

Business angels, crowdinvesting and the start-up financing funding gap*

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Abstract

This study provides comparative empirical evidence on the fundraising outcomes and the post-funding performances of ventures supported by either business angels or crowdfinvestors. Building on a multi-year original dataset combining repeated annual surveys on both angels and equity crowdfunding (ECF) markets in Italy, we find that while investing in similar companies, ECF-backed ventures raise less capital than BA-backed ones, acquire a smaller percentage of capital and are less likely to raise follow-on equity financing. These results suggest that ECF and BA are imperfect substitutes that act as screening mechanisms of unobservably heterogeneous firms with different risk profiles, growth trajectories and funding needs.

1. Introduction

Traditionally, new ventures bootstrapped their start-up through friends and family capital and would almost immediately seek Venture Capital (VC) financing in the form of so-called Series A round. The average of such capital injections up until the first decade of this century has been at about 1 million dollars. However, the median Series A round size has steadily increased and in 2022 it has set at a staggering 14.7 million. Figure 1 Panel A reports median and average deal size investments in series A rounds from 2017 to 2022 as compiled by Pitchbook.

INSERT FIGURE 1 HERE

This relentless growth in formal VC financing size has spurred a profound reshaping of new ventures financing (Bruton et al., 2015; Fang et al., 2015; Bonini and Capizzi, 2019; Chernenko, et al., 2021; Hellman et al., 2021) with a substantial increase in the number and types of sources for early-stage, capital constrained companies, as reported in Panel B. This changing landscape of the entire early-stage financing ecosystem, while apparently offering a more granular sequencing of capital provision, also poses significant challenges in selecting the optimal source of financing. In particular, there is no clear understanding of whether pre-VC financing sources are precursor of additional follow-on rounds or, rather, they cater to different kind of companies that are endogenously selected by investors (Hellman et al., 2021, Capizzi et al., 2022; Andrieu and Groh, 2023). As shown in Figure 1, Panel B, the pre-VC space is populated by a multitude of different formal and informal investors, including business incubators, startup accelerators and investment clubs. Among those, two main channels have been largely dominant: business angels (BA) and equity crowdfunding (ECF) platforms. BAs and

crowdinvestors are both fundamental sources of financing for new ventures. While both types of investors can provide valuable funding, BAs are often more selective in their investments and can bring significant expertise and connections to the table, while crowdinvestors can provide a larger pool of funding with less individual risk (Hornuf et al., 2018; Bonini and Capizzi, 2019; Wang et al., 2019; Bessière et al., 2020).

Despite the above evidence of increasing volumes of capital raised, two major questions are still lacking unambiguous as well as shared answers. First: are BA and ECF plausibly perfect substitutes in providing early-stage financing to new ventures? Second: what is the post-funding performance and possible growth path of ventures supported by BAs and crowd-investors? In this paper, we aim at providing new evidence to these research questions by analyzing the fundraising outcomes and the likelihood of follow-on rounds of ventures supported by either of these two financing sources. Building on a multi-year original dataset combining repeated annual surveys on both the angel and the equity crowdfunding markets in Italy, we present comparative evidence on the fundraising outcomes and follow-on performance of BA and crowd-investors backed companies. We find that ECF-backed ventures raise less capital than BA-backed ones and crowd-investors acquire a smaller percentage of capital than BAs. Moreover, ventures that successfully raised ECF, subsequently, are less likely to raise follow-on VC financing compared to BA-backed companies, although they are more profitable. Importantly, in our analyses we do not hypothesize that the source of finance *per-se* will determine the outcome and/or the follow-on fundraising. Accordingly, we do not aim at establishing a causal link between the source and the outcome. Differently, we document the presence of systematic differences in companies, fundraising outcomes and follow-on evolution of companies that supports the view that crowd-investors and BAs, while

apparently addressing the same need, act as a market screening mechanism that separates companies with unobservable, but intrinsically different characteristics.

The remainder of the paper is structured as follows. Section 2 presents the theoretical background and advances our research questions. Section 3 presents the sample and the methodology of the study. Section 4 reports the results. Finally, section 5 concludes and paves the way for future research directions.

2. Theoretical Background and Research Questions

The extant literature on ECF and BAs has generally analyzed the existing sources in isolation (Brush et al., 2012; Mason et al., 2016; Vismara, 2018; Croce et al., 2018; Wallmeroth et al., 2018). More recently, scholars have started exploring the characteristics of BAs, BA groups, ECF and the most recent fintech related developments (e.g., Bonini et al., 2018; 2019; Butticiè et al., 2021a; Blaseg and Hornuf, 2023). Studies that analyse different sources of financing have also focused, although separately, on the effect of BAs (Hellman et al., 2021; Capizzi et al., 2022) and ECF (Butticiè et al., 2020; Butticiè et al., 2021b) on the likelihood of follow-on VC investment. Based on current literature, limited systematic evidence has been presented regarding the varying characteristics of companies that seek different actors within the pre-VC financial ecosystem (i.e., BAs and ECF), as well as the potential outcomes associated with these distinct investment patterns.

2.1. Business Angels

BAs are high net worth individuals accredited as investors that invest their private wealth that is usually local, unlisted and without any connection to the

entrepreneur(s) (Bonnet and Wirtz, 2012). BAs satisfy a specific dimension of investment needs, from a few thousand dollars to several hundred thousands, that is overlooked by institutional investors as VCs. Because of the extremely high costs of due diligence, contracting, and opportunity assessment related to businesses in their early stages, these investments are not deemed interesting or profitable by institutional investors (Jeng and Wells, 2000; Carpenter and Petersen, 2002; Mason, 2009). BAs fill the equity gap derived by this lack of interest. The role of BAs is not that of simple providers of equity capital, but they crucially deliver strategic support, networking, knowledge, monitoring, and control, even though in a less structured way compared to institutional investors (e.g., Månsson and Lanström, 2006; Politis, 2008; 2016; Avdeitchikova and Landström; 2016). This kind of non-monetary contribution is deemed as valuable as the invested capital. Typically, BAs exercise these contributions either by becoming consultants of the invested firm, or by directly entering the board of directors of the new venture (Mason and Harrison, 1992, 1996; Landstrom, 1993; Sohl, 1999; Wong et al., 2009; Landstrom and Mason, 2016). Moreover, a close tie and interaction is formed between the angel investor and the venture, to safeguard but also endorse the investment. Over time, the BA market has evolved with the formation of higher-level organizations such as Business Angel Networks (BANs) and Business Angel Groups (BAGs), that on the one hand allow BAs to share risk, increase diversification of the deal flow and share the screening costs (Kerr et al., 2014). On the other hand, they streamline the fundraising process for entrepreneurs that have a single point of access to multiple investors. Wallmeroth et al. (2018) state that research in the investment process of BAs is still a partly unexplored stream, requiring more study to understand the procedures and implications related to this type of investors. This lack of knowledge is partly traceable to the heterogeneity of this category of investors. The heterogeneity of BAs

