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# Entrepreneurial Firms and Bank Financing: Do Business Angels Play a Role?

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## ABSTRACT

This paper investigates the contribution provided by business angels' (BAs) post-investment intervention to the interaction between young entrepreneurial firms and bank lending decisions within the entrepreneurial finance ecosystem. The analysis relies on a data set comprising 114 Italian BA-backed firms over the 2010–2018 period, alongside 498 matched firms. We find evidence that BAs' support makes it easier for entrepreneurial firms to raise follow-on bank financing. Additionally, we document the positive effects of both BAs' entrepreneurial experience and soft monitoring. These effects can be attributed to BAs' value-added contributions and their role in mitigating information asymmetries perceived by debt providers.

**JEL Classification:** G24, G32, M13

## 1 | Introduction

This study aims to analyze the possible impact of business angels' (BAs') intervention on the funded companies' bank financing path.

A consolidated stream of contributions within the entrepreneurial-finance literature has provided robust evidence on the role played by bank debt in startup companies' survival and growth, both at macro (Backman 2015; Black and Strahan 2002; Cetorelli and Strahan 2006; Kerr and Nanda 2009; Schmalz, Sraer, and Thesmar 2017) and micro (Cassar 2004; Cosh, Cumming, and Hughes 2009; Deloof and Vanacker 2018; Hanssens, Deloof, and Vanacker 2016; Hirsch and Walz 2019; Huyghebaert and Van De Gucht 2007; Robinson 2012; Robb and Robinson 2014) levels. The relevance of bank financing for early-stage entrepreneurial companies has been well-established and researchers believe that the funding cycle for start-up firms is not as straightforward as the financing life-cycle theory would suggest. This potentially leads to several competing funding trajectories across multiple follow-on rounds involving different types of capital providers whose comparative effectiveness has yet to be fully measured (Bellavitis et al. 2017; Bessière, Stéphany, and Wirtz 2020; Bonini and Capizzi 2019; Harrison, Bock, and Gregson 2020). Banks may use truly heterogeneous and flexible lending policies, ultimately leading to a wide set of financing facilities consistent with young firms' risk profiles. For instance, they can adjust the interest rates, include covenants, use signals (Coleman 2000; Scholtens 1999), or heavily rely on entrepreneurs' personal assets (Avery, Bostic, and Samolyk 1998). Additionally, not all new firms are based on disruptive capital-intensive technologies, and some of them may be able to generate sufficient cash flow to access bank financing in limited time frames.

However, unlike established, large-sized firms, many start-up companies still struggle to access bank debt. Indeed, young

entrepreneurial companies may experience liquidity shortages due to physiologically high working-capital and capital-expenditure needs, limited managerial and strategic expertize, and slow cash-flow generation paths (Dunn and Cheatham 1993; Ebben and Johnson 2011). Given the limited initial endowment of their disposable asset bases, they are also short of collateral (Schmalz, Sraer, and Thesmar 2017). Moreover, the information advantage held by an entrepreneur often gives rise to severe adverse selection and moral-hazard problems, leading to opaque and low-quality financial reporting (Berger and Udell 2002; Bertomeu and Marinovic 2016; Chua et al. 2011). Because of these issues, and consistent with the financing life-cycle theory, bank debt had typically never been considered a feasible funding option for entrepreneurial firms (Berger and Udell 1998; Carpenter and Petersen 2002; Huyghebaert and Van De Gucht 2007; Myers and Majluf 1984). Therefore, an interesting and currently relevant research topic concerns the capability of modern entrepreneurial-finance ecosystems to develop suitable solutions aimed at facilitating start-ups' bank financing.

While existing research has already explored the positive synergies between banks and venture capital (VC), our investigation pioneers the potential role of BAs, thus addressing a crucial gap in the literature (Block, Cumming, and Vismara 2017). BAs are external equity investors, often high net-worth individuals, who invest their own money in small, promising companies, typically assuming a minority equity stake (Bonini, Capizzi, and Cumming 2019a; Cumming and Zhang 2019; Landström and Mason 2016; Lerner et al. 2018; Mason 2006; OECD 2011; Wong, Bhatia, and Freeman 2009). Their key role in the economy is to fill the so-called 'primary funding gap' between, on the one hand, friends-and-family money and, on the other hand, the external financing raised from institutional VC firms when the size of the required equity investment is too large for the former and too small for the latter (Bonini and Capizzi 2019; Cassar 2004). Alongside the finance that they provide, BAs also bring valuable nonmonetary resources, such as industry knowledge, management experience, mentoring, reputation, and personal networks (Avdeitchikova and Landström 2016; Bonini, Capizzi, and Zocchi 2019b; Bonini et al. 2018; Capizzi, Croce, and Tenca 2022; Månsson and Landström 2006; Politis 2016, 2008). Such a combination of BAs' human capital and post-investment involvement in the funded companies can facilitate the latter's subsequent bank financing also due to the reduced information asymmetries featuring in banks' lending decisions. This rationale is substantiated by practical evidence (BNP Paribas 2017; Sørheim 2005).

To investigate the effect of BAs' intervention on the relationship between banks and entrepreneurial companies, we rely on a unique database built from the sequential surveys administered by the Italian Business Angels Network Association (IBAN) from 2008 to 2018. The empirical analysis draws on a data set of 612 Italian firms, 114 of which are BA-backed, while the remaining 498 constitute the propensity score-matched control group. Confirming our main hypothesis, the results of our difference-in-differences (DID) econometric model reveal that BAs positively impact the amount of bank debt raised by angel-backed companies compared to non-angel-backed ones. To ensure the robustness of or findings, we conducted a series of tests, including a two-stage Heckman procedure to address potential selection bias concerns.

The major implication is a complementarity relationship between angel financing and bank debt financing, where the former is instrumental in establishing a more efficient bank-firm relationship over time within the entrepreneurial finance ecosystem. We also document the significant impact of certain BAs' human-capital characteristics, on the one hand, and their post-investment active monitoring, on the other hand, on the amount of follow-on bank debt raised by angel-backed companies.

Our research contributes to the entrepreneurial-finance literature in several ways. First, it advances an emerging strand of contributions investigating the interconnections between different types of finance providers for entrepreneurial firms (e.g., Bessière, Stéphany, and Wirtz 2020; Capizzi, Croce, and Tenca 2022; Cumming and Zhang 2019; Harrison and Mason 2000; Hellmann, Schure, and Vo 2021; Wang et al. 2019). Particularly, it responds to the call for further research on the role of BAs in a bank-based economy (Block, Cumming, and Vismara 2017). To the best of our knowledge, this is the first study to empirically investigate the interdependencies between banks and BAs in financing entrepreneurial firms, excluding a seminal contribution based on case study evidence (Sørheim 2005). Second, this study deepens existing research on the impact of nonmonetary value-added benefits provided by BAs to the funded companies (Mason 2006; Politis 2008, 2016). Last, the study provides new evidence that highlights the role of bank financing in entrepreneurial firms (Deloof, La Rocca, and Vanacker 2019; Hanssens, Deloof, and Vanacker 2016; Hirsch and Walz 2019; Robinson 2012; Robb and Robinson 2014). From a policy perspective, this study reveals that the informal VC market may be an effective solution for improving young firms' access to the credit market. Regarding entrepreneurs, our analysis uncovers BAs' main investment practices that facilitate their availability of bank credit.

The remainder of this paper is structured as follows: Section 2 derives our research hypotheses. Section 3 describes the data set, methodology, and all the variables selected for the subsequent empirical analysis. Section 4 reports and discusses the results, followed by some additional analysis. Section 5 presents some robustness tests to verify the robustness of our findings. Finally, Section 6 concludes and provides suggestions for future research.

## 2 | Hypothesis Development

### 2.1 | BAs' Intervention and Bank Financing

BAs play an active role in the ecosystem for entrepreneurial businesses, providing small and medium-sized enterprises (SMEs) with both monetary and nonmonetary contributions. Therefore, BAs are expected to be value-adding investors as they contribute to firms with the so-called 'smart money' (Aernoudt 2005; Ehrlich et al. 1994; Politis 2008, 2016). Indeed, in addition to financial capital, they may also support companies with different contributions, such as their managerial

experience, industry knowledge, technical advice, and networking skills, thus filling the gap in both the knowledge and social capital that characterize new ventures (Collewaert and Manigart 2016; Ehrlich et al. 1994; Macht and Robinson 2009; Madill, Haines, Jr, and Riding 2005; Sætre 2003; Sørheim 2005). Entrepreneurial firms, particularly those weak in the finance and marketing area, can thus enhance the quality of their business planning. The literature on informal investors has accordingly revealed that by providing strategic and business advice (Ehrlich et al. 1994; Landström and Mason 2016; Mason and Harrison 1996), they establish a productive and trustful working relationship with an entrepreneur (Macht and Robinson 2009). Furthermore, some authors have found evidence that BAs introduce several management contacts and connections in the industry to their investees. For instance, they may provide companies with potential candidates' CVs, recommend directors, facilitate relations with potential customers, or quickly establish alliances with external service providers (Collewaert and Manigart 2016). Well-networked and reputable BAs also facilitate further additional sources of funding in the form of either debt (Macht and Robinson 2009; Sørheim 2005) or additional equity (Capizzi, Croce, and Tenca 2022; Chemmanur and Chen 2014; Kerr, Lerner, and Schoar 2014; Macht and Robinson 2009; Madill, Haines, Jr, and Riding 2005).

Thus, consistent with this research perspective, angel-backed firms may benefit from BAs' endowment of knowledge, nonmonetary contributions, and social capital; the companies then become managerially better prepared to exploit market opportunities (Sørheim 2003) and are therefore perceived as better suited to face competition and ultimately produce positive performances. As documented in previous research, the value-added contributions provided by BAs' involvement are crucial to the backed companies' survival and growth regardless of the proxy used for measuring their success: survival, increase in revenues or profitability margins, multi-factor performance indexes, follow-on VC investment rounds, or access to capital markets through initial public offerings (IPOs) (Bonini, Capizzi, and Zocchi 2019b; Capizzi, Croce, and Tenca 2022; Croce et al. 2021; Cumming and Zhang 2019; Lerner et al. 2018; Levratto, Tessier, and Fonrouge 2018). Consequently, it is reasonable to assume an increased credit standing due to a lower estimation of the insolvency risk when banks conduct creditworthiness analyses following loan applications by these companies. Furthermore, the well-documented knowledge- and information-sharing process between entrepreneurs and BAs gives rise to better-quality company management that improves an angel-backed firm's transparency and information-disclosure aptitude, ultimately facilitating banks' screening and selection processes. The role of BAs' social capital in banks' lending decisions must also be adequately considered, which is often a result of their previous successful entrepreneurial experiences. Indeed, BAs' intervention might significantly reduce moral hazard by borrowing companies, on the one hand, and monitoring costs by lenders, on the other hand, thus increasing the available amount of bank loans to BA-backed companies (Carletti 2004; Cerqueiro, Ongena, and Roszbach 2016; Diamond 1984, 1991; Diamond and Rajan 2000; Freixas and Rochet 2008; Gale and Hellwig 1985; Gustafson, Ivanov, and Meisenzahl 2021; Jensen and Meckling 1976).

One major implication of all the arguments developed above is that, given the non-moderate intrinsic riskiness underlying the type of firms investigated in this study, it is straightforward to argue that the presence of BAs inside a loan applicant's ownership base might be a risk-mitigating factor considered by banks in their lending decision-making process. Thus, we can formulate the following research hypothesis:

**H1.** *BAs' intervention increases the amount of follow-on bank debt raised by their funded companies.*

## 2.2 | BAs' Human- and Social-Capital Endowment and Bank Financing

Several studies have emphasized the key role of BAs' human- and social-capital characteristics in angel-backed companies (Bonini, Capizzi, and Zocchi 2019b; Bonini et al. 2018; Bonnet et al. 2022; Collewaert and Manigart 2016; Croce, Ughetto, and Cowling 2020, 2021).

