Do Business Angels' Investments Make It Easier to Raise Follow-on Venture Capital Financing? An Analysis of the Relevance of Business Angels' Investment Practices

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In this paper, we shed light on interactions among the various investors operating within the entrepreneurial finance ecosystem. Specifically, we aim to investigate what business angel (BA) investment practices are correlated with follow-on venture capital (VC) financing, and uncover the strategies that determine a complementary-based or a substitution-based relationship with VCs. We analysed a sample of 176 companies that received a BA investment during 2008–2016 and collected financial data over a 10-year period after the BA investment. The data examined indicate that BAs' selectivity, as measured by their rejection rate, and BAs' affiliation to an angel network, are positively related with the probability of raising follow-on VC financing. However, a high level of BAs' monitoring activity negatively influences the probability of obtaining VC funding. Interestingly, BA networks do affect this relationship. The positive impact of BAs' rejection rate is informative for VC decisions if the BA does not invest through a network. Conversely, a high level of monitoring may convey a negative signal for VC, particularly if the BA is affiliated to a network. These results extend our knowledge of the investment practices of BAs and their role in allowing angel-backed companies to raise follow-on VC financing.

Introduction

Business angels (BAs) and professional venture capitalists (VCs) play a pivotal role in the entrepreneurial finance ecosystem. Their importance as a source of financing for young entrepreneurial ventures is well established (e.g. Bellavitis *et al.*, 2017; Bonini and Capizzi, 2019; Cumming, 2005; Cumming and Johan, 2013; Gompers and Lerner, 1999; Landström and Mason, 2016; Mason and Harrison, 1995, 1996; Sohl, 2007). In fact, companies financed by private risk capital providers contribute disproportionately to regional economic development, innovation and job creation (e.g. Carpenter and Petersen, 2002; Collewaert, Manigart and Aernoudt, 2010; Colombo and Grilli, 2010; Cumming, Siegel and Wright, 2007; Da Rin, Nicodano and Sembenelli, 2006; Hall and Lerner, 2010; Metrick and Yasuda, 2011; Rosenbusch, Brinckmann and Müller, 2012).

Over the last decade, research on the investment process and decision-making models of BAs has expanded significantly. Scholars have investigated how BAs screen and select their investment targets (e.g. Croce, Tenca and Ughetto, 2017; Knockaert, Clarysse and Wright, 2010; Maxwell, Jeffrey and Levesque, 2011; Zacharakis and Shepherd, 2001), how they design their contracts (e.g. Bonini *et al.*, 2018; Ibrahim, 2008; Kaplan and Strömberg, 2004; Kelly and Hay, 2003; Lerner *et al.*, 2018), how they add value to companies in the post-investment phase (e.g. Bonini, Capizzi and Zocchi,

2019; Croce *et al.*, 2021; Kerr, Lerner and Schoar, 2014; Levratto, Tessier and Fonrouge, 2018; Mason and Harrison, 1996) and how their investments perform (e.g. Capizzi, 2015; Carpentier and Suret, 2015b; Cumming and Zhang, 2016; Mason and Harrison, 2002).

However, in light of the deep changes taking place within the entrepreneurial finance ecosystem due to the rise of new actors (e.g. crowd investors, angel investment organizations, corporate seed funds) and ad hoc financing schemes involving heterogeneous co-investors, the kind of relationship existing between BAs and other typologies of early-stage investors is still debated, in particular how BAs affect the probability for the investee venture to raise follow-on VC financing (Bessière, Stéphany and Wirtz, 2020; Bonini and Capizzi, 2019; Hanssens, Deloof and Vanacker, 2015).

As recognized by scholars dealing with the entrepreneurial finance ecosystem, the two types of investors are characterized by different strategic objectives. BAs invest their own money directly in unquoted businesses, typically in earlier stages of the lifecycle, and have both financial and non-financial goals (such as becoming part of the start-up ecosystem or giving back to the entrepreneurial community), while VCs have purely financial objectives, as they need to remunerate their limited partners (LPs) and raise new/follow-on funds (Cumming, Fleming and Schwienbacher, 2006; Cumming, Johan and Zhang, 2019; Cumming, Walz and Werth, 2016). BAs, in comparison to VCs, implement a more informal selection process, use their personal experience to evaluate projects, rely on fewer control rights and prefer active monitoring to formal control rights (Bonini *et al.*, 2018; Cumming and Johan, 2008), and have less pressure to exit the investment within a set timeframe. Such divergent perspectives result in the preference for different strategic decisions, which can lead to conflict and incompatibility in VC follow-on rounds (Cumming and Johan, 2008).

On the one hand, most studies that investigated the investment patterns of BAs and VCs have found evidence of the existence of a chronological pecking order model: new ventures first get access to the equity capital allegedly available from BAs and eventually raise further equity capital from VCs, with the BAs often remaining in the investee companies (Bruton, Chahine and Filatotchev, 2009; Chemmanur and Chen, 2014; Cumming, Johan and Zhang, 2014; Cumming *et al.*, 2017; Kerr, Lerner and Schoar, 2014; Madill, Haines and Riding, 2005; Schwienbacher, 2009; Wong, Bhatia and Freeman, 2009). This is consistent with the traditional paradigm of a company's lifecycle and the identification of the different sources of financing associated with each stage, as stated by standard finance theory (Berger and Udell, 1998).

On the other hand, an alternative stream of literature assumes the existence of a substitution-based relationship between BAs and VCs rather than a complementary-based one. The underlying rationale is that benefits brought by BAs when investing in a young venture, such as the decrease of information asymmetries and moral hazard with thorough screening, certification and active monitoring (Harrison and Mason, 2017; Landström and Mason, 2016; Madill, Haines and Riding, 2005; Politis, 2008; Van Osnabrugge and Robinson, 2000), might be outweighed by other issues that hamper VC investments in the same company (Cumming and Zhang, 2019; Hellmann, Schure and Vo, 2019; Sørheim, 2005). Interestingly, Hellmann and Thiele (2015) suggest a 'friends or foes' paradigm which assumes that firms want to proceed from angel financing to VC financing and VCs rely on BAs for their own deal flows. At the same time, due to their superior market power, VCs would drive out BAs in later stages as they no longer need them. Indeed, the bargaining power between BAs and VCs, which depends on the competition of the venture market and the legal protection of BAs, determines the complementary or substitutive nature of their relationship.

In this study, we aim to shed light on the interaction between these sources of funding. We assume that the dynamics between investors in the start-up ecosystem are much more complex than those based on the traditional model of a company's lifecycle, and market evidence suggests that a collaboration between the two types of investors is possible under the right circumstances. In particular, the objective of this study is to find evidence regarding the relationship between the probability of an angel-backed company raising follow-on VC financing and specific BAs' investment strategies, namely, BAs' screening capability on an *ex-ante* basis and their active involvement in the post-investment phase. BAs' better scrutiny capacity is associated with higher rejection rates, reflecting a set of shared practices on investment assessment

by the angel 'community' (i.e. regardless of their education, entrepreneurial background, investing experience, etc.) (Mason, Botelho and Zygmunt, 2017). In particular, more selective BAs, which employ a more thorough and rigorous screening process, are better able to select high-performing companies, which in turn allow them to attract VC funding. Moreover, we investigate the possible moderating role played by the BAs' affiliation to an angel network in these relationships. In doing so, we extend previous literature about a supposedly complementary or substitution-based relationship between BAs and VCs, and reveal how this relationship shifts according to BAs' investment practices.

Exploiting a sample of Italian angel-backed companies, we found that companies financed by BAs with higher rejection rates and that are members of a business angel network (BAN) have a higher probability of receiving follow-on VC funding. Instead, a high level of monitoring activity by the BA negatively influences the probability of obtaining later VC. We further analyse how the impact of BAs' rejection rate and active monitoring varies for individual BAs and BAs affiliated to a network.