takes place in terms of characteristics of the individuals as well as features of the investment, whether performed independently or through a group or network. This differentiation is relevant since the processes applied by independent investors strongly differ from those of networks and syndication deals (Mason et al., 2016). Most studies on pre-investment stages focus on the factors influencing the decision to invest and the investment success in terms of go/no-go decision. The investment choice is determined by many features: from specific details in the relationship between the angel and the venture, to a successful pitch shown to the BAs (Carpentier and Suret, 2015). Also, the affiliation to an angel group or network affects the angels' decision process. Bonini et al. (2018) show that BA groups drive greater diversification due to greater access to deals and shared due diligence resources.

A parallel stream of research looks at the BA investment process, focusing on the success of the investment and its post-funding performance. Levratto et al. (2018) study a sample of BA-backed companies from France, analyzing the growth effects of angel funding on three alternative growth measures: employment, sales, and tangible asset growth. They find that BA-backed firms perform better than randomly selected control firms. However, they do not grow significantly better than otherwise identical control firms. Bonini et al. (2019) provides evidence of the post-investment performance of an Italian sample of angel-backed companies showing that a set of investors' traits are associated with superior short and long-term performance and improved venture survival. Also, Lerner et al. (2018), using an international sample of angel group investments and a regression discontinuity design, explore BA-backed venture performance. In their approach, the authors compare firms just above and just below a funding threshold under the assumption that deals are quasi-randomly assigned at the discontinuity. They find that BA investments have a positive effect

on firm growth, survival, and, also, follow-on funding, partially in contrast to prior findings focusing solely on US ventures (Kerr et al., 2014). In contrast, Cumming and Zhang (2019) find that investee firms receiving angel investment their first round are less likely to successfully exit through either an IPO or an acquisition.

2.2. *Equity Crowdfunding*

Crowdfunding emerged in 2006, after the rise and development of funding through the internet.¹ Following several regulatory interventions, the internet-based crowdfunding technology has been extended to the direct sale of securities, also known as equity crowdfunding. Over the last decade ECF has progressively acquired an established role as an alternative or complement to more traditional forms of funding for early-stage businesses (Moleskis et al., [2019](#); Block et al., 20201; Colombo et al., [2015](#); Mollick [2014](#); Moritz and Block, [2016](#); Vismara, [2016](#); Wallmeroth et al. [2018](#)). A peculiarity of crowdfunding, opposed to BA and VC financing, is that crowdfunders are usually neither professional nor accredited investors. This characteristic has spurred several studies aimed at understanding the composition and traits of crowd-investors (e.g, Felipe et al., 2017; Agrawal et al., 2015). For instance, Bradford (2012), Griffin (2013) and Cholakova and Clarysse (2015) provide a detailed analysis of the segmentation of crowd-investors. A critical feature of crowdfunding campaigns is the disproportionately unilateral communication flow from the entrepreneur to the potential investors. As such a few studies have focused on signaling and information flows and their effects on campaign outcomes. For example, Vismara (2017) highlights the importance of signaling in crowdfunding campaigns, so that early investments in the first days of the campaign dramatically increase the likelihood of

¹ Most notably the JOBS act in the US in 2011

success. Relatedly, Ahlers et al. (2015) highlight that crowd-investors signal their varying level of sophistication through different investment tickets. Looking at investment processes Lukkarinen et al. (2016) suggest that conventional criteria on decisions and investments traditionally applied to BAs and VCs cannot be applied to ECF as well, and that researcher should look for innovative metrics. More recently, a stream of ECF has analysed the post-campaign performance of companies that successfully raised funds (e.g., Buttice et al., 2020, 2021b). Buttice et al. (2020) find that companies that raised ECF in UK are more likely to raise follow-on VC financing than a comparable group of firms that do not raise any external seed financing and, under some conditions, than firms collecting BA financing. Moreover, VCs that finance ECF-backed companies are less reputable than a control group of companies financed by BAs (Buttice et al., 2021b).

2.3. Joint studies on different investors

Most of the times, studies on multiple financing sources are based on cases in which there is co-investment among different categories of actors, in order to investigate how different players behave when investing together or in sequence (see Petit and Wirtz, 2022; Hornuf and Schmitt, 2016; Hornuf and Schwenbacher, 2016 and Brown et al., 2018 for co-investments between BAs and crowd-investors, see Goldfarb et al., 2013 and Witlbank and Boeker, 2007 for co-investments between BAs and VCs). There are also a few studies comparing different financing sources (see Ibrahim, 2008; Lindsay and Stein, 2020; Chemmanur et al., 2021; Hellman et al., 2021, all analysing BAs and VCs). In one prominent study, Hellman et al (2021) empirically examine how BAs and VCs interact, distinguishing complements and substitutes relationships between the two

investor types, and between investor- versus company-led interactions. They find evidence that BAs and VCs are substitutes, and this relationship is led by specific company characteristics in a sample of Canadian ventures. This would suggest the existence of two separate funding channels with minimal transitions across them. Chemmanur et al. (2021) find partial support to this preliminary result, linking the financing sequence with venture performance. In particular, the authors find that firms that received VC financing in the first round and continued to receive VC financing in subsequent rounds (VC-VC), and those that received angel financing in their first round and VC financing in subsequent rounds (Angel-VC) have a higher chance of successful exit compared to those with other financing sequences (VC-Angel or Angel-Angel).

However, prior research has rarely focused on the pre-VC financial stage alone, comparing BAs and crowd-investors. An exception is the work of Wang et al. (2019) that studies how BAs and crowd-investors interact on crowdfunding platforms. The authors find that crowd-investors complement BAs in large campaigns but remain the primary investor type in funding of small campaigns that do not generate sufficient interest from BAs. However, this study relies on an implicit definition of BAs (based on the total amount pledged in the CF campaign) and does not analyse BA characteristics nor subsequent company performance.

