	48	17	7	3	1	1	.	1	1	79
										39%
Wholesale and retail trade; repair of motor vehicles and motorcycles	55	11	9	2	2	.	1	.	.	80
										31%
Administrative and support service activities	37	5	.	1	.	.	.	.	.	43
										14%
Professional, scientific and technical activities	24	5	2	1	1	1	.	.	.	34
										29%
Other service activities	16	4	4	.	.	.	.	.	.	24
										17%
Others	58	3	5	.	.	.	1	.	.	67
										13%
Total	380	61	44	9	4	3	2	1	1	505
										25%

TABLE A5

Mediation Results

Table provides a summary of the mediation results for the average direct, indirect, and the percentage of the total effect of the number of subsequent successful campaigns on firm failure, with follow-up funding as the mediating variable. All additional covariates were controlled for in this model.

	Number of subsequent successful campaigns		
Effect	Mean	[95% Confidence interval]	
Average mediation	-0.001	-0.005	0.004
Average direct effect	-0.175	-0.338	-0.051
% of total effect mediated	0.003	0.002	0.011

TABLE A6

Determinants of follow-up funding.

Table presents the results of the regression of a two-step Heckman selection model. Column (1) presents the first step and column (2) the second step. The dependent variable in column (1) measures whether a firm ran a successful ECF campaign and in column (2) whether a firm received follow-up funding. In both columns, the method of estimation is a probit model. The method of estimation in column (1) is a probit model (coefficients reported are average marginal effects) and in column (2) Cox model (coefficients reported are hazard ratios). Standard errors are clustered at the industry level and are reported in parentheses. Significance levels for coefficients: + p<0.10, * p<0.05, ** p<0.01 *** p<0.001.

	First step	*Duration analysis*
	(1) Probit	(2) Cox
Number of senior management team members	-0.540* (0.258)	0.268 (0.274)
Average age of senior management	0.098 (0.088)	-0.074*** (0.013)
Age of the firm at end of first campaign	-0.143* (0.067)	-0.130 (0.135)
Total amounf of capital raised	-0.060 (0.038)	0.056 (0.049)
Number of investors	0.099 (0.071)	-0.014 (0.112)
Number of filed patents		0.283 (0.422)
Number of granted patents		-0.571 (0.492)
Number of granted trademarks		-0.034 (0.126)
Number of subsequent successful campaigns		0.791*** (0.230)
Total amount of funding target		0.168 (0.356)
Business valuation		-0.037 (0.114)
Ratio of amount raised to the funding target		-0.368 (0.660)
Number of VC investors		0.410 (0.274)
Number of BA investors		0.009 (0.061)
LLC form with no capital requirements		0.038 (0.164)
Share of female senior management		0.976 (0.716)
Number of employees		0.004 (0.028)
Firm located in a city bigger than 1 million inhabitants		0.037 (0.444)
Inverse mills ratio		-4.228 (6.117)
Observations	161	161
Days at risk		93511
Number of follow-up funding events	43	43
Number of firms	141	141
Pseudo R-squared	0.217	0.062
Log-likelihood	-8.444	-183.000

TABLE A7

Determinants of firm failure.

Table presents the results of the regression of a two-step Heckman selection model. Column (1) presents the first step and column (2) the second step. The dependent variable in column (1) measures whether a firm ran a successful ECF campaign and in column (2) whether a firm failure occurred. In both columns, the method of estimation is a probit model. The method of estimation in column (1) is a probit model (coefficients reported are average marginal effects) and in column (2) Cox model (coefficients reported are hazard ratios). Standard errors are clustered at the industry level and are reported in parentheses. Significance levels for coefficients: + p<0.10, * p<0.05, ** p<0.01 *** p<0.001.

	First step	*Duration analysis*
	(1) Probit	(2) Cox
Number of senior management team members	-0.540* (0.258)	-0.273 (0.484)
Average age of senior management	0.098 (0.088)	-0.036 (0.028)
Age of the firm at end of first campaign	-0.143* (0.067)	-0.569* (0.258)
Total amounf of capital raised	-0.060 (0.038)	-1.206+ (0.701)
Number of investors	0.099 (0.071)	0.037 (0.298)
Number of filed patents		-0.679 (1.613)
Number of granted patents		2.063* (1.011)
Number of granted trademarks		-0.561* (0.240)
Number of subsequent successful campaigns		0.339 (1.027)
Total amount of funding target		0.105 (1.132)
Business valuation		1.225*** (0.286)
Ratio of amount raised to the funding target		-0.850 (1.511)
Number of VC investors		1.887*** (0.224)
Number of BA investors		0.203 (0.131)
LLC form with no capital requirements		-0.856* (0.340)
Share of female senior management		0.585 (0.574)
Number of employees		-0.089+ (0.050)
Firm located in a city bigger than 1 million inhabitants		0.344 (0.703)
Inverse mills ratio		6.346 (8.583)
Observations	161	161
Days at risk		93511
Number of failures	21	21
Number of firms	141	141
Pseudo R-squared	0.217	0.224
Log-likelihood	-8.444	-67.823