The rest of the paper is structured as follows. In the next section, we review previous literature that focused on the relationship between BAs and VCs. In the third section, we formulate our research hypotheses. In the fourth section, we describe the sample and methods. The fifth section reports the empirical results, and finally the sixth section concludes the paper.

Related literature

While there is an established literature on VC finance, the literature on angel financing and, in particular, on the interaction between BAs and VCs remains underdeveloped and debated.

Previous studies have highlighted that BAs and VCs contribute to shaping a specific financing ecosystem where companies receive angel capital at the seed stage and the surviving firms proceed towards VC funding at later stages of their lifecycle (Bonini and Capizzi, 2019; Bruton, Chahine and Filatotchev, 2009; Chemmanur and Chen, 2014; Cumming, Johan and Zhang, 2014; Kerr, Lerner and Schoar, 2014; Madill, Haines

and Riding, 2005; Pandher, 2019; Schwienbacher, 2009; Wong, Bhatia and Freeman, 2009).

Concerning the degree of success of angel-backed firms in securing subsequent VC financing, the literature has extensively investigated the characteristics of a firm that ultimately drive its investment pattern (Madill, Haines and Riding, 2005). As for firm-specific attributes, we know that start-ups are reluctant to seek external equity financing (Feeney, Haines and Riding, 1999). Consequently, it is reasonable to expect that firms willing to accept angel financing are also open to other forms of external equity capital and, therefore, more likely to seek and obtain VC funding (Elitzur and Gavious, 2003). Additionally, like VCs, BAs tend to invest in high-growth opportunities (Hellmann, Schure and Vo, 2019; Madill, Haines and Riding, 2005).

Other studies, however, have revealed a negative interaction between BAs and VC financing (Cumming and Zhang, 2019; Hellmann and Thiele, 2015; Hellmann, Schure and Vo, 2019; Ibrahim, 2008; Sørheim, 2005). Hellmann, Schure and Vo (2019) analysed the financial pattern of a sample of Canadian companies and found that BAs and VCs act as dynamic substitutes, that is companies that obtain angel funding are less likely to obtain subsequent VC funding and vice versa. The authors attribute this negative association, even though it has not been further developed and validated in other contexts, to firm-specific characteristics, and thus this association is conditioned by a firm's choice of the investor type that provides the first round of equity capital, which results in BAs and VCs being parallel streams of start-ups' financing. From a theoretical point of view, Hellmann and Thiele (2015) explained when BAs and VCs become 'foes'. At the VC stage, VCs no longer need the BAs to make the investment. The BAs' investment is now considered as sunk and they provide no further value to the company. This creates a friction between BAs and VCs, adversely affecting the entry rates of BAs at the angel stage.

Conversely, our focus is on the BAs' role as a facilitator of further VC financing, that is the active capabilities of BAs in determining the funding path of a start-up. This stream of literature does not focus on firm characteristics but on the BAs' influence regarding attraction of subsequent VC financing.

First, the presence of an expert, though an informal investor in the company, like the BA,

reduces the information asymmetry surrounding the investment opportunity considered by the VC. Indeed, the BA certifies *ex-ante* the value of the firm, while the BAs' *ex-post* monitoring capability mitigates the potential for entrepreneurs' moral hazard risk (Van Osnabrugge and Robinson, 2000). Second, BAs' active involvement in the management of the company, through mentoring and coaching, may help the firm achieve higher growth performance (Bonini, Capizzi and Zocchi, 2019; Collewaert and Manigart, 2016; Madill, Haines and Riding, 2005), which facilitates subsequent VC investment.

An additional aspect regarding BAs' behaviour is their objective to ultimately reach a profitable exit (i.e. initial public offering or merger and acquisition). For BAs, who are not driven by the need to generate returns to LPs, generating positive returns (i.e. exits) is a key motivation for investing, but this is often 'unplanned' or not completely clear from the beginning (Harrison, Botelho and Mason, 2016). A traditional view among BAs is that 'good investments will find their own exits' (Mason, Botelho and Harrison, 2016): for example, approximately only a quarter of investors have a clear exit strategy at the point of making the investment. Moreover, exit is not a priority in the list of investment decision-making criteria (Landström, 1998; Mason and Botelho, 2016; Mason and Harrison, 2003; Van Osnabrugge, 1998). Nevertheless, recent research has demonstrated that most exits are the outcome of planned BA behaviour and most BAs adopt a proactive exit strategy (Botelho, Harrison and Mason, 2019). This exit objective may push a firm to seek additional larger investment rounds that usually come from VC investors (Schwienbacher, 2009).

However, the BAs' role may also prevent the attraction of VC funding. BAs' hands-on investment style and the propensity to establish a tight, trust-based relationship with the entrepreneur may result in high agency costs and misaligned strategic objectives between the BA and the VC (Ibrahim, 2008; Sørheim, 2005). For example, some VCs have reported that particularly inexperienced BAs may be difficult to deal with, leading to unpredictable hazards in later financing rounds (Freear, Sohl and Wetzel, 1994). Frictions may be present at the exit stage, wherein VCs will refuse to exit at a valuation that is below their 'hurdle rate' but perfectly acceptable to BAs, which in turn affects their ability to raise new funds (Mason, Botelho and

Harrison, 2016; Peters, 2009). Moreover, the increasing professionalization of angel investing in BANs and groups puts more emphasis on the exit as compared to individual BAs because of their need to both give their members the liquidity to make further investments and attract new members (Mason, Harrison and Botelho, 2015). Thus, BANs may turn down an opportunity to bring VCs into deals due to fears of being diluted (Mason, Botelho and Harrison, 2016) and losing control of the investment, particularly at the exit (Botelho, Harrison and Mason, 2019). Finally, there are a few studies relevant to our research questions relating the investment performance of BAs to their investment practices. The most successful investments (in terms of exit returns) are associated with the amount of due diligence conducted by BAs, their prior experience within the investee company sector and the amount of post-investment involvement in terms of mentoring, coaching, providing guidance and/or monitoring the performance of their portfolio companies (Wiltbank and Boeker, 2007; Wiltbank *et al.*, 2009). Moreover, a higher BA rejection rate is positively correlated with the investment return (Capizzi, 2015). These studies suggest a close relationship between BAs' strategies, their selection process, the management of their portfolio companies and their exit performance. Following such research streams, we explore the following research questions: (i) *Is the attraction of subsequent VC funding affected by prior BA funding?* (ii) *What BA investment strategies and practices drive or prevent the attraction of subsequent VC funding?*

Hypothesis development

Among BA investment practices that we expect could influence the probability of obtaining VC, the ability of BAs to select high-quality investment opportunities plays a particular role. BAs' selection process has been widely studied by extant literature. BAs use several different decision-making criteria throughout their investment process (Brush, Edelman and Manolova, 2012; Croce, Tenca and Ughetto, 2017; Maxwell, Jeffrey and Levesque, 2011; Mitteness, Sudek and Cardon, 2012). There is considerable agreement among the various studies that the entrepreneur/management team is the most important factor and the growth potential of the market and product/service

attributes are ranked second and third, respectively, but are considerably less important (Tenca, Croce and Ughetto, 2018).

A particular stream of literature has also highlighted the importance of rejection criteria used by BAs. Maxwell, Jeffrey and Levesque (2011) found that BAs reject a business opportunity chiefly due to a single 'fatal flaw' during the initial stage of the decision process. Carpentier and Suret (2015a) note that the basis for rejection of proposals that pass pre-screening concerns is mostly market and execution risk, whereas inexperienced entrepreneurs are turned down for market and product-related reasons. Croce, Tenca and Ughetto (2017) noted that BAs' reliance on rejection criteria differs throughout the investment process. Proposals are dismissed more often during the screening stage due to factors connected to the characteristics of the entrepreneurial team and less often due to a lack of business innovativeness.