Consistent with the resource-based view, BAs' human-capital endowment developed through experience and education leads to idiosyncratic information and knowledge, providing valuable and distinctive capabilities at the firm level, thus ensuring higher competitive advantage (Barney 1991; Conner and Prahalad 1996; Cooper, Gimeno-Gascon, and Woo 1994). Through survey-based analyses, a wide range of studies have extensively investigated the impacts of different attributes of BAs' human capital and identified their entrepreneurial experience as a major common trait among most active angel investors (e.g., Aernoudt 1999; Bonini et al. 2018; Croce et al. 2021; Mason 2006; Wetzel 1981). The investors' entrepreneurial experience results in a set of tacit knowledge (know-how and noncodified components of activities) acquired on the job, which differs from the explicit knowledge acquired through formal education. BAs' cognition, values, and behaviours are certainly shaped by their past entrepreneurial background, which in turn also affects their investment practices and how they engage and interact with entrepreneurs (Bonini, Capizzi, and Zocchi 2019b; Bonini et al. 2018; Botelho, Harrison, and Mason 2021; Croce et al. 2021). For instance, BAs who have first-hand experience of the entrepreneurial journey are more likely to use experience-based schemas or rely on their mere intuition (i.e., 'gut feel') in their decision-making process (Huang 2018). Their industry knowledge is another decision-making criterion frequently adopted by BAs to select and then monitor their investments, also providing effective value-added contributions such as coaching and business relationships (Croce et al. 2021; Maula, Autio, and Murray 2005; Walske and Zacharakis 2009). Indeed, entrepreneurial experience allows BAs to have a noncodified knowledge of an industry, technologies, and people (Cooper, Gimeno-Gascon, and Woo 1994), which arguably helps them to detect profitable market niches, identify good investment opportunities, and better manage the overall investment process until exit. The expertize and connections acquired in a similar business may also lessen the liability of newness of a new firm, enhancing its probability of success (Bruderl, Preisendorfer, and Ziegler 1992). Furthermore, when investors and entrepreneurs share a common

background, they can create a closer connection with one another, thus facilitating the transfer of knowledge and shrinking information gaps (Bonnet et al. 2022; Croce et al. 2021; Sørheim and Landström 2001).

Consequently, experienced BAs provide a truly effective contribution to the future growth and performance of their funded ventures, thus positively impacting the output of the creditworthiness analysis that banks conduct before their lending decisions. Therefore, we can posit the following hypothesis:

**H2a.** *BAs' entrepreneurial experience is positively related to the amount of follow-on bank debt raised by their funded companies.*

A second dimension of human capital considered in our research is BAs' formal education, whose crucial role has been widely investigated by the literature on entrepreneurship and start-up financing (Bosma et al. 2004; Bryant 2014; Davidsson and Honig 2003; Deakins and Whittam 2000; Dimov 2010; Rauch and Rijsdijk 2013). Formal education can be considered a valid proxy for knowledge, skills, problem-solving ability, discipline, motivation, and self-confidence (Colombo and Grilli 2005; Cooper, Gimeno-Gascon, and Woo 1994; Unger et al. 2011). Indeed, many contributions have shown that firms founded by entrepreneurs with higher levels of or more specific education have a higher probability of survival and of achieving higher performance levels (Brixy, Sternberg, and Stüber 2012; Collewaert and Manigart 2016; Criaco et al. 2014; Ganotakis and Love 2012; Gimmon and Levie 2010; Linder, Lechner, and Pelzel 2020; Tzabbar and Margolis 2017; Wiklund and Shepherd 2005). Meanwhile, prior contributions show that human capital serves as a signal for the quality of a new venture, particularly to external equity investors such as venture capitalists, BAs, and crowd investors (Ahlers et al. 2015; Busenitz, Fiet, and Moesel 2005; Butticè, Croce, and Ughetto 2021; Colombo and Grilli 2010; Harrison and Mason 2017; Ko and McKelvie 2018; Naiki and Ogane 2022). The relevance and quality of signals appear to feature particularly when venture uncertainty on future survival and growth prospects is at its maximum, that is, at the seed stage of the development of a new venture.

Following such an impactful stream of literature, it is rational to assume that BAs' formal level of education is a valuable signal in the follow-on funding strategies adopted by young firms after the initial intervention by the angel investors themselves: BAs with a higher level of education have a broader knowledge base and are generally better informed than those with a lower level of education, and are thus better positioned to leverage on the contributions, both monetary and nonmonetary, provided to funded companies. In turn, higher education might give rise to stronger learning dynamics, adaptation skills, networking opportunities, and negotiation power, which are crucial when managing high-risk entrepreneurial firms (Bonini, Capizzi, and Zocchi 2019b; Collewaert and Manigart 2016; Colombo and Grilli 2005; Mudd, Pashev, and Valev 2010; Politis 2008; Shane 2000). Accordingly, when banks conduct their credit analyses, they may feel reassured by BAs' level of formal education, which can be considered as a determinant of managerial quality and, therefore, as a risk-mitigating factor that positively contributes to their lending decisions. Thus, we formulate the following research hypothesis:

**H2b.** *Higher BAs' education positively affects the amount of follow-on bank debt raised by their funded companies.*

Alongside human capital, another critical resource provided by BAs is social capital, that is, *the sum of actual or potential resources associated with an enduring network of more or less institutionalized relationships of mutual understanding and recognition* (Bourdieu and Nice 1977). It is unambiguously accepted among scholars in the field of entrepreneurial finance that the size, width, and quality of current and future relationship networks are major determinants of the performance and growth trajectories available to new ventures and their fundraising strategies (Bonini, Capizzi, and Zocchi 2019b; Butticè, Croce, and Ughetto 2021; Colombo, Franzoni, and Rossi–Lamastra 2015; Greve and Salaff 2003; Hansen 1995; Hochberg, Ljungqvist, and Lu 2007; Hsu 2004; Jonsson and Lindbergh 2013; Reynolds 1992; Sorenson and Stuart 2001; Shane and Cable 2002; Uzzi 1999; Werth and Boeert 2013). Furthermore, previous research has shown that social capital provides benefits in terms of entrepreneurial heterogeneity in resource acquisition, the identification and acquisition of market opportunities, and innovative business ideas (Lee et al. 2019; Stam, Arzlanian, and Elfring 2014; Xie, Wang, and Lee 2021). Entrepreneurs receive advisory, coaching, legitimation, and business opportunities through various channels and informal relationships with people inside and outside the industry; among these, BAs are indeed a major valuable source of social capital, especially in the case of BAs affiliated with a BA network (BAN). Indeed, in recent times, angel investors have increasingly grouped themselves into different types of organized or semi-structured associations, usually on a geographic or industrial basis (Bonini, Capizzi, and Zocchi 2019c; Bonini et al. 2018; Capizzi, Croce, and Tenca 2022; Cumming and Zhang 2019; Lerner et al. 2018; Mason, Botelho, and Harrison 2016). These BA groups attract a higher deal flow, perform a superior appraisal and due diligence of investment opportunities, and adopt a more professional approach in their investment practices (Carpentier and Suret 2015; Croce, Tenca, and Ughetto 2017; Edelman, Manolova, and Brush 2017; Kerr, Lerner, and Schoar 2014; Mason and Harrison 1996; Paul and Whittam 2010). Consequently, BANs can better raise relevant private information on young, opaque ventures, ultimately facilitating affiliated angels' individual screening processes. These communities also provide coaching to novice angels and investment-readiness programs for entrepreneurs (Mason, Botelho, and Zygmunt 2017). Bonini et al. (2018) recently highlighted the network nature of BA groups and provided preliminary evidence that membership of a BAN is positively related to the share of personal wealth each BA is willing to invest in a given venture. Butticè, Croce, and Ughetto (2021) advanced this line of research by demonstrating that the social capital developed by BAs through affiliation to a BAN might give rise to an information- and knowledge-sharing process within the BAN that positively affects the likelihood of young companies being funded.

Moreover, one important kind of relationship BAs might share with the owners and managers of a young, invested venture relies on the network ties developed with financial institutions over time, often arising from previous lending-performance relationships in which the BAs had the opportunity to prove

their capability to regularly meet their contractual obligations to lending banks. Such a peculiar social network, whose width and heterogeneity are emphasized within a BAN, might lead to an improved borrowing capacity and better contractual provisions in terms of either a lower cost of debt or less restrictive covenants (Engelberg, Gao, and Parsons 2012).

This line of reasoning is also consistent with the banking and finance literature on corporate lending, which shows that the existence of an underlying trust-based relationship between a loan applicant and a bank is a powerful tool to extract private information, overcoming the drawbacks of pure quantitative models that merely rely on publicly available financial information which, particularly in the case of SMEs, might be incomplete and be affected by limited predictive power (Altman 1968; Altman, Sabato, and Wilson 2010; Berger, Klapper, and Udell 2001; Berger and Udell 2002, 2006; Ciampi 2015; Dell'Ariccia and Marquez 2004; Diamond 1991; Howorth and Moro 2006; Lukason and Laitinen 2019; Rajan 1992). Due to the relationship networks provided when investing in selected companies, BAs may significantly reduce information asymmetries and the moral hazard perceived by banks, thus positively affecting the outcome of the banks' creditworthiness analyses and eventually increasing the probability of favourable lending decisions.

To conclude, many arguments suggest the existence of a positive relationship between BAs' social capital and bank financing: on the one hand, BAs' social capital is a crucial resource for backed companies that ensures access to a close and wide network of financial institutions; on the other hand, it is an effective channel to reduce information asymmetries and the moral hazard perceived by banks. Thus, we formulate the following research hypothesis:

**H2c.** *BAs' social capital is positively related to the amount of follow-on bank debt raised by their funded companies.*

### 2.3 | BAs' Investment Practices and Bank Financing

One major problem that arises when lending relationships are established with entrepreneurial firms relates to moral hazard; that is, the tendency to adopt opportunistic behaviour (hidden action) after the signing of loan contracts due to ex-post information asymmetries; consequently, banks are unwilling to lend money, which may create severe financial frictions. Financial contracting, collateral, and monitoring are possible solutions available to lenders to adequately manage the moral-hazard problem (Agrawal and Mandelker 1987; Baron and Besanko 1987; Berger and Black 2011; Berger and Udell 1998; Besanko and Kanatas 1993; Boot, Thakor, and Udell 1991; Boyd, Chang, and Smith 1998; Carey 1998; DeYoung, Hughes, and Moon 2001; Diamond 1991; Foos, Norden, and Weber 2010; Grossman and Hart 1983; Holmstrom and Tirole 1997; Jensen 1986; Jensen and Meckling 1976; Myers 1977; Petersen and Rajan 1995; Smith and Warner 1979; Stiglitz and Weiss 1981). Regarding monitoring activity, in the context of long-term lending relationships, banks attempt to extract qualitative indications (called 'soft information') aimed at integrating the quantitative information offered by company financial statements and central credit registers (called 'hard information'), which, in the case of young ventures, is not sufficient for lenders to develop a full assessment of the default risk and its evolution over time (Voordeckers and Steijvers 2006). Such qualitative indications depend on mutual knowledge and trust between the borrower and the lender due to a reliable business network developed over time, and lenders can use the indications to reduce ex-post information asymmetries (Coleman 2000; Scholtens 1999). Soft information, however, is costly to obtain and verify by outsider investors. This is particularly evident in the case of start-up companies because of the uncertainties related to the new business opportunity and these young ventures' reluctance to disclose confidential information that might be spread into the market, negatively affecting their competitive advantage.