As venture capitalists increasingly focus on later stages of venture financing, BAs and ECF are the two most important sources of finance for early-stage ventures. Since they are competing on the same segment, it is important to understand the differences in their behavior, and eventually the impact that these differences have on funded ventures over time. In other words, we still don't know whether the

presence of alternative sources of financing in the early-stage segment of capital markets does imply competitive funding options available to young ventures or, rather, the possibility to get access to poorly substitutable sources of funding by intrinsically different young ventures. Thus, the aim of this study is to provide novel insights into these two types of funding sources. Specifically, in a complementary-substitution setting, we examine the characteristics of ventures funded by BAs and crowd-investors in order to identify possible differences in their behaviors and investment practices. Accordingly, we propose to answer to the following research questions.

RQ1: *Are BA and ECF plausibly perfect substitutes in providing early-stage financing to new ventures?*

RQ2: *What is the post-investment performance of ventures funded by BAs and crowd-investors?*

We provide direct evidence to these questions by analyzing the fundraising outcomes and the likelihood of follow-on rounds of companies supported by either of these two financing sources.

3. Sample and data

The institutional environment that allows angel and crowd investments is significantly heterogeneous across countries and between these two different sources.

In essentially all jurisdiction the solicitation of funds in exchange for securities is assimilated to a traditional market offering with the associated regulatory compliance and financial constraints. Exceptions are granted for issuance under Regulation D, Rule 506, that allows raising funds from "accredited" individuals

that arguably have the necessary financial sophistication to gauge the risks associated with such investments and pass a minimum income and wealth test that allows them to absorb potential losses. Despite a recent tightening in parameters of accreditation², this regulation has been flexible enough to allow for the development of a vibrant angel market. Differently, the accreditation constraints have hampered the development of equity crowdfunding structures that were similarly restricted to accredited investors only. In response to a pressing demand from the market of ad-hoc regulatory intervention, in 2012 the US passed a provision in the JOBS Act known as Title II regulation which became effective in promoting fundraising from large crowds through securities offering.

European countries have followed a similar path developing specific regulation aimed at providing a safe but effective set of rules for equity crowdfunding.

While Italy has never imposed a specific constraint to angel investor, who accordingly do not need to pass an "accreditation" test, it prohibited the solicitation of sales to the general public, unless it complied to the regulation for regular public offerings on a stock exchange. This effectively prevented any crowd-based fundraising until a specific regulation was passed in 2012. The new regulation introduced a particular category of companies (innovative startups) to raise funds through a general public, off-exchange offer. The qualifying criteria for innovative startups are broadly three: first, hold or be a licensee of a patent, or the owner and author of a registered software; second at least one third of employees must hold a Ph.D. or a research tenure (or at least two third must hold a M.Sc. degree); third, investments in R&D should account for at least 15% of the revenues (or operating

² The Dodd-Frank Act was passed in 2010 in US. It established a number of new government agencies tasked with overseeing the various components of the law and, by extension, various aspects of the financial system, which was intended to prevent another financial crisis like the one in 2007–2008. Regarding BAs, the Act tightened the requirements for qualifying as an “accredited” individual investor.

costs if they exceed the revenues). Innovative startups cannot sport revenues in excess of 5 mil/euros and cannot be directly or indirectly tied to a spin-off or a merger of pre-existing operations³. Candidate ECF portals must be authorized to operate by the local regulatory authority. Given the exceptional level of information asymmetry in such companies and the significant risk for small, naïve investors, the ECF regulation requires that at least 5% of the funds be raised by professional investors such as VC funds, structured business angels, investment companies, or incubators. Differently from other countries' regulation, offers are open to the general public with no particular income, wealth or diversification constraints. The regulation has proven successful with the first offerings launched in 2013 and a constant growth over time.

3.1. Data sources

Data availability and/or reliability in angels and crowdfunding studies is a well-known problem in the literature (Mason and Landström, 2016; Bonini et al., 2018; Lerner et al., 2018; Cumming and Zhang, 2019; Lindsay and Stein, 2020). Furthermore, the definition of BAs and their eligibility for accredited investor status changes across the world, making it difficult to run comparative analyses across countries.

In this paper, we leverage on exclusive access to two structured sources of information for angel investments and crowdfunding campaigns that allows to accurately identify companies, gather a host of investment and financial information, track them over time and identify follow-on funding (if any). Data on

³ Additional regulatory features include the following: until a company qualifies as an innovative startup, it cannot distribute dividends and cannot be listed on a stock exchange.

BA investments are obtained from the Italian Business Angel Network (IBAN), the national trade association for angels and angel groups/networks, annual surveys. IBAN administers annually a comprehensive survey to members and non-members. Each survey is completed through a four-step sequential mixed mode (Snjikers et al., 2013): at the beginning of January, IBAN forwards the survey’s website link to its associates and other known BAs. By the first week of March, the data are collected (step 1). Non-responsive BAs are contacted by email and phone to solicit survey completion (step 2), while an IBAN team reviews the data to identify incomplete, wrong or unverifiable answers (step 3), which are further checked through direct follow-up calls (step 4)⁴. Data have been reliably used in the literature (see Bonini et al., 2018 and Bonini et al., 2019) and are characterized by a long time series and a consistent data collection method. Data on crowdfunding campaigns have been obtained from Osservatorio Crowdfunding (OC), a think-tank. OC collects data from all offerings published on all 19 regulated equity crowdfunding platforms⁵. For each campaign, OC collects: term sheet, issuers’ accounting data and statutes, pitch, and management team. For successful offerings, OC extracts the full list of participating investors analyzing regulatory filings. In particular, under the Italian regulation all companies, are required to disclose their shareholders and the share of the equity capital they own. The number and identity of investors participating to the funding round is then computed by comparing the ownership structure before and after the campaign. Both individual investors and corporations are allowed to subscribe equity of the issuing company and we consider both categories in our analysis. Given these

⁴A full description of the process is available in Bonini et al. (2018).

⁵The full list of platforms is publicly available from the Consob website: http://www.consob.it/c/portal/layout?p_l_id=487934&p_v_l_s_g_id=0

characteristics, OC data allow for analyses on the entire population of equity crowdfunding campaigns minimizing the selection issue commonly found in other studies that rely on data provided by generally one single platform.

3.2. *Sample summary statistics*

Table 1 reports some sample summary statistics.