The screening process applied by angels is devoted to quickly discarding poor business ventures, while selecting the most promising investment opportunities, which might be more likely to become attractive for subsequent VC funding.

Two counterpoints arise here regarding whether rejection rates are necessarily associated with the selection of good investment opportunities. First, the fit of the business opportunity with regards to the BAs' knowledge domain and personal investment criteria is a typical 'deal killer' prior to engagement in more detailed evaluation (Mason, Botelho and Zygmunt, 2017; Mitteness, Sudek and Cardon, 2012), and this might lead to a higher rejection rate without higher levels of scrutiny. Second, in view of the heterogeneity of the BA population, one could expect that investment opportunities might be rejected for various reasons. For instance, Mitteness, Sudek and Cardon (2012) found that differences between BAs, notably in terms of their industry experience, have a moderating impact on their investment criteria and evaluation of funding investment opportunities. Hsu *et al.* (2014) concluded that the heterogeneity in BA types may affect the nature of their decision criteria. For example, regarding rejection criteria, BA decisions may be driven by reasons unrelated to rational motivations, such as a perceived lack of an entrepreneur's honesty/trustworthiness (Mason, Botelho and Zygmunt, 2017; Maxwell, Jeffrey and Levesque, 2014), an entrepreneur's passion/commitment (Mitteness, Sudek and Cardon,

2012; Sudek, 2006) or the BA's capacity to establish a personal relation with the entrepreneur after deal closure (Mason, Botelho and Zygmunt, 2017). Thereafter, some previous studies evidenced that rejection rates may vary across angels and may not necessarily be associated with the selection of good investment opportunities. Nevertheless, recent research has questioned the findings of these studies by suggesting that angel characteristics (i.e. angel heterogeneity) are not sufficient to explain the reasons behind an investment or a rejection decision. Mason, Botelho and Zygmunt (2017) found that while most BAs reject investments based on just one or two fatal flaws, different angel characteristics (i.e. demographics, education, entrepreneurial experience, investment experience and syndication) are not associated with any specific rejection factor. Thus, heterogeneity of the BA population does not seem to be reflected in the investment and rejection criteria. Instead, the authors suggest that the emergence of a 'community of practice' among BAs, who share to some extent a standard view on investment assessment, coupled with the growth of angel groups in which angels learn from others' experiences, has developed a shared endeavour of ideas, processes of thinking and ways of operating. Moreover, a positive relationship has been established between BAs' screening capabilities and their investment returns. Capizzi (2015) found that more selective BAs earn on average 10.4% higher returns than less selective ones. This result suggests that BAs that achieve higher returns carefully screen their investment opportunities and apply a highly selective investment strategy. In fact, for serial investors it is quite easy to identify and immediately reject the worst investment projects (Clark, 2008), but as the volume of deal flows increases, it becomes time-consuming to identify the best projects without a thorough examination.

Therefore, we argue that more selective BAs who employ a more accurate and strict screening process are better able to pick high-performing companies, that is 'winners', which, after the first 'seed' stage, require and manage to attract VC to sustain their future growth. Thus, we formulate our first hypothesis:

H1: Companies financed by BAs with higher rejection rates have a higher probability of receiving follow-on VC funding.

An increasingly important phenomenon in the context of BA financing is the formation of

networks and groups of BAs (BANs), whether organized or semi-structured, which span from associations of individual angels to more formal angel groups (Gregson, Mann and Harrison, 2013; Lahti and Keinonen, 2016; Mason, 2009; Mason, Botelho and Harrison, 2016; Paul and Whittam, 2010).

The investment process of BANs is rather different from that of individual BAs (Mason, Botelho and Harrison, 2016). First, BAs belonging to networks are able to effectively pool their financial resources, resulting in larger investments in companies in more advanced stages of life (EBAN, 2017; Sohl, 2007), with shorter investment horizons and the use of more structured decision processes (Sohl, 2012) compared to non-affiliated BAs. Compared to investments made by individual BAs, BANs typically apply more complex contractual forms and have an approach more similar to that of professional VC investors in the way they select projects (e.g. the BAN provides centralized pre-screening and due diligence services to their members) (EBAN, 2017). In particular, the selection process is extended with the addition of more stages (e.g. pre-screening) and people involved in different decision-making steps to vet the entrepreneur and the business opportunity and assure a higher level of scrutiny before the investment is made. Second, BANs provide greater financial firepower through co-investments among group members and follow-on rounds of funding that make a firm ready for VC investments. Third, the wide range of business expertise found among group members—who have different industry backgrounds but are mostly entrepreneurs, business professionals and senior executives (Mason and Botelho, 2014)—means that BANs can better add value to their investments relative to solo BAs. Being part of the BAN provides BAs with a series of advantages, including the sharing of information, knowledge and resources among other BAN members (Bonini, Capizzi and Zocchi, 2019; Brush, Edelman and Manolova, 2012; Mason and Botelho, 2014). Further, less experienced BAs can meet more experienced ones, which gives them the possibility to enhance their human capital and ability to make efficient investment decisions (Shane, 2000). Therefore, investments made by BAs affiliated to a BAN may be considered more conscientious and efficient.

For these reasons, the accreditation role of BANs enables firms that have raised funds from them to obtain follow-on funding from VCs more easily (Lerner et al., 2015).

Thus, we assume that because of BANs' superior screening process and the informal support provided to its members through the sharing of information and knowledge, companies funded by BAN members go through a more sophisticated and informed investment decision process, which better certifies the high potential of these investee companies to outside investors. Thus, we posit:

H2: Companies financed by BAN members have a higher probability of receiving follow-on VC funding than those financed by non-BAN members.

Following this, we focused on the angels' post-investment involvement in the entrance of future equity investors. As compared to VCs, BAs prefer to use simple non-protective contracting terms (Bonini and Capizzi, 2019; Ibrahim, 2008) and seldom design complex contracts (Bonini and Capizzi, 2017; Goldfarb et al., 2012; Van Osnabrugge, 2000; Wiltbank and Boeker, 2007). To protect and manage their investments, BAs rely upon their previous experience, direct interactions with the entrepreneur and geographical proximity to the investee company (Wong, Bhatia and Freeman, 2009). The establishment of an intimate angel–entrepreneur relation allows the former to use informal mechanisms to prevent opportunistic behaviours by the entrepreneur. BAs actively involve themselves in the businesses they invest in by regularly visiting the company premises and building a trustworthy relationship with the entrepreneur (Lengyel and Gulliford, 1997; Mason and Harrison, 1996). Through this active involvement, BAs are generally considered to add value to their portfolio firms (see Politis, 2008 for a review). Although there is no doubt that BAs become involved in their investee companies, some researchers (e.g. De Noble, 2001; Landström, 1992; Sætre, 2003) have contested these value-adding capabilities. Specifically, a more active involvement in terms of frequency of contact or operational work does not seem to contribute to a better performance of BAs' portfolio firms (Landström, 1992). Rather, BAs' value-adding potential is influenced by the entrepreneur's responsiveness to BAs' inputs and level of experience (Macht, 2011).

This type of active involvement, which has been called 'soft monitoring' (Bonini et al., 2018), has various implications for follow-on investors. On

the one hand, BAs' monitoring activities would not discourage follow-on rounds by institutional investors, since the VC would not need to deal with and eventually renegotiate burdensome pre-existing control rights established in the previous round by BAs (Ibrahim, 2008).

Nonetheless, an angel's active participation in the management of the company often results in a strong bond with the entrepreneur, which may lead to high expected agency costs for the VC. More involved BAs may in effect become part of the entrepreneurial team and stir the company's board towards certain strategic decisions (Sørheim, 2005) that have uncertain effects on companies' performance (Landström, 1992; Macht, 2011).