Moving from debt- to equity-financing, several studies have examined the monitoring mechanisms used to reduce ex-post asymmetries in the relationship between private equity investors (mostly venture capitalists) and entrepreneurial ventures, which are largely based on financial contracting and are partly due to these companies' limited collateral endowment (Chemmanur, Krishnan, and Nandy 2011; Cumming 2008; Cumming and Johan 2014; Kaplan and Stromberg 2003). Compared to both banks and VCs, BAs rarely design complex protective contracts as they adopt nonaggressive and informal monitoring mechanisms based on a close post-investment involvement in the funded company through firm visits, interactions with entrepreneurs, and other control techniques based on trust (Chemmanur and Chen 2014; Ibrahim 2008; Wong, Bhatia, and Freeman 2009). This kind of monitoring has been defined by scholars as *soft-monitoring* (Bonini, Capizzi, and Zocchi 2019b; Bonini et al. 2018; Capizzi, Croce, and Tenca 2022) and can be considered as another important value-adding contribution provided by angel investors to target companies (Ehrlich et al. 1994; Lumme, Mason, and Suomi 1998; Madill, Haines, Jr, and Riding 2005; Mason 2006; Politis 2008; Sætre 2003). Monitoring reduces agency problems between insiders and outsiders (Jensen and Meckling 1976) and shields both equity and debt holders from the risk of entrepreneurs' potential misbehaviors. This function is also performed by instituting proper management and accounting-information systems (Mitchell, Reid, and Terry 1997). BAs may, therefore, play the role of the informed party acting as a mediator in the interaction between angel-backed companies and the banking system. Their active involvement and continuous monitoring may provide significant soft information to banks, convincing them of a business's integrity and creditworthiness. In other words, BAs' active engagement reduces the risk of 'hidden actions' and provides further assurance that a firm will comply with a lending contract. Summing up, banks can strongly rely on BAs' soft monitoring to alleviate the moral-hazard problem, thus increasing the credit available to angel-backed companies. Hence, we formulate the following hypothesis:

**H3a.** *BAs' soft monitoring is positively related to the amount of follow-on bank debt raised by their funded companies.*

Another well-consolidated strand of literature dealing with both formal and informal investors has shown that early-stage investors typically invest in their local economy (Colombo, D'Adda, and Quas 2019; Cowling, Brown, and Lee 2021; Cumming and Dai 2010;

Harrison, Mason, and Robson 2010; Lindgaard Christensen 2007; Lumme, Mason, and Suomi 1998; Sohl 1999; Sorenson and Stuart 2001; Wetzel 1983; Wong, Bhatia, and Freeman 2009). On the demand side, it must be considered that young ventures, especially those located in peripheral regions, are not used to seeking VC or BAs due in part to the high opaqueness of the entrepreneurial-finance ecosystem (Bertoni, D'Adda, and Grilli 2019; Mason and Harrison 2002). On the supply side, co-localization, in terms of BAs' geographical proximity to funded start-ups, facilitates BAs' screening process, the provision of post-investment support and monitoring, and the relationship with the banks financing the company. In other words, geographical proximity helps minimize both ex-ante and ex-post information asymmetries and provides BAs a comparative advantage in dealing with the agency problems that might arise when investors' strategic objectives diverge from those of the entrepreneurs (Butticè, Croce, and Ughetto 2021; Croce, Guerini, and Ughetto 2018; Jensen and Meckling 1976; Shane and Cable 2002; Wong, Bhatia, and Freeman 2009). Beyond the distance, also referred to as 'functional proximity', some recent studies have investigated geographical proximity from a relational perspective, finding that the closer the distance between BAs and the investee companies, the more similar the cultural, social, and behavioural mindsets that are crucial in promoting the establishment of a trust-based relationship in the context of high information asymmetries and agency costs (Bonini et al. 2018; Herrmann, Avdeitchikova, and Hjertström 2016; Kuebart 2019).

Thus, the geographical proximity between investor and investee can increase the overall quality of the subsequent lending relationship by mitigating the information gaps generated by the adverse selection and moral-hazard behaviours between ventures and potential lenders. Geographical proximity also plays a certification role, assuring lenders of the effectiveness of BAs' post-investment involvement. In other words, banks may rest assured that BAs who invest in entrepreneurial companies located close to their headquarters will act as active (hands-on investment approach) rather than passive (hands-off approach) investors, contributing with their human and social capital to the investee companies' growth and performance. However, geographical proximity does not necessarily imply that angel investors will engage in frequent company visits because, as shown by previous contributions, this may negatively affect the trust-based relationship between a BA and the funded entrepreneur (Bonini, Capizzi, and Zocchi 2019b; Croce et al. 2021). Summing up, the local-bias behaviour typically adopted by BAs may play a positive role in banks' lending decisions, ultimately increasing the overall efficiency of the credit market for angel-backed companies. Therefore, we formulate the following hypothesis:

**H3b.** *BAs' geographical proximity is positively related to the amount of follow-on bank debt raised by their funded companies.*

## 3 | Data and Methods

### 3.1 | Data Source and Data Set Construction

We test our research hypotheses using a data set of Italian angel-backed companies. We exploit data from the sequential surveys administered by IBAN[1] to its associates and other unaffiliated BAs. The survey collects annual information on BAs' operations and their relative investment practices.

One major challenge in BA research is estimating the full angel market. Most angel investments are indeed individual and private, thus constituting an 'invisible market' that is difficult to detect using simple survey techniques (Landström and Mason 2016; Mason and Harrison 2000). The survey method adopted by IBAN integrates the 'visible market', represented by BAs and networks/groups affiliated to IBAN, with an estimation of the 'invisible' component, therefore reaching a more representative sample of the population of Italian BAs.[2]

We used data from the 2008–2018 survey waves. The initial sample available through the surveys comprised 1124 deals, representing 905 companies funded by 556 BAs from 2008 to 2018. We then matched these companies with the AIDA-BVD[3] database to collect accounting and financial information. We preferred AIDA over other BVD products (such as Orbis or Amadeus) because it provided more detailed accounting information on Italian companies and offered the possibility of consulting the scan of the original annual reports deposited in the Italian Chambers of Commerce. The matching process required a rigorous and meticulous approach to unequivocally identify each company detected through the IBAN surveys. Because cross-country institutional differences could influence the relationship between SMEs and banks (Detragiache, Garella, and Guiso 2000; Hernández-Cánovas and Koëter-Kant 2010; Ongena and Smith 2000), non-Italian BA-backed companies were excluded, resulting in a final sample comprising 348 companies (out of the initial 905).

To explore the role of BAs in influencing backed companies' bank financing, we focused on the time each firm received its first BA investment. This event can be considered a fundamental change of status for a firm since it will affect its subsequent growth and investment path (Capizzi, Croce, and Tenca 2022); it allowed us to distinguish between a pre- and post-investment period. After excluding firms with non-complete or missing accounting information in either the pre- or post-investment period, we remained with 136 firms (39.66% of the initially identified companies) for which we had at least one observation before and after the BA's equity investment into the funded venture.

To accurately assess the impact of BAs' involvement on companies' bank financing, we then leveraged the Zephyr-BVD[4] and Crunchbase[5] databases to identify and exclude companies that secured BA funding through a syndicate involving a VC fund or received VC funding within the following 3 years after BAs' support. Following this step, we successfully narrowed down the selection to 114 firms that were exclusively backed by BAs. This final set of firms represents our treated group. Table 1 shows the representativeness of our treated group compared to the initial IBAN sample in terms of industry, geographical distributions, and year of BA's intervention.

### 3.2 | Control Group

To properly assess the value-adding effect of BAs (RQ1) and posit a causal relationship between their support and

**TABLE 1** | Comparison between our treated group of BA-backed firms and the IBAN sample.

| | Our treated group | | IBAN sample | |
|---|---|---|---|---|
| | **Freq.** | **%** | **Freq.** | **%** |
| *Panel A. Industry (NACE Rev2 code)* | | | | |
| C - Manufacturing | 20 | 17.54% | 60 | 17.24% |
| D - Electricity, gas, steam, and air conditioning supply | 0 | 0.00% | 3 | 0.86% |
| F - Construction | 3 | 2.63% | 8 | 2.30% |
| G - Wholesale and retail trade | 6 | 5.26% | 32 | 9.20% |
| H - Transportation and storage | 0 | 0.00% | 1 | 0.29% |
| I - Accommodation and food service activities | 3 | 2.63% | 6 | 1.72% |
| J - Information and communication | 37 | 32.46% | 128 | 36.78% |
| K - Financial and insurance activities | 2 | 1.75% | 11 | 3.16% |
| L - Real estate activities | 1 | 0.88% | 2 | 0.57% |
| M - Professional, scientific, and technical activities | 39 | 34.21% | 71 | 20.40% |
| N - Administrative and support service activities | 2 | 1.75% | 15 | 4.31% |
| P - Education | 1 | 0.88% | 4 | 1.15% |
| Q - Human health and social work activities | 0 | 0.00% | 4 | 1.15% |
| R - Arts, entertainment, and recreation | 0 | 0.00% | 2 | 0.57% |
| S - Other service activities | 0 | 0.00% | 1 | 0.29% |
| Total | 114 | 100.00% | 348 | 100.00% |
| *Panel B. NUTS statistical regions of Italy (NUTS1)* | | | | |
| ITC - Northwest Italy | 51 | 44.74% | 162 | 46.55% |
| ITF - South Italy | 11 | 9.65% | 36 | 10.34% |
| ITG - Insular Italy | 3 | 2.63% | 13 | 3.74% |
| ITH - Northeast Italy | 27 | 23.68% | 70 | 20.11% |
| ITI - Central Italy | 22 | 19.30% | 67 | 19.25% |
| Total | 114 | 100.00% | 348 | 100.00% |
| *Panel C. Year of financing* | | | | |
| 2008 | 0 | 0.00% | 5 | 1.44% |
| 2009 | 0 | 0.00% | 41 | 11.78% |
| 2010 | 14 | 12.28% | 42 | 12.07% |
| 2011 | 19 | 16.67% | 44 | 12.64% |
| 2012 | 29 | 25.44% | 41 | 11.78% |
| 2013 | 14 | 12.28% | 36 | 10.34% |
| 2014 | 15 | 13.16% | 37 | 10.63% |
| 2015 | 13 | 11.40% | 49 | 14.08% |
| 2016 | 9 | 7.89% | 30 | 8.62% |
| 2017 | 0 | 0.00% | 9 | 2.59% |
| 2018 | 1 | 0.88% | 14 | 4.02% |
| Total | 114 | 100.00% | 348 | 100.00% |

*Note:* This table presents a comparison between our treated group of BA-backed firms and the IBAN sample in terms of industry distribution (*Panel A*), geographical distribution (*Panel B*), and year of BA's financing (*Panel C*).

bank financing, we must compare BA-backed companies' levels of bank debt with those of a matched control group comprising similar companies that did not receive any BA's support.

To construct such a control group, we employed the following methodology. First, after consulting the AIDA-BVD database, we randomly selected 65,314 companies operating in Italy with similar characteristics in terms of age, industry, and

accounting data, and which also had more than four consecutive years of available accounting data. As part of the selection process, we carefully verified that none of the companies had received support from BAs or VCs. Second, we adopted a nearest-neighbour propensity score matching (PSM)[6] with replacement to match each BA-financed firm, in the year before obtaining BA funding, with five non-BA-financed firms based on nine observable characteristics: revenues, revenues growth (between years $t$ and $t-1$), net income, bank debt, leverage ratio (computed as total assets over equity), firm age, geographical region[7], industry, and year. A suitably matched group of 498 non-BA-backed companies was found for the 114 BA-backed entrepreneurial companies. Table 2 reports the composition of the final data set, comparing the treated and control groups by industry, geographical area, and age at the time of the treatment ($t=0$).

### 3.3 | Methodology and Variables

Because our aim was to test the role of BAs in facilitating angel-backed companies' access to follow-on bank financing, we deemed the DID methodology the best approach to test our hypotheses. The DID approach allows us to determine the effect of BAs' support on bank financing using a control group as a proxy for what would have occurred in the treated group in the absence of treatment. The difference in the average level of posttreatment bank debt between the treated and control groups is then used as a measure of the effect of BAs' support. The DID approach is typically implemented as an interaction term between time and treatment-group dummy variables in a regression model.