INSERT TABLE 1 HERE

In panel A we report unique investments, investors, and companies' statistics. Our sample includes 3,231 unique investments, by 2,076 unique investors on 402 unique companies. The total number of funding rounds is 438. The number of funding rounds is greater than the number of companies which reflects that a few companies receive funding multiple times. This appears to be the case for angel-backed companies only, for which we observe 369 unique deals on 333 unique companies. Looking at unique investors, the sample includes 146 angels and 1,930 crowd-investors. BAs on average appear to invest in 3 transactions in our sample as captured by the number of unique investments (443). Perhaps more surprisingly, also investors participating to crowdfunding offerings exhibit some consistency as measured by the roughly 1.5 times larger number of their unique investments.

In Panel B, we present the yearly distribution of investments. Crowdfunded deals are constrained by the regulatory change and are therefore non-existing before 2013. Differently BA deals are distributed fairly consistently across years albeit at a declining pace. There is no immediate reason as to why this could be the case, however a potential substitution effect could be in place whereby angels (especially small ones) may shift from investing alone to participating to ECF campaigns.

Unfortunately, while we have tax IDs for investors in crowdfunding campaigns which allows for an exact identification of the investor, IBAN data do not report such information hence our ability to empirically measure this conjecture is limited. In order to capture subsequent venture performance and follow-on investment rounds accurately, it is crucial to consider an extended post-investment time frame. In our dataset, we compiled BA/ECF investments up to 2017, enabling us to observe the performance of these ventures for a minimum of two years thereafter. Our observation window ends with data on fiscal year 2019⁶, before Covid-19 had an impact on the start-up investment landscape. In particular, atypical dynamics in equity crowdfunding during this time may have impacted our findings. Given the substantial unbalance of the sample, to ensure robustness in our results we run all our estimates on the subset of deals from 2013 to 2017.

4. Results

4.1. *First round univariate fundraising evidence*

To answer to our first research question, we compare the first round of investment of BA-backed and ECF ventures. Panel A of Table 2 shows our main dependent variables. These are the total *Invested capital* in the BA or ECF deal and the *Share Acquired* by BAs or crowd-investors in the focal deal.

INSERT TABLE 2 HERE

On average, BA-backed deals receive more capital (206,000€) compared to

⁶ It's important to note that data availability is significantly lagged because access to one year financial stamentes (e.g. 2019) is generally possible 6 to 12 months after the closing of the fiscal year (e.g. mid to end of 2020)

ECF-backed transaction (67,000€), and the difference is statistically significant. Interestingly, the share acquired by BAs is more than three times (16%) than the share acquired by crowd-investors (5%). Moreover, BA-backed deals achieve significantly higher pre-money valuations. Companies seem also somehow different in terms of observable characteristics, such as the pre-investment company revenues, which are almost half for BA-backed companies compared to ECF ones, as shown in Panel B of Table 2. Finally, Panel C shows investors characteristics in terms of experience, measured as the number of prior deals performed by the investor and investor's age. The two types of investors show relatively similar characteristics, even if crowd-investors are generally younger and with slightly less experience than BAs.

4.2. *First round fundraising evidence: multivariate analysis*

We now analyze more in depth the differences between companies that received BA and ECF financing to understand different behaviors of BAs and crowd-investors, examining whether and how the amount invested, and the ownership stake acquired depend on some specific ventures' observable factors.

In our analyses, we do not propose any hypothesis testing suggesting that a specific source of finance per-se will determine the outcome of subsequent fundraising. Our objective is not to establish a causal relationship between the source itself and the outcome, rather we aim at identifying structural differences after controlling for covariates. We perform a series of OLS regressions, where the dependent variable, *Fundraising outcome*, is alternatively the natural logarithm of total amount of funds raised (i.e., *Invested Amount*) per company or the percentage acquired by the investors participating in the deal (i.e., *Share Acquired*).

We estimate the following regression:

$$Fundraising\ outcome_i = \beta_1 Fundraising\ type_i + \gamma_s \sum Controls_{s,i} + Industry_i + Year_t + \varepsilon_i,$$

where the main independent variable is the *Fundraising type_i*, an indicator variable taking the value of 1 for ECF deals and 0 for BA deals for venture *i*. *Controls_{s,i}* include a number of covariates relating to deal-level and industry-level characteristics. The first group include: *Pre-money valuation*, a variable capturing the pre-money valuation of the firm; *Pre-investment company revenues*, a variable capturing venture’s revenues in the last fiscal year prior to the BA/ECF round; and the *Number of co-investors* participating in the focal financing round. As for industry characteristics, we include the price to book value ratio (i.e., *Industry P/BV*) for the industry in which the venture operates, and the *Industry CAPEX/Sales* ratio, measured as the ratio of total capital asset expenditures on the industry revenues. We finally include industry (a series of dummy variables for the industry in which the venture operates captured by the NACE Rev. 2 two-digit code) and year fixed effects.

We then augment the previous model with investors specific characteristics and estimate the following equation:

$$\begin{aligned} Fundraising\ outcome_i &= \beta_1 Fundraising\ type_i + \gamma_s \sum Controls_{s,i} + \delta_s \sum Investor_{s,i} + Industry_i + Year_t \\ &+ \varepsilon_i, \end{aligned}$$

where we include the following investor-level covariates: *Investor age* at the time of investment; the number of previous investments made by the investors participating in the focal round (i.e., *Investor experience*); *Former Manager*, an indicator variable taking the value of 1 if the investor has past experience as a manager, and 0 otherwise; *Former Entrepreneur*, an indicator variable taking the value of 1 if the investor has past experience as an entrepreneur, and 0 otherwise. All investor-level variables are aggregated at the deal level, taking either the average or the maximum for co-investors investing in the same focal deal. For BA deals we further include the level of monitoring

performed by the BAs co-investing in the deal (i.e., *Soft Monitoring*), an ordinal variable assuming the values from one to five, where one means very low control intensity on the venture and five very high intensity, and the BA *Active Involvement* in the invested company, a dummy variable taking the value of 0 for investors stating to provide only capital contribution to their investee companies and 1 for investors stating to provide both capital and active contributions to the venture. Table 3 reports the description of all variables used in the analysis.

INSERT TABLE 3 HERE

Table 4 shows the results, including deal-level and industry-level controls. All models (except univariate ones) include industry and time fixed effects. Columns 1-3 reports results for the dependent variable *Invested Capital (log)*, while columns 4-6 reports results for the dependent variable *Share Acquired*.