Thus, we argue that VCs anticipate the emergence of high agency costs, both with angels, who may pursue specific strategic objectives misaligned with those of VCs (e.g. regarding further investing rounds, exit preference, strategic directions in the business), and with a 'smarter' entrepreneur who is constantly advised and guided by the BA(s) and may align with them when strategic decisions are made. Thus, we hypothesize:

H3: BAs' active monitoring has a negative impact on the probability of receiving follow-on VC funding.

In addition to the direct effect of BAN membership on the probability of receiving follow-on VC funding as stated in H2, we also tested a moderation effect of BAN membership; in particular, we expected different magnitudes of the impact of BAs' rejection rate and active monitoring on the probability of obtaining subsequent VC funding for BAN and non-BAN members.

As mentioned previously, BANs apply a more in-depth selection process and BAN members benefit from the information and knowledge-sharing with other BAN members. This reduces the effort that individual BAs must make in selecting investment opportunities. Thus, less selective BAs benefit from the support provided by more selective BAs in identifying promising investments. Hence, in the context of BANs, the rejection rate of a single BA becomes less informative about individual investment decisions and is at least partially replaced by the good functioning of the BAN, which can provide an efficient investment process and facilitate engagement and interaction among its members. Therefore, we hypothesize:

H4a: BAs' rejection rate has a stronger positive effect on the probability of receiving follow-on VC funding for non-BAN members.

When BAs co-invest though networks or groups, the contracts are more sophisticated and similar in terms of amounts, stage of investment and incentives to those provided by VCs (Goldfarb *et al.*, 2012; Ibrahim, 2008; Wiltbank and Boeker, 2007), and thus require less active monitoring. As mentioned previously, the screening support provided by the BAN leads to less informationally opaque investments than those made by individual BAs, who must account for greater information asymmetry by enforcing higher levels of monitoring.

Thus, a higher level of monitoring observed for BAN members would be perceived by the VC as a negative signal as it may suggest the presence of conflicts and/or a lack of trust between the BAs and the entrepreneur (i.e. standard monitoring applied for the 'average' investment made by a BAN member is not enough), or a riskier investment that needs a higher level of active monitoring (i.e. investment characterized by higher information asymmetry than the 'average' investment made by a BAN member). In either case, the VC is unlikely to invest. Therefore, we hypothesize:

H4b: BAs' active monitoring has a stronger negative effect on the probability of receiving follow-on VC funding for BAN members.

Data

Sample

We used a dataset of Italian angel-backed companies to test our hypotheses. We exploited data obtained from the Italian Business Angel Network (IBAN), which is the national trade association for angels and angel groups/networks that surveys a large pool of Italian BAs annually. We utilized data from the 2008 to 2016 survey waves. Within the national context, IBAN is the reference point for private investors, regional BA networks and investor clubs/groups. IBAN identifies BAs, puts them in contact with entrepreneurs, organizes 'forums' with investors, and performs and distributes specialized research and publications. Therefore, the main objective of IBAN is to connect BAs, facilitate the sharing of knowledge between them and foster co-investment opportunities.

The survey method used by IBAN assures the partial alleviation of the issue related to the detection of the 'invisible' share of the angel market (Landström and Mason, 2016; Mason and Harrison, 2000) and reach a complete and reliable sample of Italian BAs as compared to common survey techniques. IBAN combines the IBAN-affiliated angel population with an approximation of the 'invisible' market portion, which is obtained by combining conventional snowball sampling aimed at identifying individuals suspected to be BAs using their contacts with IBAN members, and information on businesses collected from the report of the Private Equity Monitor (PEM), a research programme that analyses private equity and venture capital activity in Italy. In particular, after retrieving full ownership data from the Bureau Van Dijk-AIDA database, IBAN researchers identify additional potential angel investors to be surveyed, who are characterized by a BA investment profile (Mason, 2006); that is, repeated investment in new companies, non-executive role, minority shareholder.

Concerning potential biases in the survey data, the robust sampling method and the repetitive design of the survey over a span of 10 years mitigate problems of sample representativeness. A full description of the survey procedure is reported in Bonini *et al.* (2018).[1] Overall, IBAN administered more than 3,500 questionnaires to both affiliated and unaffiliated angels, with a response rate close to 42%.

After discarding incomplete or inconsistently filled in questionnaires, the total sample available through the surveys comprised 784 deals, representing 712 unique companies that were invested in by 452 BAs. We matched this sample of companies with the Bureau Van Dijk Orbis database to collect accounting and financial information. For each company, we retrieved 10 years of financial information from 2009 to 2018 if available. Following this, we obtained a sample of 389 investment rounds in 334 companies, representing 213 BAs. This is not surprising considering that angels invest in seed and early-stage projects in which the company is not yet founded and is therefore likely to never be founded or fail in the first year(s). Finally, we tracked companies' entire investment pattern from Crunchbase, an online database on start-ups managed by TechCrunch. Data from Crunchbase have been used in several studies in entrepreneurial finance (e.g. Cumming, Meoli and Vismara, 2019; Cumming, Walz and Werth, 2016; Hellmann and Thiele, 2015). We collected information on the equity offerings carried out by each firm, including the type of transaction and the identity of the investors up to June 2019 to detect subsequent VC investments.

To ensure that all VC investments have been found, we further scanned the firms in the Bureau Van Dijk Zephyr database and the annual reports provided by the Private Equity Monitor that has a yearly publication of the list of Italian VC-backed companies. If a company had not been found in any of these three databases (Cruchbase, Zephyr or Private Equity Monitor), we considered it as not having received any VC funding. Further missing accounting information (e.g. sales, intangibles, etc.) reduced the final sample to 176 companies that received a first round of angel investment. Of those, 42 companies, corresponding to 24% of the sample, received a follow-on VC investment.[2]

Variables and descriptive statistics

Since we have a panel data structure with each firm observed for 10 years, we defined our outcome variable as a step dummy variable, *VC_invested*, which takes value 1 starting from the year in which the company received the first VC investment, and 0 otherwise.

To test our hypotheses, we built different explanatory and control variables based on the IBAN survey. All angel individual variables refer to the first BA investment received by the

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[1]Each survey is completed in a four-step process: at the beginning of January, the 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). This process is a common survey technique called sequential mixed mode (Snjikers *et al.*, 2013) and evidence shows that it significantly improves the response rate (De Leeuw, 2005; Dillman *et al.*, 2009).

[2]Companies in our sample may have secured other types of follow-on funding than VC financing after the first round of angel investment, such as one or more follow-on angel investment rounds.

focal firm because this event can be considered a fundamental change of status for the firm, which will affect its subsequent investment pattern and the probability of raising VC funds. Moreover, since we were interested in the effect of the BA deal on firm performance, angel-specific variables have been aggregated at the BA round level for deals co-invested by more than one BA (approximately 66% of deals). Accordingly, depending on the metric, we calculated the average and the minimum or maximum of the individual co-investor's characteristics for these variables, which is further explained in the following discussion. Furthermore, all these variables were transformed into step variables, which took a value of 0 in each year preceding the first angel investment and switching from 0 to 1 in the year in which the company received the first angel investment onwards.

To test H1, we used the variable of average rejection rate for BAs that co-invested in the focal deal, *Rejection_rate*. It is computed as 1 minus the ratio between the number of investments made and the total number of projects evaluated by the BA in the year of the investment (1 − acceptance rate) (Capizzi, 2015; Mason, Botelho and Zygmunt, 2017).[3] For syndicated investments, the average rejection rate of the BAs that co-invested in the focal deal was computed.

For testing H2, we used a dummy variable, *BAN_membership*, which takes value 1 if at least one of the BAs that co-invested in the focal company is a BAN member, and 0 otherwise.