The DID method is strongly dependent on the parallel trend assumption, which assumes that without BA support, the

**TABLE 2** | Final data set: comparison between treated and control groups.

| | Treated group | | Control group | |
|---|---|---|---|---|
| | Freq. | % | Freq. | % |
| *Panel A. Industry (NACE Rev2 code)* | | | | |
| C - Manufacturing | 20 | 17.54% | 116 | 23.29% |
| F - Construction | 3 | 2.63% | 14 | 2.81% |
| G - Wholesale and retail trade | 6 | 5.26% | 33 | 6.63% |
| I - Accommodation and food service activities | 3 | 2.63% | 12 | 2.41% |
| J - Information and communication | 37 | 32.46% | 126 | 25.30% |
| K - Financial and insurance activities | 2 | 1.75% | 20 | 4.02% |
| L - Real estate activities | 1 | 0.88% | 5 | 1.00% |
| M - Professional, scientific, and technical activities | 39 | 34.21% | 154 | 30.92% |
| N - Administrative and support service activities | 2 | 1.75% | 13 | 2.61% |
| P - Education | 1 | 0.88% | 5 | 1.00% |
| Total | 114 | 100.00% | 498 | 100.00% |
| *Panel B. NUTS statistical regions of Italy (NUTS1)* | | | | |
| ITC - Northwest Italy | 51 | 44.74% | 212 | 42.57% |
| ITF - South Italy | 11 | 9.65% | 43 | 8.63% |
| ITG - Insular Italy | 3 | 2.63% | 18 | 3.61% |
| ITH - Northeast Italy | 27 | 23.68% | 125 | 25.10% |
| ITI - Central Italy | 22 | 19.30% | 100 | 20.08% |
| Total | 114 | 100.00% | 498 | 100.00% |
| *Panel C. Firm age at the time of the treatment ($t=0$)* | | | | |
| Firm age $\leq 2$ | 35 | 30.70% | 127 | 25.50% |
| $2 <$ Firm age $\leq 4$ | 32 | 28.07% | 165 | 33.13% |
| $4 <$ Firm age $\leq 6$ | 21 | 18.42% | 100 | 20.08% |
| $6 <$ Firm age $\leq 8$ | 12 | 10.53% | 40 | 8.03% |
| $8 <$ Firm age $\leq 10$ | 3 | 2.63% | 18 | 3.61% |
| Firm age $> 10$ | 11 | 9.65% | 48 | 9.64% |
| Total | 114 | 100.00% | 498 | 100.00% |

*Note:* This table presents the final data set composition comparing the treated and control groups by industry (*Panel A*), geographical area (*Panel B*), and age of firms at the time of the treatment ($t=0$) (*Panel C*).

bank debt levels of the treated and control groups would have followed the same trajectory over time. To assess this assumption, first, we visually inspected the trends of bank debt in our data set before the treatment, as shown in Figure 1. This figure is also particularly informative as it offers initial graphical evidence of the impact of the BA intervention on bank debt. Second, we performed a placebo test, assuming the BA intervention occurred at an earlier time than it actually did. Both tests confirmed the common trend assumption.

Formally, to test Hypothesis 1, we adopted the following equation:

$$\text{Bank Debt}_{it} = \alpha + \beta_1 * \text{Post}_t + \beta_2 * \text{Treated}_i + \beta_3 * \text{Post}_t * \text{Treated}_i + \beta_4 * \text{Firm controls}_{it} + \beta_5 * \text{dyears} + \beta_6 * f_i + \varepsilon_{it}, \quad (1)$$

where the dependent variable, *Bank Debt*$_{it}$, is the amount of bank debt as reported in a company's balance sheet in logarithmic form (Bonini et al. 2018; Croce et al. 2021; Giraudo, Giudici, and Grilli 2019; Ivanov and Xie 2010); $i$ is an index for firms; $t$ refers to different time periods; *Post*$_t$ is a dummy variable that equals 1 in the period after a BA's intervention ($t \geq 0$) and 0 before; *Treated*$_i$ is a dummy variable that equals 1 for firms that are backed by BAs; *Post*$_t$ * *Treated*$_i$ is the interaction term associated with the DID estimator; *Firm controls*$_{it}$ are time-varying firm characteristics to control for the possibility that the factors influencing bank debt may vary differently for treated and nontreated firms after the matching; *dyears* are year dummies to control for different economic cycles; $f_i$ stands for the firm fixed effect to control for unobservable firm characteristics that are fixed over time; $\varepsilon_{it}$ is the error term. Standard errors are clustered at the firm level to consider the correlation among the observations of the same firm and control for heteroskedasticity.

To test Hypotheses 2 and 3, we introduce into Equation (1) a triple interaction term constructed as the product between the variables: *Post*$_t$, *Treated*$_i$, and the vector of variables *BA's characteristics*$_i$. The following equation below presents the fully saturated model.

$$\begin{aligned}\text{Bank Debt}_{it} = {} & \alpha + \beta_1 * \text{Post}_t + \beta_2 * \text{Treated}_i + \beta_3 * \text{BA's characteristics}_i + \beta_4 * \text{Post}_t * \text{Treated}_i + \beta_5 * \text{Post}_t * \text{BA's characteristics}_i \\ & + \beta_6 * \text{Treated}_i * \text{BA's characteristics}_i + \beta_7 * \text{Post}_t * \text{Treated}_i * \text{BA's characteristics}_i + \beta_8 * \text{Firm controls}_{it} \\ & + \beta_9 * \text{dyears} + \beta_{10} * f_i + \varepsilon_{it} \end{aligned} \quad (2)$$

All angels' individual variables were constructed using the IBAN survey, and, as mentioned above, they refer to the first BA investment raised by each firm. Moreover, angel-specific variables were aggregated in the case of co-invested deals with more than one BA (see variable description below).

To test Hypothesis 2, we employed the following three variables as representative of a BA's human- and social-capital endowment: *BA entrep exp*, *BA education lev*, and *BA network memb*. The BA literature considers these human- and social-capital characteristics as distinctive and material elements of a BA's profile (Collewaert and Manigart 2016; Bonini et al. 2018; Croce, Ughetto, and Cowling 2021, 2020; Capizzi, Croce, and Tenca 2022).

The variable *BA entrep exp*, is a dummy variable that equals 1 if the BA investing in the company was an entrepreneur at the time of the investment or before. For syndicated investments, it equals 1 if at least one BA co-investing in the deal was an entrepreneur at the time of the investment or before.

The variable *BA education lev*, is a dummy variable that equals 1 if the BA investing in the company holds a master's degree. For syndicated investments, it equals 1 if at least one BA co-investing in the deal has a master's degree.

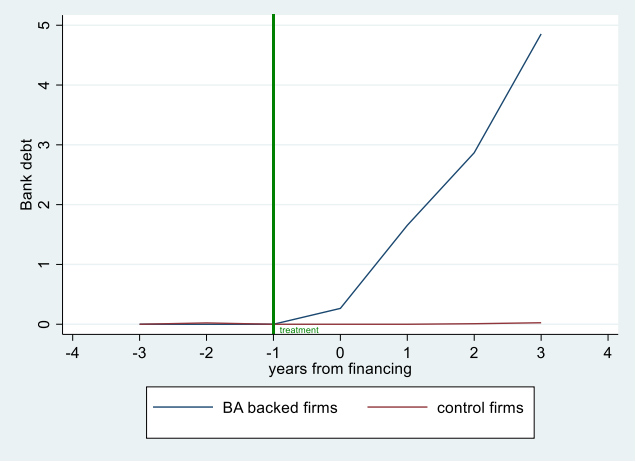


**FIGURE 1** | Median of bank debt (thousands €) over time for both BA-backed and control firms. [Color figure can be viewed at wileyonlinelibrary.com]

The variable, *BA network memb*, is a dummy variable that equals 1 if the BA investing in the company is a BAN member. For syndicated investments, it equals 1 if at least one of the BAs that co-invested in the focal company is a BAN member. BAN affiliation represents a valid proxy for BAs' social capital (Butticè, Croce, and Ughetto 2021; Bonnet et al. 2022).

To test Hypothesis 3, we integrated the variable BA's characteristics with two further variables related to BAs' investment practices and, hence, deemed as a proxy for a BA's capability to reduce the level of information asymmetries between banks and entrepreneurial ventures: *BA soft monitoring* and *BA geogr proximity*. Previous studies have shown that these characteristics are the most relevant indicators of the level of information asymmetries between a firm and informal investors (Bonini, Capizzi, and Zocchi 2019b; Capizzi, Croce, and Tenca 2022; Croce, Guerini, and Ughetto 2018; Wong, Bhatia, and Freeman 2009; Harrison, Mason, and Robson 2010).

The variable *BA soft monitoring*, is a dummy variable that equals 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 visits the BA made to the target company. Notably, this variable has already been tested and used within the extant BA literature (Capizzi, Croce, and Tenca 2022; Croce et al. 2021).

The variable *BA geogr proximity*, is a dummy variable that indicates co-localization in terms of a BA's geographical proximity to the funded venture. It equals 1 if the investing BA lives less than 150 km from the funded company.[8] For syndicated investments, it equals 1 if at least one co-investing BAs lives less than 150 km from the funded company.

Finally, as a control variable, we employed the variable *Coinvestors*, which represents the number of BAs co-investing the deal. On the one hand, when many investors are involved, banks may be less willing to provide funds because they perceive an unexploited funding capacity by the overall group of BAs. Additionally, financing contracts designed by a higher number of co-investors are generally more complex than those stipulated by solo BAs, and banks may be less willing to participate in such a complex relationship. On the other hand, coinvesting also provides the target firm with a more heterogeneous pool of resources and know-how. Applying a resource-based approach to entrepreneurial finance (Bosma et al. 2004; Colombo and Grilli 2010; Cooper, Gimeno-Gascon, and Woo 1994; Croce et al. 2021; Wright, Westhead, and Sohl 1998), a firm that is supported by more than one BA can take advantage of the network of relationships built by each coinvestor, increasing the probability of accessing friendly lenders.

Table 3 provides the definitions of all BA variables used in our estimates and presents their descriptive statistics for treated firms. Table 4 offers the summary statistics for accounting variables, divided into two panels: Panel A covers the period before treatment ($T < 0$), while Panel B covers the period after treatment ($T \geq 0$). Each panel also separately reports the descriptive statistics for treated and control groups, enabling a clear comparison between the two groups across different time periods. Lastly, Table 5 presents the correlation matrix for all variables in the final data set.

## 4 | Empirical Results

This section presents the results concerning the effect of BAs' involvement and their previously mentioned characteristics on companies' level of bank debt.

Table 6 reports the estimation outcome for Equation 1 testing Hypothesis 1. Column 1 displays the overall posttreatment effect of BA intervention: the variable, *Post * Treated*, associated with the DID estimator, has a positive and highly significant effect (1% level), indicating that the level of bank debt for BA-backed firms increases more than for the control group. Interestingly, the posttreatment level of bank debt for treated firms exhibited a considerable increase, surpassing that of the control group by approximately 119% ($= e^{0.785} - 1$) (see Table 6 Column 1). Indeed, the predicted mean level of bank debt[9] for the treated group is about €15,416 after the BA intervention, while for control firms, it stands at approximately €7031. Hypothesis 1, which postulates a positive impact of BAs' investment on backed companies' bank financing, is thus supported, confirming the value-added benefits BAs provide. Columns 2, 3, 4, and 5, of Table 6 display the effect of BA intervention in the four subsequent years, year by year. From the interaction terms $Post_t$ * *Treated*, which capture the trends year by year, we elicit that the effect of BAs on backed companies' bank financing is consistently positive and significant.

Furthermore, in Table 7 we calculate the economic impact of the independent variables on bank debt based on the estimated coefficients provided in Table 6, column 1. Interesting our results highlight a remarkable effect of BAs' intervention. Assuming a normal distribution, Table 7 shows that a company with an age equal to the sample mean would have to age up to the 99th percentile to replicate the BA effect. Whereas a firm with a size equal to the sample mean would have to grow to the 75th percentile to replicate the BA effect. It is also worth noting that the variable *Total assets/equity* is not statistically significant, suggesting that the BA's intervention is of greater relevance than the level of leverage itself.