INSERT TABLE 4 HERE

Fundraising type is negative and statistically significant across all models ($p < 0.001$). This confirms that ECF-backed companies raise less capital than BA-backed ones and crowd-investors acquire a smaller percentage of capital than BAs, supporting the results of our univariate analysis. As for control variables, we find that pre-money valuation and pre-investment revenues are positively related to the capital invested. Instead, pre-money valuation is negatively correlated with the share acquired by investors. As expected, a higher number of co-investors is associated to higher capital collected and a larger percentage of capital acquired. These findings suggest that ECF and BA respond to different financial needs of ventures, as demonstrated by the lower capital need and,

consequently, lower share acquired by crowd-investors. In this regard, the two typologies of investors may, at least, partially cater to different types of entrepreneurial ventures and serve, to some extent, as parallel or substitute sources of funding for nascent businesses in their initial stages in the pre-VC financial ecosystem.

Table 5 replicates the previous analysis adding to the models our set of investor-specific characteristics. Columns 1-3 reports results for the dependent variable *Invested Capital (log)*, while columns 4-6 reports results for the dependent variable *Share Acquired*.

INSERT TABLE 5 HERE

We confirm previous results on the relationship between *Fundraising type* and *Fundraising outcome*, revealing a negative significant correlation between crowdfunding and both the capital raised and the ownership stake acquired by investors. When examining investor-specific variables, we found intriguing patterns that contribute to a more comprehensive understanding of the dynamics at play. Firstly, our analysis suggests that investor-level variables play a more influential role in determining the percentage of share acquired rather than the total capital raised. One notable factor is the age of the investor, which shows a negative association with the acquired share. This finding implies that younger investors may be more inclined to seek larger ownership stakes in ventures, potentially driven by a desire for greater control, involvement, or a strategic position in emerging ventures. Furthermore, the investor's past investment experience emerges as another relevant factor. Surprisingly, we observed a negative relationship between past

investment experience and the acquired share. This suggests that experienced investors may be more selective in their investment choices, opting for smaller ownership stakes in a higher number of promising ventures rather than larger ones. On the other hand, results reveal a positive correlation between an investor's previous experience as an entrepreneur and the share acquired. This result indicates that individuals with firsthand entrepreneurial experience are more inclined to acquire larger ownership stakes in ventures, which may stem from their understanding of the value they can contribute as active partners, leveraging their own entrepreneurial expertise, network, and/or industry knowledge to foster the growth and success of investee ventures. Furthermore, results point to well-known evidence regarding BAs investment practices. BAs who engage in higher levels of soft monitoring tend to invest a greater amount of capital, suggesting that BAs who exert higher control in the venture's decision-making processes are more willing to allocate a larger sum of their resources. Furthermore, while BA active involvement positively influences the capital invested, it is negatively associated with the share acquired. This is in line with the fact that when BAs become more actively involved in the operations and strategic direction of their investees, e.g., providing advice, guidance, and/or mentorship to the entrepreneurs, they may prioritize their relationship with the entrepreneur over securing a larger ownership stake. This approach could be driven by various factors, such as the importance of fostering a collaborative relationship with the

entrepreneur. By actively engaging and working alongside him/her, they can build a strong partnership based on trust and shared goals, while still allowing the entrepreneur to retain a larger share of ownership.

4.3. *Follow-on funding*

To answer to our second research question, we investigate the follow-on performance of ECF- and BA-backed companies after the first round of investment. In order to do so, we run a probit regression, where the dependent variable is the probability of receiving a follow-on round by a VC after the ECF campaign or the BA round. The main independent variable is, as before, the *Fundraising type*, a dummy taking value 1 for ECF deals and 0 for BA deals. We control for the capital raised in the previous round of investment and the company pre-money valuation (we also include time and industry fixed effects). Table 6 shows the results. We find that ECF-backed ventures are less likely to raise additional follow-on financing compared to BA-backed ones. We, therefore, find different follow-on investment patterns for BA- and ECF-backed ventures, suggesting a substitute relationship between BAs and crowd-investors.

INSERT TABLE 6 HERE

Receiving VC may or may not affect the survival and performance of ventures, therefore, to assess the subsequent performance of ventures, we performed an analysis of the survival and profitability of companies, conditional on receiving either a prior round of BA or ECF financing. Data availability limits our ability to consider exits as an

additional measure of venture performance, as only a very small number of companies underwent an exit event in our sample.

Survival is measured by an indicator variable taking the value of 1 if the venture was recorded as still operating as from 2019 tax filings and 0 otherwise, thus we estimate a probit regression. *Profitability* is measured by the Profitability Index (PI) developed in Bonini et al. (2019), based on different combinations of revenues, asset value and income. PI assumes five different ordinal scores: 2 when revenues, net asset value and net income are positive; 1 when revenues and net asset value are positive but net income is negative; 0 when revenues are positive but net asset value and net income are negative; -1 when revenues are zero and net income is negative but net asset value is positive; -2 when revenues are zero and net income and net asset value are negative. The reasoning behind the PI index is that it takes time for a small company to turn the equity capital injection received into a profitable stream of revenues and cash flows. Typically, there is an initial period of zero or low revenues, negative profits, and erosion of equity capital. However, as operations develop, the company may experience an increase in turnover, leading to higher earnings and positive cash flows. Given the ordinal nature of PI, we estimate an ordinal logistic regression. The main independent variable is, again, the *Fundraising type*. Additional covariates include the pre-money valuation of the venture, the total capital raised in the previous round and the venture pre-investment revenues.

Results are reported in Table 7. Columns 1-3 report results on companies' survival, while columns 4-6 report results on companies' profitability. First, *Fundraising type* is not statistically significant after controlling for covariates (column 2,3), even though positive, thus indicating a potential higher survival rate for ECF-backed ventures.

Looking at profitability, we find a positive and statistically significant coefficient associated with the *Fundraising type*, providing evidence for a better post-investment performance of ECF-backed ventures ($p < 0.05$, model 5). Nevertheless, the previous relation becomes non-significant at conventional levels when controlling for the capital raised and the pre-investment revenues (model 6). While these results should be interpreted cautiously, they contribute to the understanding that ECF and BA financing channels cater to different types of early-stage ventures. To shed light on the motivations behind these findings, it is essential to consider the characteristics inherent to ECF-backed and BA-backed companies. ECF-backed ventures tend to be smaller in scale, requiring comparatively lesser capital to grow. This aspect implies that these ventures are likely to be intrinsically less risky compared to their high-growth-oriented BA-backed counterparts and, thus, have a higher potential for achieving profitability at an earlier stage. Considering these characteristics, one plausible explanation is that the different performance observed between ECF and BA-backed ventures can be attributed to their distinct risk-return profiles. ECF-backed ventures, characterized by a smaller scale, lower capital requirements, and reduced risk exposure, may have a more favorable balance between risk and return, resulting in a relatively better performance in terms of survival and profitability.