Finally, to test H3, we adopted the dummy variable *Monitoring_level*, which assumes a value of 1 for high levels of active monitoring (high or constant presence of the angel at the firm) and 0 for low levels of monitoring (moderate or limited involvement of the angel at the firm), calculated according to the BA's visiting frequency to the target company. For this variable, we took the highest value for all BAs co-investing in a particular deal.

As for control variables, we first controlled for a series of angel-specific characteristics that might affect the probability of receiving VC funding.

First, depending on their experience and education, angels might have different capabilities in selecting and creating value for their target firms. For example, previous research shows that more experienced angel investors have stronger reputations and network connections (Kelly and Hay, 2003); they may therefore serve as better certifiers of ventures' value to outside investors such as VCs (Hsu, 2007). Thus, we included a dummy variable that indicated if at least one BA was an entrepreneur prior to the focal investment (*Entrepreneurial_exp*) and the average number of companies invested in prior to the focal investment by the angels co-investing in a deal (*Investing_exp*). We also controlled for the education of the BA with a dummy variable that indicated if at least one BA holds a Master's degree (*Education*).

Furthermore, we controlled for the total amount invested in the BA round converted to logarithmic form (*Capital_invested*), because it affects the future growth of the company and the consequent chance of raising VC as well as the number of BAs that co-invested in the deal (*Co-investors*).

Finally, we included several firm-specific controls that influenced the probability of VC financing. We controlled for firm size by including the variable *Sales* in the previous period (in logarithmic form), the firm's *Intangible_ratio* to capture future growth opportunity, computed as the ratio between intangible assets and total assets in the previous period, and the firm's *Age* (in logarithmic form). We add the variable *VC_pre_BA*, which assumes a value of 1 if the firm has received VC prior to BA investing (from the year of the first VC investment onwards), and 0 otherwise. We also controlled for firm industry by including a set of dummy variables based on NACE Rev. 2 main section and geographical location by including a set of dummies at the NUTS 2 level (i.e. Italian regions). Finally, we included year dummies. Table 1 describes all variables used in our estimates, while Tables 2 and 3 report principal summary statistics and correlations,[4] respectively.

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[3]One may notice that a more appropriate measure would be the total number of investments ever made and evaluated by the angel, however, as this latter number is challenging to recall, we are confident that our indicator is a good proxy of a BA's investment behaviour.

[4]The variable *Capital_invested* shows quite high levels of correlation with some of the other independent variables, nevertheless we included the variable in all empirical models for its relevance, in accordance with prior studies (Bonini *et al.*, 2019). Results for our main direct and moderation models (Tables 8 and 9) do not change significantly, excluding the variable *Capital_invested*.

Table 1. Variable definitions

Variable	Description	Data source
VC_invested	Dummy variable that takes a value of 1 from the year in which the company has received the first VC investment round onwards, and 0 otherwise.	*Primary source*: Crunchbase. *Secondary sources*: Bureau Van Dijk Zephyr, Private Equity Monitor
Rejection_rate	Ratio computed as 1 minus the ratio between the number of investments made and the total number of projects evaluated by the focal BA in the year of the investment, that is (1 − acceptance rate). Rejection_rate = 1 − (number of investments performed/number of investments considered). In case of syndicated investments, the average rejection rate of the BAs that co-invested in the focal deal is considered.	IBAN survey
BAN_membership	Dummy variable that takes a value of 1 if at least one of the BAs that co-invested in the focal company is a BAN member.	IBAN survey
Monitoring_level	Dummy variable which assumes a value of 1 for high levels of active monitoring (high or constant presence of the angel at the firm) and 0 for low levels of monitoring (moderate or limited involvement of the angel at the firm), according to the frequency of the visits that the BA made to the target company. In case of syndicated investments, the highest value for all BAs co-investing in a particular deal is considered.	IBAN survey
Capital_invested	Total amount invested (in thousands EUR) in the round in which the BA invested, in logarithmic form.	IBAN survey
Co-investors	Number of BAs co-investing in the deal.	IBAN survey
Entrepreneurial_exp	Dummy variable that takes a value of 1 if at least one BA was an entrepreneur prior to the focal investment, and 0 otherwise.	IBAN survey
Investing_exp	Average number of companies invested in prior to the focal investment by the BA co-investing in a deal.	IBAN survey
Education	Dummy variable that takes a value of 1 if at least one BA in the deal holds a Master's degree.	IBAN survey
Sales(t−1)	Sales (in thousands EUR) in year t−1, in logarithmic form.	Bureau Van Dijk Orbis
Intangible_ratio(t−1)	Ratio between intangible assets and total assets in year t−1.	Bureau Van Dijk Orbis
Age	Age of company (in logarithmic form).	Bureau Van Dijk Orbis
VC_pre_BA	Dummy variable that takes a value of 1 if the company has received VC funding prior to BA investing (starting from the year of the first VC investment onwards), and 0 otherwise.	–

Results

To test our research hypotheses, we first obtained some preliminary evidence about the differences between BA-backed companies that received follow-on financing by VC and those that did not receive later VC financing. Table 4 reports the results, which indicate that companies receiving further financing by VC show a higher amount of capital invested by BA and are characterized by a higher number of co-investors at the time of BA financing (these differences are significant at the 1% confidence level). Moreover, the results indicate significant differences in terms of characteristics of the BAs; companies financed by BAs with higher education (Master's degree)

have a significantly higher probability of receiving follow-on financing by VC (at the 1% confidence level). The same result holds when we focus on entrepreneurial and investing experience; more experienced BAs seem to increase the probability of follow-on VC financing in the same company. These differences are significant at the 5% and 1% levels for entrepreneurial and investing experience, respectively.

Regarding the impact of our principal independent variables, that is BA investment strategy, we observe for both rejection rate and BAN membership, a significant (at the 1% confidence level) and positive effect on the probability of receiving a follow-on round of VC financing; this provided a first confirmation of our research hypotheses H1

Table 2. Descriptive statistics

Variable	N	Mean	SD	Median	Min	Max
VC_invested	673	0.181	0.386	0	0	1
Rejection_rate	673	0.596	0.324	0.667	0	1
BAN_membership	673	0.513	0.500	1	0	1
Monitoring_level	673	0.571	0.495	1	0	1
Capital_invested	673	3.953	2.280	3.989	0	12.429
Co-investors	673	2.614	4.726	0	0	40
Entrepreneurial_exp	673	0.465	0.499	0	0	1
Investing_exp	673	3.652	2.248	4	0	8
Education	673	0.447	0.498	0	0	1
Sales(t−1)	673	4.039	2.701	4.309	0	9.973
Intangible_ratio(t−1)	673	0.312	0.292	0.232	0	0.967
Age	673	1.633	0.665	1.609	0.693	3.497
VC_pre_BA	673	0.065	0.247	0	0	1

Note: This table presents descriptive statistics: number of observations (N), mean, standard deviation (SD), median, minimum and maximum for the main variables. The full sample includes 673 firm-year observations for 176 unique firms over the period 2009–2018. Definitions for all variables are reported in Table 1.

and H2. Specifically, companies backed by BAs with a high rejection rate (H1) and BAs belonging to a BAN (H2) have higher probability of receiving follow-on VC financing, while the effect of monitoring level seems not significant in predicting the probability of receiving VC financing.

We further analysed the characteristics of firms backed by both BAN and non-BAN members, our moderating factor. Table 5 presents a comparison of the two groups according to all the variables included in this study. We found substantially different characteristics for the two groups of BAs. On average, companies backed by BAN members receive higher investment amounts by a higher number of co-investors who have higher levels of education, investing and entrepreneurial experience. These companies also appear to be older and bigger (i.e. higher sales level), but show lower levels of intangibles and have received fewer VC investments (the median is zero) before the BA investment.