Table 8 presents the estimation outcome for Equation 2 testing both Hypotheses 2 (BAs' human and social capital) and 3 (BAs' investment practices). Columns 1, 2, 3, 4, and 5, individually test the variables associated with each hypothesis. Column 6 jointly tests all the previous variables. Regarding Hypothesis 2 on BAs' human capital (see Table 8 Columns 1, 2, 3), the results show that the variable *BA entrep exp* has a positive and significant effect on a company's level of bank debt; its significance also holds in the full model (see Table 8 Column 6). Meanwhile, the variables *BA education lev* and *BA network memb* are not statistically significant. As for education, we perhaps require more granular information that considers the specific disciplines studied by the surveyed angels. Concerning angel network membership, the great deal of heterogeneity characterizing different BANs should be considered, as well as the centrality of a given BA within their reference network (Butticè,

**TABLE 3** | Definition and descriptive statistics of BA variables.

| Variables | Description | Hypothesis | Treated group | | | |
|---|---|---|---|---|---|---|
| | | | No. firms | Mean | Median | SD |
| BA entrep exp | Dummy variable that equals 1 if the BA investing in the company was an entrepreneur at the time of the investment or before, and 0 otherwise. For syndicated investments, it equals 1 if at least one BA co-investing in the deal was an entrepreneur at the time of the investment or before. | H2a | 114 | 0.491 | 0.000 | 0.502 |
| BA education lev | Dummy variable that equals 1 if the BA investing in the company holds a master's degree. For syndicated investments it equals 1, if at least one BA co-investing in the deal holds a master's degree. | H2b | 114 | 0.491 | 0.000 | 0.502 |
| BA network memb | Dummy variable that equals 1 if the BA investing in the company is a BAN member. For syndicated investments it equals 1 if at least one of the BAs that co-invested in the focal company is a BAN member. | H2c | 114 | 0.439 | 0.000 | 0.498 |
| BA soft monitoring | Dummy variable that equals 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 visits the BA made to the target company. | H3a | 114 | 0.711 | 1.000 | 0.456 |
| BA geogr proximity | Dummy variable that equals 1 if the BA investing in the firm lives less than 150 km away from the funded company. For syndicated investments, it equals 1 if at least one BAs co-investing in the deal lives less than 150 km away from the funded company. | H3b | 114 | 0.754 | 1.000 | 0.432 |
| BA coinvestors | Number of BAs co-investing in the deal. | control variable | 114 | 1.833 | 1.000 | 2.357 |

*Note:* This table presents the definition for all BA variables used in Equation (2), along with their respective descriptive statistics.

**TABLE 4** | Descriptive statistics.[13]

| | Treated group | | | | Control group | | | | Mann–Whitney U test[14] |
|---|---|---|---|---|---|---|---|---|---|
| | *N* | Mean | Median | SD | *N* | Mean | Median | SD | *p*-value |
| *Panel A. before treatment ($T < 0$)* | | | | | | | | | |
| Bank debt (thousands €) | 214 | 299.417 | 0.000 | 1764.27 | 817 | 165.608 | 0.000 | 681.885 | 0.694 |
| Bank debt (ln) | 214 | 1.537 | 0.000 | 2.533 | 817 | 1.573 | 0.000 | 2.468 | 0.694 |
| Revenues (thousands €) | 214 | 3278.09 | 8.076 | 30991.073 | 817 | 1109.604 | 23.430 | 8931.517 | 0.110 |
| Revenues (ln) | 214 | 2.741 | 2.205 | 2.817 | 817 | 3.153 | 3.196 | 2.741 | 0.110 |
| Cash flow (thousands €) | 214 | 358.58 | −0.793 | 4123.413 | 817 | 270.909 | −0.627 | 3039.655 | 0.318 |
| Total assets/equity | 214 | 8.572 | 2.626 | 31.039 | 817 | 12.86 | 2.851 | 59.792 | 0.424 |
| Total assets (thousands €) | 214 | 2961.186 | 227.225 | 21928.678 | 817 | 2134.315 | 145.005 | 11522.716 | 0.265 |
| Total assets (ln) | 214 | 5.359 | 5.430 | 1.942 | 817 | 5.212 | 4.984 | 1.983 | 0.265 |
| Firm age | 214 | 4.272 | 3.000 | 4.689 | 817 | 4.263 | 3.000 | 4.61 | 0.753 |
| Firm age (ln) | 214 | 1.405 | 1.386 | 0.671 | 817 | 1.417 | 1.386 | 0.646 | 0.753 |
| *Panel B. after treatment ($T \geq 0$)* | | | | | | | | | |
| Bank debt (thousands €) | 393 | 437.842 | 0.977 | 2233.079 | 1716 | 200.797 | 0.000 | 784.394 | 0.000*** |
| Bank debt (ln) | 393 | 2.466 | 0.682 | 2.769 | 1716 | 1.817 | 0.000 | 2.522 | 0.000*** |
| Revenues (thousands €) | 393 | 3803.34 | 67.915 | 31414.046 | 1716 | 1595.312 | 86.115 | 10847.909 | 0.474 |
| Revenues (ln) | 393 | 3.941 | 4.233 | 2.913 | 1716 | 4.082 | 4.467 | 2.673 | 0.474 |
| Cash flow (thousands €) | 393 | 266.661 | −4.173 | 3266.293 | 1716 | 206.381 | 3.575 | 2605.17 | 0.000*** |
| Total assets/equity | 393 | −0.003 | 2.469 | 147.627 | 1716 | 17.92 | 3.312 | 142.863 | 0.000*** |
| Total assets (thousands €) | 393 | 3496.88 | 550.466 | 20633.172 | 1716 | 2569.857 | 245.036 | 11540.539 | 0.000*** |
| Total assets (ln) | 393 | 6.255 | 6.313 | 1.568 | 1716 | 5.672 | 5.505 | 1.930 | 0.000*** |
| Firm age | 393 | 6.606 | 5.000 | 4.606 | 1716 | 6.27 | 5.000 | 4.348 | 0.209 |
| Firm age (ln) | 393 | 1.895 | 1.792 | 0.494 | 1716 | 1.864 | 1.792 | 0.460 | 0.209 |

*Note:* This table presents descriptive statistics for accounting variables in the final data set. Panel A shows the descriptive statistics for treated and control groups before the treatment ($T < 0$), while Panel B shows the descriptive statistics for the treated and control group after the treatment ($T \geq 0$). Descriptive statistics include: number of observations (*N*), mean, median, and standard deviation (SD).

**TABLE 5** | Correlation matrix.

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Bank debt | 1.000 | | | | | | | | | | | | | | | |
| (2) Bank debt (ln) | 0.488* | 1.000 | | | | | | | | | | | | | | |
| (3) Revenues | 0.087* | 0.043* | 1.000 | | | | | | | | | | | | | |
| (4) Revenues (ln) | 0.173* | 0.422* | 0.295* | 1.000 | | | | | | | | | | | | |
| (5) Cash flow | 0.062* | 0.001 | 0.826* | 0.234* | 1.000 | | | | | | | | | | | |
| (6) Total assets/ equity | 0.092* | 0.042 | 0.006 | −0.008 | −0.007 | 1.000 | | | | | | | | | | |
| (7) Total assets | 0.208* | 0.068* | 0.857* | 0.248* | 0.767* | 0.025 | 1.000 | | | | | | | | | |
| (8) Total assets (ln) | 0.344* | 0.460* | 0.303* | 0.435* | 0.243* | 0.104* | 0.448* | 1.000 | | | | | | | | |
| (9) Firm age | 0.156* | 0.318* | 0.137* | 0.318* | 0.106* | −0.004 | 0.150* | 0.368* | 1.000 | | | | | | | |
| (10) Firm age (ln) | 0.154* | 0.312* | 0.140* | 0.321* | 0.113* | −0.002 | 0.166* | 0.421* | 0.915* | 1.000 | | | | | | |
| (11) BA entrep exp | 0.010 | 0.100* | 0.079* | 0.075* | 0.022 | −0.046* | 0.051* | 0.091* | −0.030 | −0.036 | 1.000 | | | | | |
| (12) BA education lev | 0.112* | 0.047* | −0.029 | 0.006 | −0.036 | −0.041 | −0.017 | 0.065* | −0.073* | −0.067* | 0.452* | 1.000 | | | | |
| (13) BA network memb | −0.010 | 0.043 | 0.067* | 0.035 | 0.022 | −0.039 | 0.036 | 0.052* | 0.028 | 0.013 | 0.325* | 0.475* | 1.000 | | | |
| (14) BA soft monitoring | 0.068* | 0.084* | −0.035 | 0.053* | −0.053* | −0.038 | −0.039 | 0.043 | −0.090* | −0.097* | 0.555* | 0.652* | 0.607* | 1.000 | | |
| (15) BA geogr proximity | −0.007 | 0.040 | 0.032 | −0.002 | −0.012 | −0.046* | 0.002 | 0.066* | −0.043* | −0.052* | 0.487* | 0.568* | 0.482* | 0.684* | 1.000 | |
| (16) BA coinvestors | 0.029 | 0.030 | −0.030 | −0.011 | −0.055* | −0.028 | −0.028 | 0.087* | −0.087* | −0.080* | 0.487* | 0.530* | 0.387* | 0.457* | 0.510* | 1.000 |

*Note:* This table presents the correlation matrix for all variables in the final data set. Significance level: $*p < 0.01$.

**TABLE 6** | Effect of BA support on companies' bank debt.

| Independent variables | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $Post_{all\ years}$ * Treated | 0.785*** | | | | |
| | (0.203) | | | | |
| $Post_0$ * Treated | | 0.361* | | | |
| | | (0.187) | | | |
| $Post_1$ * Treated | | | 0.882*** | | |
| | | | (0.245) | | |
| $Post_2$ * Treated | | | | 0.822*** | |
| | | | | (0.279) | |
| $Post_3$ * Treated | | | | | 0.592** |
| | | | | | (0.283) |
| Revenues (ln) | 0.004 | 0.019 | −0.017 | −0.006 | 0.029 |
| | (0.027) | (0.037) | (0.038) | (0.043) | (0.042) |
| Cash flow | 0.000 | −0.000 | −0.000 | −0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Total assets/equity | −0.000 | −0.000 | −0.001 | −0.002* | −0.002*** |
| | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) |
| Total assets (ln) | 0.523*** | 0.356*** | 0.438*** | 0.574*** | 0.493*** |
| | (0.071) | (0.088) | (0.090) | (0.095) | (0.092) |
| Firm age (ln) | 0.769*** | 1.321*** | 1.021*** | 0.729** | 0.901*** |
| | (0.252) | (0.389) | (0.322) | (0.310) | (0.305) |
| Constant | −4.505* | −4.717** | −4.272* | −5.053** | −4.549* |
| | (2.299) | (2.357) | (2.290) | (2.320) | (2.388) |
| Year FE | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 3140 | 1623 | 1585 | 1547 | 1478 |
| Number of firms | 612 | 612 | 612 | 612 | 612 |
| *R*-squared | 0.179 | 0.160 | 0.188 | 0.227 | 0.236 |

*Note:* Diff-in-diff estimations. This table presents regression results of Equation (1) testing the effect of BAs' support on companies' bank debt using diff-in-diff estimation. The dependent variable is bank debt in logarithmic form. Column 1 shows the regression results with all firms split into two periods to capture the overall posttreatment effect of BA financing: the dummy *Post* equals 1 after BA's intervention ($t \geq 0$) and 0 before. Columns 2, 3, 4, and 5, capture the dynamic effects of BA financing and show the results of separate regressions where the dummy $Post_t$ takes values 1 in the specific post-investment year ($t = 0, 1, 2, 3$) when we want to evaluate the BA effect on the firm, 0 before BA's intervention and missing otherwise. The individual variables $Post_t$ and $Treated_i$ are not reported. Significance levels: *10%, **5%, ***1%. Standard errors clustered at the firm level.