INSERT TABLE 7 HERE

5. Discussion and Conclusions

In this paper, we analysed the presence of systematic differences in entrepreneurial

ventures, fundraising outcomes and follow-on evolution of companies that received their first round of financing by either BAs or crowd-investors. Relying on two unique proprietary databases of BA-backed and ECF ventures, we find that ECF companies raise less capital than BA-backed companies with crowd-investors acquiring a smaller percentage of capital than BAs, therefore, showing different investment outcomes and investors' behaviors. Moreover, ventures that performed a successful ECF campaign subsequently are less able to raise follow-on financing compared to BA-backed ones. Nonetheless ECF-backed companies seem to be more likely to survive and more profitable than BA-backed companies. Taken together, our results support the view that crowd-investors and BAs, while apparently addressing the same need in the pre-VC financial ecosystem, may represent different market screening mechanisms that separate companies with unobservable but, intrinsically, different characteristics. The better post-investment performance observed among ECF-backed ventures can be attributed to their smaller size, lower capital requirements, and lower inherent risk profile. As such, one major implication of our analysis is the existence of a possible market matching mechanism whereby BAs and crowd-investors screen heterogeneous types of ventures to identify companies whose objective function aligns with that of the investor.

We also expand on the existing body of literature on BAs and ECF, by shedding light on the interactions between different pre-VC investor types (Wang et al., 2019). Differently from previous contributions that mainly analysed co-investment practices or

the sequential investment patterns of companies financed by different capital providers (e.g., Hellman et al., 2017, Butticcè et al., 2020), we suggest the existence of different but unobservable characteristics of ventures supported by BAs and crowd-investors, which lead to ex-ante different investment selection and ex-post different follow-on venture performance.

This study has some limitations that however, open up various avenues of future research. First, in comparing BA and ECF investors we have considered business angels features, such as the level of monitoring and active involvement in their portfolio companies, as homogenous across angels. However, it is well known that angels increasingly form groups and networks leading to different screening and investment practices. Whether different forms of cooperation among angels affect companies survival, performance and follow-on fundraising is an open question with interesting ramifications. Second, our data structure does not allow to test whether the source per-se may determine the outcome and/or the follow-on fundraising. Accordingly, we did not aim at establishing a causal link between the source per-se and the outcome, but we only documented the presence of systematic differences in fundraising outcomes and follow-on evolution of ventures funded by either BAs or crowd-investors. Future work based on novel datasets may help overcome this limitation. Thirdly, while our results should be applicable globally, differences in regulation and investment cultures may lead

to idiosyncratic outcomes. Therefore, future work can extend our findings to other geographies and institutional contexts. Finally, this study compares two different samples of companies financed by BAs and crowd-investors where BAs and ECF invest in isolation. Subsequent research might look at interaction effects between BAs and crowd-investors and their joint participation in crowdfunding deals. Indeed, ECF is an opportunity for BAs to expand their deal flow being a relevant source of diversification of their investment. Thus, it is important to understand the involvement of BAs in ECF platforms, and the impact of BAs on venture subsequent performance when they co-invest with crowd-investors.

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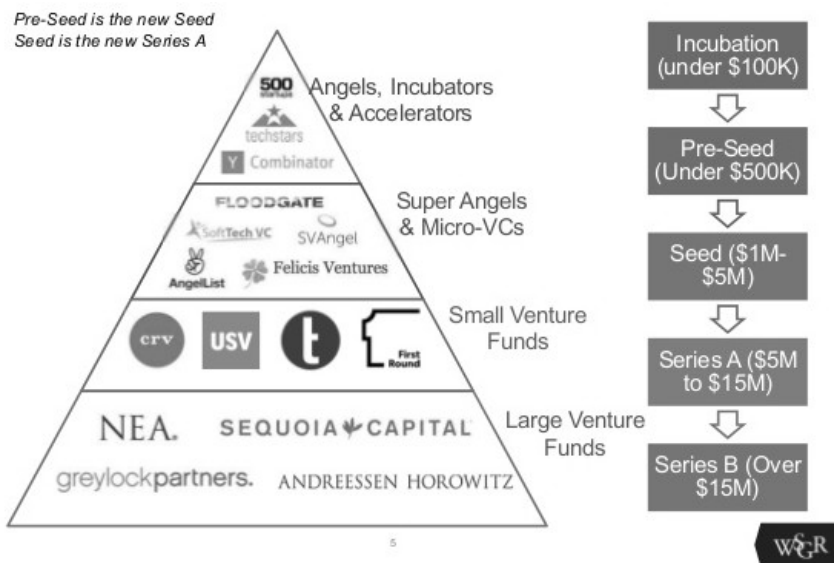
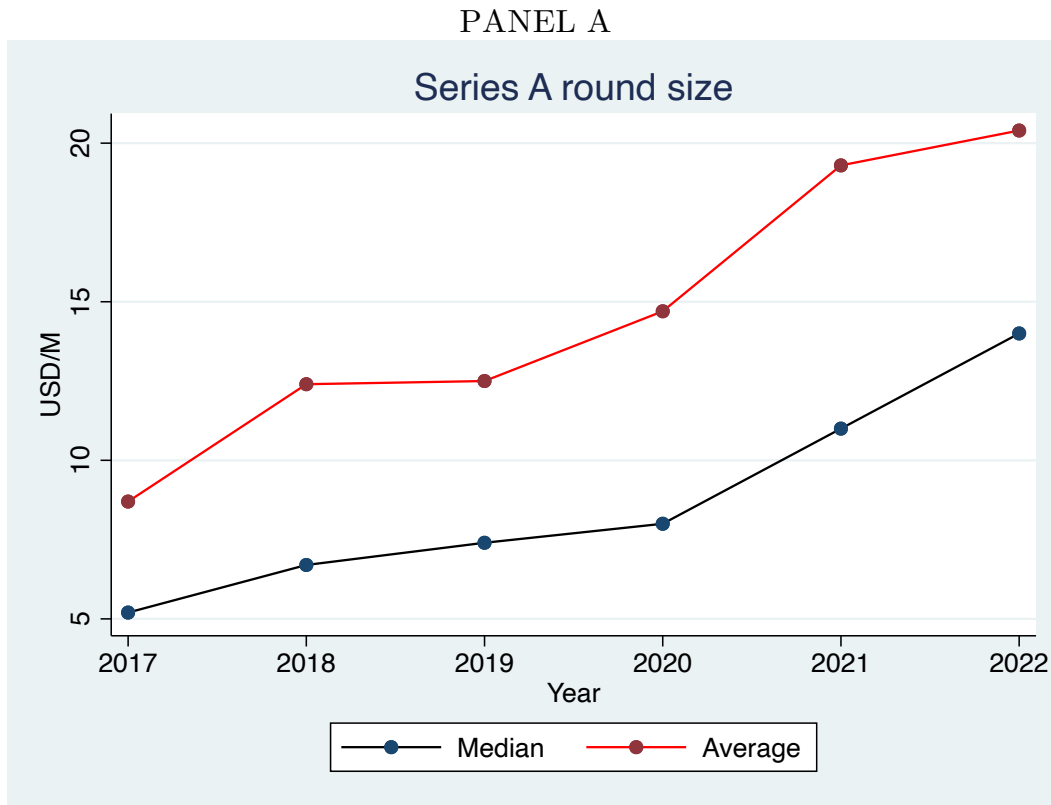
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Figure. 1. Series A deals and sources of financing
 Panel A reports Series A median deal size and median pre-money valuation, Panel B the financing funnel.