To provide preliminary evidence about H4a and H4b, Table 6 presents a comparison of BAs' rejection rate and level of monitoring activity for both companies that receive later VC financing and those that do not, accounting for whether the focal BA is a BAN member or not. For rejection rate, the results show that companies that receive later VC financing are characterized by a higher BA rejection rate compared to companies that do not receive later VC financing, for both BAN and non-BAN members. However, this difference seems to

be higher for non-BAN members (the difference is 0.403 for non-BAN members vs. 0.096 for BAN members). In other words, this result seems to provide a preliminary confirmation of H4a, which indicates that the positive impact of BAs' rejection rate on the probability of receiving follow-on VC funding is higher for non-BAN members. Regarding the moderating role of BAN membership on the relationship between monitoring level and the probability of receiving follow-on VC funding, the results demonstrate a significant difference between BAN and non-BAN members. Specifically, for BAN members, data suggest a negative effect of high BA monitoring intensity on the probability of receiving follow-on VC funding, while this effect is positive for non-BAN members. This is consistent with H4b, which indicates that BAs' active monitoring has a stronger negative effect on the probability of receiving follow-on VC funding for BAN members.

To test our research hypotheses, we then performed a multivariate analysis by estimating a series of panel logit models with the dummy *VC_invested* as our dependent variable, which takes a value of 1 from the year in which the company has received the first VC investment round onwards, and 0 otherwise. Independent and control variables are described in the 'Variables and descriptive statistics' section. Table 7 reports the results of estimates including only the direct effect of the variables and Table 8 includes the interaction effects of BAN membership to test H4a and H4b.

Table 3. Correlation matrix

	VC_invested	1	2	3	4	5	6	7	8	9	10	11
1. Capital_invested	0.2616*	1										
2. Co-investors	0.2580*	0.2626*	1									
3. Entrepreneurial_exp	0.1341*	0.4833*	0.3148*	1								
4. Investing_exp	0.2669*	0.6293*	0.2670*	0.3545*	1							
5. Education	0.1534*	0.2941*	0.2365*	0.2505*	0.3685*	1						
6. Sales(t−1)	0.0314	0.0389	0.0384	0.2176*	0.0275	0.1004*	1					
7. Intangible_ratio(t−1)	0.0363	0.0679	0.0179	−0.1456*	0.054	−0.1418*	−0.3894*	1				
8. Age	−0.0405	0.0820*	−0.0063	0.0936*	0.1038*	−0.0111	0.4775*	−0.2029*	1			
9. VC_pre_BA	0.0003	0.0332	−0.0051	−0.0576	0.0748	−0.0438	−0.0209	0.1611*	−0.0025	1		
10. Rejection_rate	0.2551*	0.4080*	0.3215*	0.3806*	0.5847*	0.5657*	0.1493*	−0.1640*	0.1252*	−0.1134*	1	
11. BAN_membership	0.1259*	0.1773*	0.1726*	0.3099*	0.3213*	0.2725*	0.1989*	−0.1467*	0.1674*	−0.1793*	0.5398*	1
12. Monitoring_level	0.0887*	0.4106*	0.0609	0.2608*	0.3421*	0.3891*	0.0178	−0.0413	−0.0349	−0.0975*	0.5050*	0.3177*

Significance levels: * p < 0.01.

In Table 7 the 'base' model refers to the model in which we included only control variables, while, in the following three columns, we included rejection rate, BAN membership and monitoring variables, respectively. The last column refers to the total model including all the variables considered in our analysis.

As for control variables, results indicated that a higher capital invested by the BA and a higher size of the syndication in BA investments favours the probability of receiving follow-on VC financing, as suggested by the univariate analysis shown in Table 4. As for the BA's characteristics, estimates confirm that only investing experience plays a significant role, with the exception of estimates in column 2 in which the coefficient is not significant.

As for the independent variables, Table 7 reports the estimates that confirm our research hypotheses: companies financed by BAs with higher rejection rates and BAN members have a higher probability of receiving follow-on VC funding, which confirms H1 and H2, respectively. Results regarding the role played by BA monitoring level indicate a negative relationship, as stated in H3: a high level of BA monitoring activity negatively influences the probability of receiving later VC funding. Panel B of Table 7 reports the marginal effects of the independent variables related to our research hypotheses: when the rejection rate goes from 0% to 100%, the probability of receiving VC financing increases with a rate ranging from 25.2% to 38.5%. When BAs are members of a BAN, the probability of receiving follow-on VC funding increases with a rate ranging from 14.7% to 18.6%. Finally, when BAs exert a high level of active monitoring (i.e. high or constant presence of the angel at the firm), the probability of receiving VC funding is reduced with a rate ranging from 7.1% to 8.4%.

Table 8 reports the results of our analysis of the moderating effects of BAN membership. It is notable that to discuss the effects of rejection rate and BA monitoring activity on the probability of receiving VC funding, it is necessary to account for the presence of their interaction terms in our model. The coefficients of standalone variables (e.g. rejection rate and monitoring level) represent the impact of these variables on the probability of receiving later VC financing for non-BAN members. To estimate the role of these variables with regard to BAN members, we needed to estimate the linear combination of both the direct and mediated effect using a Wald test. Thus, we

Table 4. Differences between VC invested and non-VC invested companies

	Receiving follow-on financing by VC		Not receiving follow-on financing by VC		Difference VC vs. non-VC invested
	Mean	Median	Mean	Median	Mean difference (t-test)
Capital_invested	4.898	5.017	3.743	3.829	1.155***
Co-investors	5.780	3	1.913	0	3.867***
Education	0.623	1	0.408	0	0.215***
Entrepreneurial_exp	0.582	1	0.439	0	0.143**
Investing_exp	4.854	5	3.386	4	1.468***
Rejection_rate	0.808	0.800	0.549	0.667	0.259***
BAN_membership	0.746	1	0.461	1	0.285***
Monitoring_level	0.582	1	0.568	0	0.014

Note: The equality of means of the same variable between two sub-samples of firms, that is VC invested and non-VC invested, is tested using the two-sample t-test with equal variances. *Rejection_rate* is 1 minus the ratio between the number of investments made and the total number of projects evaluated by the BA in the year of the investment, *BAN_membership* is a dummy taking value 1 if at least one of the BAs that co-invested in the focal company is a BAN member, *Monitoring_level* is a dummy taking value 1 for high levels of active monitoring (high or constant presence of the angel at the firm) and 0 for low levels of monitoring (moderate or limited involvement of the angel at the firm). Significance levels: *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table 5. Differences between companies invested in by BAN and non-BAN members

	BAN membership		Non-BAN membership		Difference BAN vs. non-BAN membership
	Mean	Median	Mean	Median	Mean difference (t-test)
Capital_invested	4.289	4.151	3.599	3.829	0.691***
Co-investors	3.482	1	1.701	0	1.781***
Education	0.559	1	0.329	0	0.230***
Entrepreneurial_exp	0.586	1	0.338	0	0.247***
Investing_exp	4.034	4	3.250	4	0.784***
Rejection_rate	0.736	0.750	0.449	0.646	0.287***
Monitoring_level	0.690	1	0.445	0	0.245***
Sales(t−1)	4.656	4.831	3.391	3.724	1.265***
Intangible_ratio(t−1)	0.239	0.157	0.388	0.326	−0.149***
Age	1.702	1.609	1.561	1.609	0.141**
VC_pre_BA	0.026	0	0.107	0	−0.081***

Note: The equality of means of the same variable between two sub-samples of firms, i.e. invested by BAN and non-BAN members, is tested using the two-sample t-test with equal variances. *Rejection_rate* is 1 minus the ratio between the number of investments made and the total number of projects evaluated by the BA in the year of the investment, *Monitoring_level* is a dummy taking value 1 for high levels of active monitoring (high or constant presence of the angel at the firm) and 0 for low levels of monitoring (moderate or limited involvement of the angel at the firm). Significance levels: *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table 6. Differences for BAN membership between VC invested and non-VC invested companies