**TABLE 7** | Economic impact of independent variables on bank debt.

| | (1) $\hat{\beta}$ | (2) Economic impact | (3) z-score | (4) $P(Z \leq z)$ |
|---|---|---|---|---|
| $Post_{all\ years}$ * Treated | 0.785*** | 119% | — | — |
| Revenues (ln) | 0.004 | 1% | 2.06E + 84 | 100th |
| Cash flow | 1.73E-06 | 1% | 156.043 | 100th |
| Total assets/equity | −4.49E-04 | −5% | −14.444 | 0th |
| Total assets (ln) | 0.523*** | 159% | 0.672 | 75th |
| Firm age (ln) | 0.769*** | 57% | 2.230 | 99th |

*Note:* This table provides an overview of the economic impact of independent variables on bank debt. Column 1 displays the estimated coefficients reported in column 1 of Table 6. Column 2 displays the economic impact of each variable: it denotes the percentage variation in the dependent variable (bank debt) for a one standard deviation variation in the corresponding independent variable.[15] Column 3 presents the *z*-score: the standard deviation multiplier that equals the economic impact of each specific variable to the economic impact of the term *Post * Treated* (which represents the BA intervention).[16] Finally, column 4 shows the percentile associated with the *z*-score, assuming a standard normal distribution.

**TABLE 8** | Effect of BAs' characteristics on firms' bank financing.

| Independent variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Post * Treated | 0.548*** | 0.613*** | 0.771*** | 0.346* | 0.906*** | 0.363 |
| | (0.167) | (0.177) | (0.169) | (0.209) | (0.229) | (0.293) |
| Post * Treated * BA entrep exp | 0.570*** | | | | | 0.615*** |
| | (0.201) | | | | | (0.208) |
| Post * Treated * BA education lev | | 0.310 | | | | 0.248 |
| | | (0.203) | | | | (0.217) |
| Post * Treated * BA network memb | | | −0.038 | | | −0.196 |
| | | | (0.200) | | | (0.208) |
| Post * Treated * BA soft monitoring | | | | 0.606*** | | 0.511** |
| | | | | (0.215) | | (0.235) |
| Post * Treated * BA geogr proximity | | | | | −0.191 | −0.279 |
| | | | | | (0.221) | (0.227) |
| Post * Treated * BA coinvestors | −0.009 | 0.002 | 0.015 | 0.012 | 0.011 | −0.033 |
| | (0.041) | (0.042) | (0.041) | (0.040) | (0.041) | (0.043) |
| Revenues (ln) | 0.005 | 0.006 | 0.005 | 0.002 | 0.004 | 0.004 |
| | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) |
| Cash flow | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Total assets/equity | −0.000** | −0.000** | −0.000** | −0.000** | −0.000** | −0.000** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Total assets (ln) | 0.516*** | 0.519*** | 0.523*** | 0.516*** | 0.525*** | 0.512*** |
| | (0.041) | (0.041) | (0.041) | (0.041) | (0.041) | (0.041) |
| Firm age (ln) | 0.739*** | 0.767*** | 0.767*** | 0.682*** | 0.770*** | 0.668*** |
| | (0.195) | (0.195) | (0.195) | (0.197) | (0.195) | (0.197) |
| Constant | −4.491*** | −4.558*** | −4.511*** | −4.539*** | −4.465*** | −4.575*** |
| | (0.732) | (0.733) | (0.735) | (0.732) | (0.734) | (0.736) |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 3140 | 3140 | 3140 | 3140 | 3140 | 3140 |
| Number of firms | 612 | 612 | 612 | 612 | 612 | 612 |
| *R*-squared | 0.182 | 0.180 | 0.180 | 0.182 | 0.180 | 0.186 |

*Note:* Diff-in-diff estimations. This table presents regression results of Equation (2) testing the effect of BAs' characteristics on companies' bank debt. The dependent variable is bank debt in logarithmic form. Columns 1, 2, 3, 4, and 5, individually test the variables *BA entrep exp*, *BA education lev*, *BA network memb*, *BA soft monitoring*, and *BA geogr proximity*, respectively. Column 6 tests jointly all the previous variables. All BA variables are defined in Table 3. The individual variables $Post_t$, $Treated_i$, $BA's\ characteristics_i$, along with the dual interaction terms $Post_t$ * $BA's\ characteristics_i$, $Treated_i$ * $BA's\ characteristics_i$, are not reported. Significance levels: *10%, **5%, ***1%. Standard errors clustered at the firm level.

Croce, and Ughetto 2021). Overall, the results support Hypothesis 2a, revealing that BAs with an entrepreneurial background promote backed companies' bank financing in absolute terms.

Regarding Hypothesis 3 on BAs' investment practices (see Table 8, Columns 4, 5), the results show that the variable, *Soft-monitoring*, has a positive and significant effect on a company's level of bank debt; its significance also holds in the full model (see Table 8, Column 6). The variable *Proximity* shows a positive sign; however, its effect on a company's bank debt is non-significant. Overall, the results support Hypothesis 3a, revealing that the BAs can reduce ex-post information asymmetries through soft-monitoring and promote backed companies' bank financing.

## 4.1 | Further Analysis

Besides bank financing, trade debt represents another important external financing source for entrepreneurial companies (Cosh, Cumming, and Hughes 2009; Hirsch and Walz 2019; Huyghebaert and Van De Gucht 2007; Robb and Robinson 2014). Indeed, by deferring payment for a specified value of

goods or services, suppliers can be a natural source of capital for some developing firms. By applying the same methodology described above, we examined the effect of BAs' involvement on companies' level of trade debt. The DID estimation revealed no significant difference between the treated and control groups, thereby ruling out any influential role played by BAs in the relationship between young ventures and their suppliers. Results are detailed in Table A2 of the Online Appendix.

Several factors may explain this phenomenon. First, trade debt is operational and part of working capital. Firms typically have limited flexibility in managing trade debt because it is closely tied to their day-to-day operations and supplier relationships (Paul and Wilson 2007; Petersen and Rajan 1997). In contrast, bank debt involves strategic financial decisions, where BAs can exert more direct influence through their networks and expertize. Secondly, trade debt is closely linked to revenue patterns. Our treated and control groups demonstrated comparable revenue growth, as reflected in our posttreatment descriptive statistics in Panel B of Table 4. Indeed, BAs often invest in companies with moderate growth rates, and the effect on trade debt may take longer to manifest (Croce et al. 2021). With consistent turnover increases across both groups, the impact of BA involvement on trade debt is not discernable.

## 5 | Robustness Tests

### 5.1 | Selection Bias

One possible concern in our analysis is that BAs might support companies exhibiting qualities that make them more attractive to banks. In this case, the increase in bank debt of BA-backed companies would be driven by BAs' selection capability rather than by their value-adding contributions. However, we believe this concern is mitigated by the different decision-making drivers inherent to BAs and banks' financing decisions. As equity investors, angels prioritize qualitative factors like market potential and founders' commitment and reliability during their due diligence process, whereas banks, as debt providers, emphasize quantitative aspects such as repayment capability and collaterals. These intrinsic differences reduce the risk of selection bias.

Nevertheless, we further checked our results' robustness against potential selection bias issues by employing the two-stage Heckman procedure (Heckman 1979). In the first step of the Heckman procedure, we computed the probability of a company being supported by a BA by estimating a probit model among our treated and control groups of BA-backed and non-BA-backed companies. Afterward, we used the first-stage estimates to impute the Inverse Mills Ratio values included in the second-stage estimates.

In the first-stage estimation, we insert the following variables: *Intangible ratio*[10], *BA density ratio*[11], *Firm age (ln), Revenues (ln), Total assets (ln)*, industry, and year-fixed effects. We identified the *Intangible ratio* as our instrumental variable because it positively correlates with BAs' selection likelihood. Indeed, intangible assets can serve as an important positive signal to external investors for new and young companies characterized by severe information asymmetries (e.g., Audretsch, Bönte, and Mahagaonkar 2012; Colombo et al. 2023; Hoenig and Henkel 2015; Zhang, Guo, and Sun 2019; Zhou et al. 2016). However, since banks' creditworthiness assessments focus on tangible assets and financial metrics—rather than intangible assets, which are harder to evaluate—the *Intangible ratio* remains uncorrelated with a venture's likelihood of securing bank financing.[12]

Panel A of Table 9 presents the first-stage results of the Heckman model, which assesses the likelihood of a company receiving support from a BA. The probit model reveals a positive and statistically significant coefficient for the variable *Intangible ratio*. Building upon this initial analysis, we derived the Inverse Mills Ratio and incorporated it into Equations (1) and (2) to test our Hypotheses 1 and 2, respectively. The results are displayed in Panels B and C of Table 9. These findings are consistent with the original results reported in Tables 6 and 8.

### 5.2 | Financial Risk and Performance

One possible concern is that BAs might prompt companies to assume greater financial risk by increasing bank debt, which could negatively impact companies' survival. To address this issue, we implemented the following panel regression model:

$$\begin{aligned}\text{Bankruptcy}_{it} = {} & \alpha + \beta_1 * \text{Post}_t + \beta_2 * \text{Treated}_i + \beta_3 * \\ & \text{Post}_t * \text{Treated}_i + \beta_4 * \text{Bank Debt}_{it} + \beta_5 * \\ & \text{Post}_t * \text{Bank Debt}_{it} + \beta_6 * \text{Treated}_i * \text{Bank Debt}_{it} + \beta_7 * \\ & \text{Post}_t * \text{Treated}_i * \\ & \text{Bank Debt}_{it} + \beta_8 * \text{Firm controls}_{it} + \beta_9 * \text{dyears} + \beta_{10} * \\ & f_i + \varepsilon_{it}\end{aligned} \quad (3)$$

where the dependent variable, $Bankruptcy_{it}$, is a binary variable set to 1 from the year a company files for bankruptcy onwards. The model includes the individual variable $Bank\ Debt_{it}$ and all its interaction terms with the variables $Post_t$ and $Treated_i$ to capture the combined effect of BA intervention and bank debt on bankruptcy risk. Notably, the term of interest is the triple interaction term $Post_t * Treated_i * Bank\ Debt_{it}$, which shows how bank debt influences bankruptcy risk for treated firms after the BA intervention. Please refer to Equation (1) for the definitions of all other terms.

Our findings revealed that BA-backed companies did not experience a higher likelihood of bankruptcy. Additionally, the increase in a company's bank debt following the BA intervention was not significantly correlated with bankruptcy. Results are presented in Table 10, Column 1.