PANEL B

Table 1**Sample distribution**

This table reports the sample distribution for the full, the BA and the ECF sample. Panel A shows the number of investments, investors, companies and funding rounds. Panel B reports the distribution of funding round by year.

PANEL A - AGGREGATE SAMPLE

	Full sample	Business Angels	Crowdfunding	
Unique investments	3,231	443 (13.8%)	2,784	(86.2%)
Unique Investors	2,076	146 (7.1%)	1,930	(92.9%)
Unique Companies	402	333 (82.8%)	69	(17.2%)
Unique Funding Rounds	438	369 (84.2%)	69	(15.8%)

PANEL B - YEAR DISTRIBUTION

Funding rounds

Year	Total sample	Business Angels	Crowdfunding	
2010	57	57		
2011	52	52		
2012	71	71		
2013	52	51 (98.1%)	1	(1.9%)
2014	48	45 (93.8%)	3	(6.3%)
2015	51	43 (84.3%)	8	(15.7%)
2016	56	34 (60.7%)	22	(39.3%)
2017	50	15 (30.0%)	35	(70.0%)

Table 2
Descriptive statistics

This table reports the results of the univariate analysis on the differences between BA-backed and ECF companies. Panel A reports summary statistics for the full, BA and ECF sample for the dependent variables *Invested Capital* and *Share Acquired*. Panel B reports summary statistics on deal characteristics, Panel C reports investor characteristics.

PANEL A – Dependent variables				
	Full Sample	Business Angels	Crowdfunding	Mean/Median difference (t/χ)
Invested Capital (Mean (SD) EUR/000)	193 (559)	206 (583)	67 (88)	0.000/0.000
Top(bottom) decile by target (EUR/000)	368 (15)	750 (8)		
Share Acquired (Mean (SD) %)	0.14 (0.18)	0.16 (0.18)	0.05 (0.07)	0.000/0.000
Top(bottom) decile by target (%)	0.28 (0.01)	0.44 (0.03)	0.016 (0.005)	

PANEL B – Deals				
	Full Sample	Business Angels	Crowdfunding	Mean/Median difference (t/χ)
Target pre-money value (EUR/000)	1,810 (6,647)	4,749 (9.469)	562 (971)	0.000/0.000
Target pre-investment revenues (EUR/000)	61 (183)	56 (180)	111 (211)	0.000/0.000
Number of co-investors	2.96 (8.66)	1.21(0.86)	20.47(22.86)	0.000/0.000

PANEL C – Investor characteristics				
	Full Sample	Business Angels	Crowdfunding	Mean/Median difference (t/χ)
Experience (N. past deals by investor)	6.75 (4.93)	6.83 (4.67)	5.93 (4.67)	0.000/0.000
Investor age	47.36 (9.57)	48.77 (9.81)	43.94 (5.79)	0.000/0.000

Table 3
Variable
Description

Deal level	
Fundraising type	Indicator variable taking the value of 0 for business angels deals and 1 for crowdfunding campaigns
Pre-money value	A continuous variable capturing the pre-money valuation of the venture
Pre-investment revenues	A continuous variable capturing the venture revenues in the last fiscal year prior to the investment
Number of investors	The number of investors identified as participating in the financing round/campaign
Industry	The industry NACE Rev.2 two-digit industry identifier
Investor level	
Investor age	The investor age at the time of the investment
Investor experience	The number of previous investments as a proxy for experience.
Former Manager	Indicator variable taking the value of 1 if the investor has past experience as manager, and 0 otherwise
Former Entrepreneur	Indicator variable taking the value of 1 if the investor has past experience as an entrepreneur and 0 otherwise
Soft Monitoring	Ordinal variable assuming values from one to five, where one means very low control intensity on the venture and five very high intensity.
Active Involvement	Indicator variable taking the value of 0 for investors stating to provide only capital contributions and 1 for capital and additional active contribution to the venture.
Industry level	
Industry P/BV	The price to book value ratio for the industry of the ventures
Industry CAPEX/Sales	The Capex/Sales ratio for the industry of the venture measured as the ratio of total capital asset expenditures on the industry revenues

Table 4

Fundraising outcome and deal characteristics

The table reports results for two sets of OLS regressions where the dependent variable is alternatively the natural logarithm of total amount of funds raised per company or the percentage acquired. For both BA and ECF deals we aggregate the dependent variables at the deal level. The main explanatory variable is a dummy taking the value of 1 for ECF campaigns and 0 for BA-backed deals. Deal-level and industry-level covariates are included, and they are defined in Table 3. All models except univariate ones include time and industry fixed effects. Huber-White heteroskedasticity-consistent standard errors are reported in parentheses and are clustered at the year level. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively.