	BAN membership			Non-BAN membership		
	VC_invested N = 91	Non-VC_invested N = 254	Difference VC vs. non-VC invested	VC_invested N = 31	Non-VC_invested N = 297	Difference VC vs. non-VC invested
Rejection_rate	0.807	0.711	0.096***	0.813	0.410	0.403***
Monitoring_level	0.538	0.744	−0.206***	0.710	0.418	0.292***

Note: The equality of means of the same variable between two sub-samples of firms, that is VC invested and non-VC invested, is tested using the two-sample t-test with equal variances. *Rejection_rate* is 1 minus the ratio between the number of investments made and the total number of projects evaluated by the BA in the year of the investment, *BAN_membership* is a dummy taking value 1 if at least one of the BAs that co-invested in the focal company is a BAN member, *Monitoring_level* is a dummy taking value 1 for high levels of active monitoring (high or constant presence of the angel at the firm) and 0 for low levels of monitoring (moderate or limited involvement of the angel at the firm). Significance levels: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Table 7. Impact of BAs' investment practices on VC follow-on investment

	(1) Base	(2) Rejection_rate	(3) BAN_membership	(4) Monitoring_level	(5) Total
Panel A: Panel logit estimates					
Capital_invested	0.503	0.662*	0.929*	0.958**	1.366**
	(0.483)	(0.392)	(0.486)	(0.424)	(0.617)
Co-investors	1.070***	0.902***	0.897***	0.967***	0.560***
	(0.147)	(0.092)	(0.137)	(0.148)	(0.153)
Entrepreneurial_exp	−0.151	3.429	−1.568	−1.062	0.216
	(2.521)	(2.302)	(2.708)	(2.328)	(2.897)
Investing_exp	1.441***	0.424	1.444***	1.836***	1.346**
	(0.499)	(0.468)	(0.502)	(0.441)	(0.569)
Education	1.064	−2.244	1.153	5.100**	1.400
	(2.195)	(2.287)	(2.365)	(2.049)	(2.313)
Sales$(t-1)$	0.604	0.508	0.684*	0.669*	0.536
	(0.408)	(0.344)	(0.373)	(0.402)	(0.415)
Intangible_ratio$(t-1)$	5.381*	4.647	5.422**	4.721*	4.379
	(2.955)	(3.484)	(2.756)	(2.718)	(3.597)
Age	−0.478	0.665	−1.147	0.175	−0.048
	(1.852)	(1.647)	(1.762)	(2.106)	(1.836)
VC_pre_BA	−2.859	−2.583	−1.624	−6.034	−2.196
	(4.506)	(3.726)	(3.390)	(4.699)	(4.806)
Rejection_rate		21.461***			18.963**
		(4.656)			(7.582)
BAN_membership			13.332***		11.059***
			(2.784)		(3.429)
Monitoring_level				−6.140***	−6.320**
				(2.367)	(2.715)
Dummy industry	Yes	Yes	Yes	Yes	Yes
Dummy NUTS	Yes	Yes	Yes	Yes	Yes
Dummy year	Yes	Yes	Yes	Yes	Yes
Log-likelihood	−90.513	−85.851	−83.274	−88.016	−80.637
N	673	673	673	673	673
Panel B: Marginal effects					
Rejection_rate		0.385***			0.252**
		(0.126)			(0.122)
BAN_membership			0.186***		0.147**
			(0.059)		(0.062)
Monitoring_level				−0.071**	−0.084*
				(0.035)	(0.046)

Note: This table presents the result of BAs' investment practices (i.e. *Rejection_rate*, *BAN_membership* and *Monitoring_level*) on VC follow-on investment. The dependent variable is *VC_invested*, which is a dummy taking value 1 from the year in which the company has received the first VC investment round onwards, and 0 otherwise, Rejection rate is 1 minus the ratio between the number of investments made and the total number of projects evaluated by the BA in the year of the investment, *BAN_membership* is a dummy taking value 1 if at least one of the BAs that co-invested in the focal company is a BAN member, *Monitoring_level* is a dummy taking value 1 for high levels of active monitoring (high or constant presence of the angel at the firm) and 0 for low levels of monitoring (moderate or limited involvement of the angel at the firm). The remaining variables are defined in Table 1. Panel A shows panel logit estimates, using heteroscedasticity-robust standard errors (in parentheses); beta coefficients are reported. Panel B shows average marginal effects of *Rejection_rate*, *BAN_membership* and *Monitoring_level* on the probability *VC_invested* = 1 for Models 2–5. Significance levels: *p < 0.10; **p < 0.05; ***p < 0.01.

estimated the marginal effects of both variables according to BAN membership.[5] We concentrated

on the sign and significance of these marginal effects to test our research hypotheses.

First, we focus on rejection rate, as reported in the first column of Table 8. The positive and significant coefficient of the rejection rate variable

Table 8. Moderating effect of BAN membership on VC follow-on investment

	(1) Rejection_rate × BAN_membership	(2) Monitoring_level × BAN_membership
Panel A: Panel logit estimates		
Capital_invested	1.791***	1.528**
	(0.573)	(0.659)
Co-investors	0.654***	0.671***
	(0.150)	(0.147)
Entrepreneurial_exp	−2.209	0.303
	(2.400)	(2.314)
Investing_exp	1.680***	1.561***
	(0.561)	(0.479)
Education	2.306	0.429
	(2.816)	(2.440)
Sales(t−1)	0.738*	0.688
	(0.435)	(0.438)
Intangible_ratio(t−1)	6.203	5.869*
	(4.125)	(3.317)
Age	−2.618	−0.717
	(2.409)	(2.137)
VC_pre_BA	−1.746	−3.688
	(5.566)	(4.370)
Rejection_rate	44.288***	20.455***
	(12.340)	(6.673)
BAN_membership	54.153***	20.251***
	(12.002)	(5.074)
Monitoring_level	−9.419***	−1.088
	(2.689)	(5.543)
Rejection_rate × BAN_membership	−48.703***	
	(13.499)	
Monitoring_level x *BAN_membership*		−7.936
		(5.842)
Dummy industry	Yes	Yes
Dummy NUTS	Yes	Yes
Dummy year	Yes	Yes
Log-likelihood	−76.975	−78.776
N	673	673

Panel B: Marginal effects

	Rejection_rate	Monitoring_level
BAN_membership = 0	0.280*	−0.003
	(0.168)	(0.018)
BAN_membership = 1	−0.116	−0.163***
	(0.185)	(0.054)

Note: This table presents the result of the moderation effects between BAN membership and rejection rate (Model 1) and BAN membership and monitoring level (Model 2) on VC follow-on investment. The dependent variable is *VC_invested*, which is a dummy taking value 1 from the year in which the company has received the first VC investment round onwards, and 0 otherwise, Rejection rate is 1 minus the ratio between the number of investments made and the total number of projects evaluated by the BA in the year of the investment, *BAN_membership* is a dummy taking value 1 if at least one of the BAs that co-invested in the focal company is a BAN member, *Monitoring_level* is a dummy taking value 1 for high levels of active monitoring (high or constant presence of the angel at the firm) and 0 for low levels of monitoring (moderate or limited involvement of the angel at the firm). The remaining variables are defined in Table 1. Panel A shows panel logit estimates, using heteroscedasticity-robust standard errors (in parentheses); beta coefficients are reported. Panel B shows average marginal effects of *Rejection_rate* (Model 1) and *Monitoring_level* (Model 2) on the probability $VC\_invested = 1$ for non-BAN members and BAN members, respectively. Significance levels: $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table 9. Robustness: impact of rejection rate and monitoring level for non-BAN and BAN members sub-samples