We also analyzed company performance to determine whether the BAs' impact on bank debt might lead to poorer company performance. To address this issue, we implemented the following panel regression model:

**TABLE 9** | Robustness test: correction for potential selection bias.

| ***Panel A. First-stage Heckman probit model*** | |
|---|---|
| | **Prob (BA)** |
| Intangible ratio | 0.034*** |
| | (0.010) |
| BA density | −4.396 |
| | (6.146) |
| Firm age (ln) | −0.221** |
| | (0.110) |
| Revenues (ln) | −0.016 |
| | (0.016) |
| Total assets (ln) | 0.113*** |
| | (0.026) |
| Constant | −2.506*** |
| | (0.480) |
| Year FE | Yes |
| Industry FE | Yes |
| Observations | 3140 |
| No. of firms | 612 |
| Log pseudolikelihood | −444.306 |
| R squared | 0.133 |
| Wald Test *p*-value | 0.000 |

| ***Panel B. Testing Equation (1): correction for sample selection*** | | | | | |
|---|---|---|---|---|---|
| | **(1) Bank debt (ln)** | **(2) Bank debt (ln)** | **(3) Bank debt (ln)** | **(4) Bank debt (ln)** | **(5) Bank debt (ln)** |
| $Post_{all\ years}$ * Treated | 0.784*** | | | | |
| | (0.202) | | | | |
| $Post_0$ * Treated | | 0.355* | | | |
| | | (0.187) | | | |
| $Post_1$ * Treated | | | 0.882*** | | |
| | | | (0.245) | | |
| $Post_2$ * Treated | | | | 0.828*** | |
| | | | | (0.279) | |
| $Post_3$ * Treated | | | | | 0.592** |
| | | | | | (0.282) |
| Revenues (ln) | 0.004 | 0.009 | −0.016 | −0.016 | 0.034 |
| | (0.028) | (0.039) | (0.041) | (0.044) | (0.044) |
| Cash flow | 0.000 | −0.000 | −0.000 | −0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Total assets/equity | −0.000 | −0.000 | −0.001 | −0.002* | −0.002*** |
| | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) |
| Total assets (ln) | 0.527*** | 0.410*** | 0.433*** | 0.638*** | 0.460*** |
| | (0.076) | (0.093) | (0.112) | (0.104) | (0.103) |
| Firm age (ln) | 0.760*** | 1.200*** | 1.032*** | 0.611* | 0.965*** |

(Continues)

**TABLE 9** | (Continued)

***Panel B. Testing Equation (1): correction for sample selection***

| | (1) Bank debt (ln) | (2) Bank debt (ln) | (3) Bank debt (ln) | (4) Bank debt (ln) | (5) Bank debt (ln) |
|---|---|---|---|---|---|
| | (0.255) | (0.376) | (0.333) | (0.317) | (0.307) |
| Constant | −4.612* | −5.913** | −4.176 | −6.487** | −3.812 |
| | (2.533) | (2.585) | (2.817) | (2.591) | (2.871) |
| Inverse Mills ratio | 0.051 | 0.558 | −0.046 | 0.680 | −0.352 |
| | (0.332) | (0.357) | (0.594) | (0.489) | (0.493) |
| Year FE | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 3140 | 1623 | 1585 | 1547 | 1478 |
| Number of firms | 0.179 | 0.161 | 0.188 | 0.228 | 0.237 |
| R-squared | 612 | 612 | 612 | 612 | 612 |

***Panel C. Testing Equation (2): correction for sample selection***

| | (1) Bank debt (ln) | (2) Bank debt (ln) | (3) Bank debt (ln) | (4) Bank debt (ln) | (5) Bank debt (ln) | (6) Bank debt (ln) |
|---|---|---|---|---|---|---|
| Post * Treated | 0.547*** | 0.613*** | 0.772*** | 0.339 | 0.906*** | 0.362 |
| | (0.167) | (0.177) | (0.169) | (0.211) | (0.229) | (0.293) |
| Post * Treated * BA entrep exp | 0.575*** | | | | | 0.612*** |
| | (0.202) | | | | | (0.209) |
| Post * Treated * BA education lev | | 0.310 | | | | 0.248 |
| | | (0.203) | | | | (0.217) |
| Post * Treated * BA network memb | | | −0.039 | | | −0.197 |
| | | | (0.200) | | | (0.208) |
| Post * Treated * BA soft monitoring | | | | 0.615*** | | 0.517** |
| | | | | (0.217) | | (0.238) |
| Post * Treated * BA geogr proximity | | | | | −0.191 | −0.282 |
| | | | | | (0.223) | (0.228) |
| Post * Treated * BA coinvestors | −0.010 | 0.001 | 0.015 | 0.013 | 0.011 | −0.032 |
| | (0.042) | (0.042) | (0.041) | (0.041) | (0.041) | (0.043) |
| Revenues (ln) | 0.003 | 0.005 | 0.004 | 0.003 | 0.004 | 0.005 |
| | (0.021) | (0.021) | (0.021) | (0.021) | (0.021) | (0.021) |
| Cash flow | 0.000 | 0.000 | 0.000 | −0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Total assets/equity | −0.000** | −0.000** | −0.000** | −0.000** | −0.000** | −0.000** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Total assets (ln) | 0.526*** | 0.521*** | 0.527*** | 0.507*** | 0.525*** | 0.507*** |
| | (0.052) | (0.052) | (0.052) | (0.052) | (0.052) | (0.052) |
| Firm age (ln) | 0.718*** | 0.764*** | 0.759*** | 0.699*** | 0.768*** | 0.678*** |
| | (0.205) | (0.204) | (0.205) | (0.205) | (0.205) | (0.206) |
| Constant | −4.734*** | −4.593*** | −4.604*** | −4.330*** | −4.482*** | −4.453*** |
| | (1.030) | (1.030) | (1.034) | (1.033) | (1.038) | (1.041) |
| Inverse Mills ratio | 0.114 | 0.016 | 0.044 | −0.099 | 0.008 | −0.057 |

(Continues)

**TABLE 9** | (Continued)

| *Panel C. Testing Equation (2): correction for sample selection* | | | | | | |
|---|---|---|---|---|---|---|
| | **(1) Bank debt (ln)** | **(2) Bank debt (ln)** | **(3) Bank debt (ln)** | **(4) Bank debt (ln)** | **(5) Bank debt (ln)** | **(6) Bank debt (ln)** |
| | (0.342) | (0.341) | (0.341) | (0.344) | (0.343) | (0.346) |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 3140 | 3140 | 3140 | 3140 | 3140 | 3140 |
| Number of firms | 0.182 | 0.180 | 0.180 | 0.182 | 0.180 | 0.186 |
| *R*-squared | 612 | 612 | 612 | 612 | 612 | 612 |

*Note:* This table presents the results of a robustness test against potential selection bias issues by employing the two-stage Heckman procedure. Panel A presents the first stage of the Heckman probit model, which predicts the probability of a company being supported by a BA. Panel B presents the regression results of Equation (1), which tests the effect of BAs' support on companies' bank debt. The analysis addresses potential selection bias by incorporating the Inverse Mills ratio estimated from the Heckman first-stage regression. Panel C presents regression results of Equation (2), testing the effect of BAs' characteristics on companies' bank debt. The analysis addresses potential selection bias by incorporating the Inverse Mills ratio estimated from the Heckman first-stage regression. Significance levels: *10%, **5%, ***1%. Standard errors clustered at the firm level.

$$\begin{aligned}\text{Performance}_{it} = \alpha + \beta_1 * \text{Post}_t + \beta_2 * \text{Treated}_i + \beta_3 * \\ \text{Post}_t * \text{Treated}_i + \beta_4 * \\ \text{Bank Debt}_{it} + \beta_5 * \text{Post}_t * \text{Bank Debt}_{it} + \beta_6 * \text{Treated}_i * \\ \text{Bank Debt}_{it} + \beta_7 * \\ \text{Post}_t * \text{Treated}_i * \text{Bank Debt}_{it} + \beta_8 * \text{Firm controls}_{it} \\ + \beta_9 * \text{dyears} + \beta_{10} * f_i + \varepsilon_{it}\end{aligned} \quad (4)$$

In line with the existing literature on the performance of angel-backed companies (Kerr, Lerner, and Schoar 2014; Levratto, Tessier, and Fonrouge 2018), we adopted two alternative performance metrics—revenues and tangible assets—as our dependent variable. The model includes the individual variable *Bank Debt*$_{it}$ and all its interaction terms with the variables Post$_t$ and Treated$_i$ to capture the combined effect of BA intervention and bank debt on performance. Please refer to Equation (1) for the definitions of all other terms.

Our findings indicate that the performance of BA-backed companies (in terms of revenues and tangible assets) was not negatively affected by the increase in bank debt following the BA intervention. The results, consistent with the existing literature, also underscore the significant complexity of measuring the performance of growing/young companies with simple company variables or ratios (Bonini et al. 2019; Levratto, Tessier, and Fonrouge 2018). Results are reported in Columns 2 and 3 of Table 10.

### 5.3 | Bankrupt Firms

During the selected time horizon, some companies filed for bankruptcy in both the treated and control groups. To test the robustness of our results, we apply the same models only to companies that did not file for bankruptcy during the analyzed period. This smaller data set comprises 537 firms: 103 BA-backed firms (90.35% of the initial treated group) and 434 non-BA-backed firms (87.15% of the initial control group). The results of the complete models are presented in Column 1 of Table 11, with Panel A testing Equation (1) and Panel B testing Equation (2).

The findings are consistent with the primary analysis (see Section 4). For detailed results, please refer to Tables A4 and A5 in the Online Appendix.

### 5.4 | BA-VC Co-Investments

To accurately assess the impact of BAs' involvement on companies' bank financing, we initially excluded from our treated group those companies that secured BA funding through a syndicate involving a VC fund or received VC funding during the subsequent 3 years after BAs' support (see Section 3.1). To further test the robustness of our results, we expanded our treated group by including the 22 BA-backed companies excluded in the main analysis. This resulted in a new treated group comprising 136 companies. We estimated Equation (1) to test Hypothesis 1, and Equation (2) to test Hypotheses 2 and 3 in this larger data set. The results of the complete models are presented in Column 2 of Table 11, with Panel A testing Equation (1) and Panel B testing Equation (2). The findings are consistent with the primary analysis (see Section 4). For detailed results, please refer to Supporting Information S1: Tables A6 and A7.

### 5.5 | Alternative Definitions for the Dependent Variable

To further ensure the robustness of our findings, we estimated Equations (1) and (2) using alternative definitions of the dependent variable (*Bank Debt*$_{it}$). Specifically, we considered two variations: first, we employed a binary indicator to represent the presence or absence of bank debt; second, we employed the ratio of bank debt to total assets. The results from these alternative specifications are presented in Column 3 and 4 of Table 11, with Panel A testing Equation (1) and Panel B testing

**TABLE 10** | Robustness test: BAs' effect on financial risk and performance of backed companies.

| | (1) Bankruptcy | (2) Revenues (ln) | (3) Tangible assets (ln) |
|---|---|---|---|
| Post * Treated | −0.022 | −0.128 | 0.380*** |
| | (0.022) | (0.189) | (0.132) |
| Bank debt (ln) | 0.003 | 0.033 | 0.114*** |
| | (0.004) | (0.036) | (0.020) |
| Post * Bank debt (ln) | −0.007** | −0.001 | −0.004 |
| | (0.003) | (0.029) | (0.013) |
| Treated * Bank debt (ln) | −0.012 | −0.152 | 0.027 |
| | (0.008) | (0.094) | (0.042) |
| Post * Treated * Bank debt (ln) | 0.013 | 0.054 | −0.046 |
| | (0.008) | (0.076) | (0.036) |
| Revenues (ln) | −0.012*** | | 0.238*** |
| | (0.004) | | (0.021) |
| Cash flow | 0.000 | −0.000 | 0.000*** |
| | (0.000) | (0.000) | (0.000) |
| Total assets/equity | −0.000 | −0.001 | 0.001*** |
| | (0.000) | (0.000) | (0.000) |
| Total assets (ln) | −0.017* | 0.997*** | |
| | (0.009) | (0.087) | |
| Firm age (ln) | 0.021 | 1.439*** | 0.660*** |
| | (0.036) | (0.296) | (0.139) |
| Constant | 0.054 | −1.638* | 3.051*** |
| | (0.046) | (0.910) | (0.258) |
| Year FE | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes |
| Observations | 3140 | 3140 | 3140 |
| Number of firms | 612 | 612 | 612 |
| *R*-squared | 0.093 | 0.402 | 0.466 |

*Note:* This table presents regression results from Equation (3) in Column 1 and Equation (4) in Columns 2 and 3. Equation (1) examines the effect of BA intervention and bank debt on companies' likelihood of financial distress. Equation (4) analyzes the effect of BA intervention and bank debt on company performance. Two alternative performance metrics are used: *Revenus (ln)* and *Tangible assets (ln)*. The individual variables $Post_t$ and $Treated_i$ are not reported. Significance levels: *10%, **5%, ***1%. Standard errors clustered at the firm level.

Equation (2). In both instances, the results align with the original findings reported in Section 4. For detailed results, please refer to Supporting Information S1: Tables A8–A11.

## 6 | Conclusions and Suggestions for Future Research

In this study, we investigated whether and how the intervention of BAs played a positive role in the subsequent backed companies' funding strategies, with a particular focus on bank debt. Our analysis relied on a unique data set of Italian companies that received their first BA round in the period 2010–2018. We found evidence that, compared to a matched control group of Italian ventures that did not receive any financing from BAs, BAs' support facilitated backed companies' follow-on bank financing. Additionally, we document the positive effects of the characteristics associated with both BAs' human capital (entrepreneurial experience) and their investment practices (soft monitoring).