	Log Invested Capital			Acquired Share		
	(1)	(2)	(3)	(1)	(2)	(3)
Fundraising type	-0.763** (0.295)	-2.789*** (0.634)	-2.736*** (0.645)	-0.099*** (0.016)	-0.329*** (0.081)	-0.336*** (0.083)
Pre-money value		0.556*** (0.068)	0.554*** (0.067)		-0.033*** (0.009)	-0.033*** (0.009)
Pre-investment revenues		0.121** (0.058)	0.118** (0.059)		0.009 (0.006)	0.009 (0.006)
Number of investors		1.000*** (0.180)	0.981*** (0.184)		0.068*** (0.025)	0.069*** (0.025)
Industry P/BV			0.000			0.000
Industry CAPEX/Sales			0.000			0.000
			2.591 (1.982)			0.043 (0.270)
Constant	10.907*** (0.082)	2.757*** (0.942)	2.725*** (0.930)	0.155*** (0.010)	0.486*** (0.130)	0.496*** (0.134)
Time F.E.	NO	YES	YES	NO	YES	YES
Industry F.E.	NO	YES	YES	NO	YES	YES
R ²	0.02	0.50	0.50	0.02	0.28	0.29
N	388	231	231	388	231	231

Table 5

Fundraising outcome and investor characteristics

The table reports results for two sets of OLS regressions where the dependent variable is the natural logarithm of total amount of funds raised per company and the percentage acquired. For both BA and ECF deals we aggregate the dependent variables at the deal level. The main explanatory variable is a dummy taking the value of 1 for ECF campaigns and 0 for BA-backed deals. Deal-level, industry-level and investor-level covariates are included, and they are defined in Table 3. All models include time fixed effects. Huber-White heteroskedasticity-consistent standard errors are reported in parentheses and are clustered at the year level. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively.

	Log Invested Capital			Acquired Share		
	(1)	(2)	(3)	(1)	(2)	(3)
Fundraising type	-2.755*** (0.641)	-2.675*** (0.659)	-2.681*** (0.650)	-0.356*** (0.083)	-0.350*** (0.086)	-0.367*** (0.086)
Pre-money equity value	0.553*** (0.070)	0.539*** (0.070)	0.541*** (0.068)	-0.030*** (0.008)	-0.032*** (0.008)	-0.033*** (0.008)
Pre-investment revenues	0.121** (0.059)	0.128** (0.059)	0.127** (0.059)	0.011* (0.006)	0.012** (0.005)	0.010* (0.005)
Number of investors	0.992*** (0.185)	1.023*** (0.191)	1.056*** (0.193)	0.065*** (0.025)	0.072*** (0.025)	0.077*** (0.026)
Industry P/BV	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Industry CAPEX/Sales	3.405* (1.956)	4.062** (1.989)	3.695* (1.968)	0.103 (0.267)	0.184 (0.267)	0.118 (0.255)
Investor age	-0.010 (0.008)	-0.012 (0.008)	-0.007 (0.008)	-0.002* (0.001)	-0.002** (0.001)	-0.001 (0.001)
Investor experience	-0.014 (0.018)	-0.017 (0.018)	-0.009 (0.017)	-0.008*** (0.002)	-0.008*** (0.002)	-0.007*** (0.002)
Former Manager		-0.007 (0.100)	-0.105 (0.105)		0.032 (0.026)	0.032 (0.025)
Former Entrepreneur		0.126 (0.184)	0.099 (0.187)		0.063** (0.029)	0.057** (0.028)
Soft Monitoring		0.485** (0.211)	0.425** (0.209)			0.043*** (0.013)
Active Involvement			0.259*** (0.071)			-0.106** (0.045)
Constant	5.436*** (0.795)	5.429*** (0.794)	4.378*** (0.810)	0.560*** (0.129)	0.539*** (0.124)	0.539*** (0.132)
Time F.E.	YES	YES	YES	YES	YES	YES
Industry F.E.	YES	YES	YES	YES	YES	YES
R ²	0.51	0.53	0.55	0.33	0.35	0.41
N	227	227	227	227	227	227

Table 6
Follow-on financing regressions

The table reports results for a battery of probit regressions of the likelihood of receiving follow-on financing conditional on whether the previous round was an angel or crowdfunded one. The main explanatory variable is a dummy taking the value of 1 for ECF campaigns and 0 for BA-backed deals. Additional covariates include the pre-money valuation of the company and total capital raised in the previous round. All models except univariate ones include time and industry fixed effects. Huber-White heteroskedasticity-consistent standard errors are reported in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively.

	(1)	(2)	(3)	(4)
Fundraising type	-0.846*** (0.281)	-1.028*** (0.357)	-0.963*** (0.362)	-0.914*** (0.346)
Pre-money value		0.029 (0.044)	0.043 (0.055)	0.046 (0.057)
Total Capital raised in previous round			-0.034 (0.056)	-0.013 (0.057)
Year F.E.	NO	YES	YES	YES
Industry F.E.	NO	YES	YES	YES
Constant	-0.551*** (0.179)	-0.966 (0.651)	-0.782 (0.660)	-0.489 (0.797)
Chi ²	14.65	15.95	16.35	36.58
Pseudo-R ²	0.03	0.04	0.04	0.08
N	431	416	416	415

Table 7
Profitability and survival

The table reports results for two sets of regressions of the profitability of companies and their survival conditional on whether the previous round was an angel or crowdfunded one. Profitability regressions use the Profitability Index developed in Bonini et. al. (2019) which ranges from 0 to 4. Regressions are accordingly Ordinal Logistic. Survival is measured as a binary variable taking the value of 1 if the company was recorded as still operating as from the 2019 tax filings and 0 otherwise. The main explanatory variable is a dummy taking the value of 1 for ECF campaigns and 0 for BA-backed deals. Additional covariates include the pre-money valuation of the company, the total capital raised in the previous round and the company pre-investment revenues. All models except univariate ones include time and industry fixed effects. Huber-White heteroskedasticity-consistent standard errors are reported in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively.

	Surv	Surv	Surv	Delta PI	Delta PI	Delta PI
Fundraising type	1.106*** (0.412)	0.370 (0.569)	0.804 (1.131)	0.455 (0.290)	0.827** (0.390)	0.027 (0.533)
Pre-money value			0.000 (0.000)			0.000 (0.000)
Total Capital raised in previous round			-0.000 (0.000)			-0.000 (0.000)
Pre-investment revenues			-0.000** (0.000)			0.000* (0.000)
Constant	0.785*** (0.160)	-0.371 (0.763)	0.148 (1.493)			
Year F.E.	NO	YES	YES	NO	YES	YES
Industry F.E.	NO	YES	YES	NO	YES	YES
Chi ²	7.19	24.65	20.67	2.46	30.93	32.03
Pseudo-R ²	0.03	0.10	0.17	0.00	0.03	0.09
N	243	241	127	243	243	134