	(1) *BAN_membership = 0*	(2) *BAN_membership = 1*
Panel A: Panel logit estimates		
Capital_invested	2.856*	2.012***
	(1.503)	(0.627)
Co-investors	2.488***	0.180
	(0.693)	(0.137)
Entrepreneurial_exp	−4.330	1.927
	(5.840)	(2.566)
Investing_exp	0.708	2.315***
	(1.617)	(0.555)
Education	19.525*	−2.531
	(11.345)	(1.902)
Sales(t−1)	−0.769	0.896**
	(1.410)	(0.413)
Intangible_ratio(t−1)	12.643	8.008**
	(10.763)	(3.517)
Age	−6.237	−5.554**
	(9.111)	(2.177)
VC_pre_BA	26.890	−9.526*
	(25.162)	(5.722)
Rejection_rate	41.870*	9.274
	(24.632)	(8.435)
Monitoring_level	−3.685	−12.033***
	(7.234)	(2.414)
Dummy NUTS	Yes	Yes
Dummy year	Yes	Yes
Log-likelihood	−13.811	−61.880
N	292	345
Panel B: Marginal effects		
Rejection_rate	0.183	0.243
	(0.313)	(0.223)
Monitoring_level	−0.016	−0.316***
	(0.049)	(0.095)

Note: This table presents the result of the *Rejection_rate* and *Monitoring_level* on VC follow-on investment separately for the two sub-samples for non-BAN members (Model 1) and BAN members (Model 2). The dependent variable is *VC_invested*, which is a dummy taking value 1 from the year in which the company has received the first VC investment round onwards, and 0 otherwise, Rejection rate is 1 minus the ratio between the number of investments made and the total number of projects evaluated by the BA in the year of the investment, *BAN_membership* is a dummy taking value 1 if at least one of the BAs that co-invested in the focal company is a BAN member, *Monitoring_level* is a dummy taking value 1 for high levels of active monitoring (high or constant presence of the angel at the firm) and 0 for low levels of monitoring (moderate or limited involvement of the angel at the firm). The remaining variables are defined in Table 1. Panel A shows panel logit estimates, using heteroscedasticity-robust standard errors (in parentheses); beta coefficients are reported. Panel B shows average marginal effects of *Rejection_rate* and *Monitoring_level* on the probability *VC_invested = 1* for non-BAN members (Model 1) and BAN members (Model 2). Significance levels: $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

suggests that the estimates confirm a positive and significant impact of rejection rate on the probability of receiving later VC financing for non-BAN members. This is in accordance with the results shown in Table 7, as discussed previously. The negative coefficient of the interaction between rejection rate and BAN membership suggests that BAs' rejection rate has a stronger positive effect on the probability of receiving follow-on VC funding for

non-BAN members; this confirms H4a. The Wald test of the combination of the two coefficients revealed a coefficient that equalled −4.414, which was not significant at standard confidence levels. This result means that an increase in BA rejection rate does not have any significant effect on the probability of receiving VC financing for BAN members. Thus, H4a is confirmed: the positive impact of BA rejection rate on the probability of

receiving follow-on VC funding is higher for non-BAN members. According to marginal effects reported in Panel B of Table 8, when the rejection rate of BAs investing in the company goes from 0% to 100%, the probability of receiving follow-on VC financing increases by 28% if the BAs are non-BAN members, while the correspondent increase for BAN members is not significant at standard significance levels.

Regarding H4b, estimates of which are shown in Table 7, we found that BA monitoring level has a negative effect on the probability of receiving follow-on VC financing. When we included the moderating effect of BAN membership, an interesting result emerges. In particular, the coefficient of the monitoring variable is not significant; this suggests a non-significant role of monitoring for non-BAN members. Additionally, the interaction term of BAN membership and monitoring level is not significant at standard confidence levels. However, to estimate the role of monitoring level regarding BAN members, we need to estimate the linear combination of both the direct and mediated effect. The Wald test of the combination of the two coefficients indicated a coefficient that equalled −9.024, significant at the 1% confidence level. This result means that the negative effect found in the estimates shown in Table 7 indicates that an increase in BA monitoring level has a negative and significant effect on the probability of receiving VC financing only for BAN members; this confirms H4b. Thus, we conclude that the negative impact of BAs' monitoring level on the probability of receiving follow-on VC funding is lower for BAN members. According to marginal effects reported in Panel B of Table 8, when BAs exert a high level of monitoring on the company invested, the probability of receiving follow-on VC financing decreases by 16.3% if the BAs are BAN members, while the corresponding effect for non-BAN members is not significant at standard confidence levels.

Finally, we performed a robustness check of the moderating effects of BAN membership by using two separate panel logit models on the two samples of non-BAN and BAN members. Table 9 reports the results of our analysis and they are in line with our previous discussion: the rejection rate of BAs has a positive and significant effect for BAs that are not members of a BAN. Conversely, for BAN members, the level of monitoring of BAs involved in the company has a negative and significant effect on the probability of receiving follow-on VC financing.

Conclusions

In this paper, we shed light on a promising and novel stream of literature on BA and VC financing by focusing on the interactions among the various investors operating within the entrepreneurial finance ecosystem. We investigated what BA investment strategies are correlated with follow-on VC financing. In doing so, we departed from extant literature investigating the existence of a complementary-based, rather than a substitution-based, relationship between BAs and VCs, just focusing on firm characteristics conditioned by a firm's prior financing choices. Instead, we focused on how BA investment policies and behaviour, such as selection strategies and active monitoring, might favour or hinder the attraction of a follow-on round of VC financing, thus further enabling target ventures' future growth.

We analysed a sample of 176 companies that received a first angel investment round during the period 2008–2016 and found that BAs' selectivity, as measured by their rejection rate, and BAs' affiliation to an angel network, are positively related with the probability of receiving follow-on VC financing. However, a high level of BA monitoring activity negatively influences the probability of receiving later VC funding. Interestingly, in line with extant literature, we found that BANs do affect the relationship between BAs and VCs. We found that the positive impact of BAs' rejection rate on later VC funding is informative for the VC investment decision if the BA is not a BAN member, whereas if the BA is affiliated to a BAN, a high level of monitoring may convey a negative signal for the VC.

Our research contributes to the academic literature in different ways. First, the findings of this paper contribute to the stream of literature exploring the interaction between BA and VC funding channels by uncovering which BA strategies determine a complementary-based or a substitution-based relationship with VCs. In particular, we answered this research question at a finer-grained level of analysis than previous literature, by examining BA investment policies and behaviours, such as selection strategies and monitoring activity. Second, the study adds to a growing body of

knowledge about the complementary or alternative relationship between various forms of entrepreneurial finance (for a review, see Cumming, Johan and Zhang, 2018). Indeed, previous literature lacks research addressing the relationships among different sources of capital accessible to entrepreneurs prior, during and after BA and/or VC. Third, we investigated how the effect of BAs' strategies on follow-on VC funding differs between BANs and investments made by individual BAs. Lastly, we contributed to the research on the impact of BA investment strategies on the performance of start-ups, with a particular focus on the role of BAs in facilitating follow-on VC funding.

However, we recognize that our study has some limitations. To draw more general conclusions, we believe that further analysis is required on a wider (i.e. including a greater number of follow-on VC investments) and possibly international dataset. Moreover, other robustness checks are needed to claim the existence of causal relationships among the investigated variables.

Our work paves the way for interesting subsequent studies. We believe that future research could investigate the differential contributions provided by various types of angel investment organizations (e.g. more or less organized forms of BANs or BA groups) to their affiliated members in relation to subsequent VC financing. Moreover, future work can analyse the spillovers across BANs/BA groups and different sources of equity finance (e.g. incubators and accelerators, public subsidies, crowdfunding, different types of VCs, etc.). Finally, it might be interesting to investigate how to train and develop BAs to have a more sophisticated rejection capacity and study the impact of human capital (e.g. education, professional background, investment experience, standing and relationship network) on the knowledge and information-sharing processes taking place within BANs or ad hoc angel syndicates.

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