We argue that BAs' involvement, with their value-added contribution, improves SMEs' skills and strategic capabilities in developing a successful business model. This, in turn, reduces the operating and information risks perceived by banks and improves the SMEs' bank financing.

This study deepens our understanding of the interplay between different finance providers within the entrepreneurial ecosystem, demonstrating that BAs facilitate young companies' access to follow-on bank debt financing in addition to equity financing. It also adds to the current research on the translation and impact of value-added benefits provided by BAs, suggesting a complementary relationship between BAs and banks. In this

**TABLE 11** | Additional robustness tests: sub- and extended sample analysis, alternative definitions for the dependent variable.

| | *Removing bankrupt firms* | *Adding BA-VC co-investments* | *Alternative definitions for the dependent variable* | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Bank debt (ln) | Bank debt (ln) | Bank debt (yes/no) | Bank debt/total assets |
| *Panel A. Testing Equation (1)* | | | | |
| $Post_{all\ years}$ * Treated | 0.816*** | 0.770*** | 1.551*** | 0.074*** |
| | (0.217) | (0.190) | (0.431) | (0.017) |
| Revenues (ln) | −0.005 | 0.013 | 0.236*** | 0.002 |
| | (0.031) | (0.027) | (0.048) | (0.002) |
| Cash flow | 0.000 | −0.000 | −0.000 | −0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Total assets/equity | −0.000 | −0.000 | −0.001 | −0.000 |
| | (0.000) | (0.000) | (0.001) | (0.000) |
| Total assets (ln) | 0.534*** | 0.486*** | 0.601*** | |
| | (0.079) | (0.070) | (0.087) | |
| Firm age (ln) | 0.832*** | 0.802*** | 0.568* | 0.094*** |
| | (0.272) | (0.247) | (0.318) | (0.026) |
| Constant | −4.506** | −4.575** | −7.930*** | −0.185 |
| | (2.291) | (2.297) | (2.291) | (0.135) |
| Year FE | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes |
| Observations | 2767 | 3255 | 3140 | 3140 |
| Number of firms | 537 | 634 | 612 | 612 |
| R-squared | 0.191 | 0.184 | 0.098 | 0.050 |
| *Panel B. Testing Equation (2)* | | | | |
| Post * Treated | 0.449 | 0.060 | −0.049 | 0.049* |
| | (0.309) | (0.280) | (0.889) | (0.026) |
| Post * Treated * BA entrep exp | 0.713*** | 0.454** | 1.300* | 0.065*** |
| | (0.225) | (0.193) | (0.685) | (0.019) |
| Post * Treated * BA education lev | 0.245 | 0.008 | −0.411 | 0.009 |
| | (0.227) | (0.195) | (0.679) | (0.020) |
| Post * Treated * BA network memb | −0.280 | −0.079 | 0.643 | −0.039** |
| | (0.221) | (0.189) | (0.672) | (0.019) |
| Post * Treated * BA soft monitoring | 0.524** | 0.804*** | 1.519** | 0.047** |
| | (0.249) | (0.212) | (0.684) | (0.021) |
| Post * Treated * BA geogr proximity | −0.363 | −0.024 | 0.356 | −0.008 |
| | (0.246) | (0.212) | (0.716) | (0.020) |
| Post * Treated * BA coinvestors | −0.027 | −0.004 | −0.164 | −0.011*** |
| | (0.047) | (0.039) | (0.146) | (0.004) |

(Continues)

**TABLE 11** | (Continued)

| | *Removing bankrupt firms* (1) | *Adding BA-VC co-investments* (2) | *Alternative definitions for the dependent variable* (3) | (4) |
|---|---|---|---|---|
| | **Bank debt (ln)** | **Bank debt (ln)** | **Bank debt (yes/no)** | **Bank debt/total assets** |
| Revenues (ln) | −0.005 | 0.010 | 0.218*** | 0.002 |
| | (0.022) | (0.020) | (0.048) | (0.002) |
| Cash flow | 0.000 | −0.000 | −0.000 | −0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Total assets/equity | −0.000** | −0.000** | −0.001 | −0.000*** |
| | (0.000) | (0.000) | (0.001) | (0.000) |
| Total assets (ln) | 0.520*** | 0.473*** | 0.596*** | |
| | (0.045) | (0.040) | (0.087) | |
| Firm age (ln) | 0.718*** | 0.675*** | 0.612* | 0.084*** |
| | (0.214) | (0.196) | (0.318) | (0.017) |
| Constant | −4.547*** | −4.647*** | −7.988*** | −0.203*** |
| | (0.755) | (0.739) | (2.250) | (0.065) |
| Year FE | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes |
| Observations | 2767 | 3255 | 3140 | 3140 |
| Number of firms | 537 | 634 | 612 | 612 |
| *R*-squared | 0.198 | 0.191 | 0.101 | 0.060 |

*Note:* This table presents the results of additional robustness checks conducted to validate the findings of the primary analysis. Column 1 applies our models to a smaller data set of firms that did not file for bankruptcy during the analyzed period. Column 2 conduct the analysis using a larger data set of treated firms that have received support from BAs as well as from BA-VC co-investments. Columns 3 and 4 test alternative metrics for our dependent variable, namely a binary indicator (yes/no) representing the presence of bank debt and the ratio bank debt over total assets. Panel A presents the regression results of Equation (1), which tests the effect of BAs' support on companies' bank debt. Panel B presents regression results of Equation (2) testing the effect of BAs' characteristics on companies' bank debt. All BA variables are defined in Table 3. The individual variables $Post_t$, $Treated_i$, $BA's\ characteristics_i$, along with the dual interaction terms $Post_t$ * $BA's\ characteristics_i$, $Treated_i$ * $BA's\ characteristics_i$, are not reported. Significance levels: *10%, **5%, ***1%. Standard errors clustered at the firm level.

dynamic, BAs play a pivotal role in fostering stable and effective long-term bank-firm lending relationships within the start-up ecosystem. Moreover, from a policy perspective, this study reveals that the informal VC market is a valid tool for improving the efficiency of the credit market and that further incentive schemes could be developed to enhance both BAs' investments and start-up financing.

Our study is not without limitations. The most notable one is that we cannot completely rule out the problem of selection versus value-added effect (e.g., Bertoni, Colombo, and Grilli 2011; Chemmanur, Krishnan, and Nandy 2011; Croce, Martí, and Murtinu 2013). While the two-stage Heckman procedure helps address this issue, the lack of random assignment of BAs to firms prevents a definitive causality assessment, as we do not have a natural experiment providing a clearly exogenous test. Secondly, our analysis is based on data from only one European country, Italy, which may limit the generalizability of our findings. The heterogeneity of the banking industry within different countries affects ventures' bank financing, and it is reasonable to expect that country-specific factors may also influence the role of BAs as catalysts for bank financing. Thirdly, due to data constraints, we were not able to capture in-depth characteristics of bank-financing contracts, such as applied interest rates, maturity, and presence of collaterals, nor to distinguish between different types of contracts like overdrafts, bridge loans, factoring, leasing, and commercial mortgages.

Several areas for future research areas arise from these limitations. Future studies could extend the results to other countries, considering the heterogeneity of the banking industry and its impact on ventures' bank financing. Additionally, research could explore the detailed characteristics of bank-financing contracts and distinguish between various types of financing agreements. Further investigation is needed to understand the long-term effects of BA involvement and the potential impact of BA disinvestment on companies' bank debt levels. Finally, future research could consider the differential contribution provided by other BAs' characteristics or affiliation to heterogeneous forms of angel investment organizations (such as clubs, groups, or syndicates) and their interplay with bank financing decisions.

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### Conflicts of Interest

The authors declare no conflicts of interest.

### Data Availability Statement



### Endnotes

[1]Within the Italian context, IBAN is the reference trade association for private investors, regional BA networks, and investor clubs/groups.

[2]A full description of the survey procedure is provided by Bonini et al. (2018).

[3]Analisi Informatizzata Delle Aziende Italiane—Bureau Van Dijk Electronic Publishing (AIDA-BVD). The financial data are provided by Honeyvem (www.honeyvem.it), which acquires and revises the annual reports deposited in the Italian Chambers of Commerce. For each company, AIDA includes in a single document the figures of the previous 10 years or less depending on availability, and adds information on shareholdings and management for the first 20,000 Italian firms.

[4]Zephyr—Bureau Van Dijk is one of the most comprehensive databases of deal information and contains information on M&A, IPO, BA, VC, and private equity deals. Given its extensive coverage of European deals, it has been utilized in numerous entrepreneurial finance studies (e.g., Capizzi, Croce, and Tenca 2022; Croce, Martí, and Murtinu 2013).

[5]Crunchbase is an online database on start-ups managed by TechCrunch and contains information on investments and funding rounds. Crunchbase data have been employed in several studies in entrepreneurial finance (e.g., Capizzi, Croce, and Tenca 2022; Cumming, Meoli, and Vismara 2019; Cumming, Walz, and werth 2016).

[6]PSM equates the treatment and comparison groups by using a balancing score computed on observed pretreatment characteristics. Propensity score methods are now common in social science research; for a similar procedure in the entrepreneurial-finance literature, see Croce et al. (2021), Croce and Martí (2016), Croce, Martí, and Murtinu (2013), Puri and Zarutskie (2012), and Chemmanur, Krishnan, and Nandy (2011).

[7]Previous research has provided evidence on the effects of local banking development on new firms' debt financing (Deloof, La Rocca, and Vanacker 2019).

[8]We have selected a threshold of 150 km as the maximum reasonable daily commutable distance. Notably, our results would remain consistent when considering different threshold values. Supporting Information S1: Table A1 displays the results of Equation (2) across a range of threshold values for the proximity variable, increasing from 25 to 200 km in increments of 25 km.

[9]The predicted mean level for the response variable is computed by substituting the sample means of the independent variables into the model estimated in column 1 of Table 6.

[10]It measures the proportion of intangible assets to total tangible assets on a company's balance sheet. Total tangible assets have already been used in previous entrepreneurial finance literature (e.g., Levratto, Tessier, and Fonrouge 2018).

[11]It represents the ratio between the number of BAs located in the region where the company is based and the total number of SMEs operating within that specific region.

[12]Our data set shows a nonsignificant correlation of -0.0299 between the *Intangible ratio* and *Bank debt*. Furthermore, regression analysis on the determinants of bank debt (refer to Supporting Information S1: Table A3) indicates that this ratio does not significantly predict bank debt levels among the companies in our data set. These results support our initial assertion regarding the validity of the Intangible ratio as an instrument in our Heckman model.

[13]Logarithmic transformations were performed using the $\ln(x+1)$ function, where $x$ represents the variable of interest.

[14]The Mann–Whitney U test (also called the Wilcoxon–Mann–Whitney test) is a nonparametric statistical test employed to assess differences between two groups on a single variable with no specific distribution. It tests the null hypothesis $H_0$ that there is no difference between the distributions of the variable between the two groups.

[15]Given that the dependent variable, bank debt, is log-transformed, the economic impact of the $i$th independent variable is computed differently depending on whether the independent variable is log-transformed or non-log transformed. For non-log transformed independent variables, the economic impact is computed as $e^{(\hat{\beta}_i * \sigma_i)} - 1$, where $\hat{\beta}_i$ is the estimated coefficient and $\sigma_i$ is the sample standard deviation. Conversely, for log-transformed independent variables, the economic impact is computed as $\left(\frac{\mu_i + \sigma_i}{\mu_i}\right)^{\hat{\beta}_i} - 1$, where $\mu_i$ is the sample mean.

[16]For non-log transformed independent variables the $z$-score is computed by deriving the multiplier $n$ from the following equation $e^{(\hat{\beta}_i * n * \sigma_i)} - 1 = 119\%$. For log-transformed independent variables the $z$-score is computed by deriving $n$ from the following equation $\left(\frac{\mu_i + n * \sigma_i}{\mu_i}\right)^{\hat{\beta}_i} - 1 = 119\%$.

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## Supporting Information

Additional supporting information can be found online in the Supporting Information section.