The Differential Role of Business Angels and Crowd-investors on Entrepreneurial Ventures' Borrowing Decisions

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Abstract
This paper investigates the differential impact of Business Angels (BAs) and Crowd Investors (CIs) on the ability of early-stage ventures to obtain bank debt. We further examine how bank financing influences subsequent venture growth, depending on the type of equity financing received. Using a sample of 6,774 European ventures from PitchBook, we find that BA-backed ventures experience a significantly smaller increase in bank debt levels in the post-investment period compared to CI-backed ventures. Nevertheless, the marginal effect of debt on subsequent growth is significantly higher for BA-backed ventures, confirming the positive role of BAs in fostering the efficient use of venture debt. In additional analyses, we also show that this enhanced growth effect of debt is driven by BAs with focused portfolios and small syndicate investments, rather than by their investment experience. Our results contribute to the literature on investor heterogeneity and venture performance, underscoring that the non-monetary, value-added contributions of sophisticated investors are key determinants of an optimal capital structure and the growth effects generated by the efficient use of bank debt.

Keywords. Business Angels; Crowd-investors; bank debt; debt productivity; venture growth.
JEL classification: G24, G32, M13.

1. Introduction

Business Angels (BAs, hereafter) and Crowd-investors (CIs, hereafter) represent two distinct and increasingly prevalent sources of external equity financing for early-stage ventures. BAs are typically high net worth individuals who invest their personal wealth in promising entrepreneurial ventures, often taking minority equity stakes and providing active post-investment support (Mason, 2006; Politis, 2008). In contrast, CIs in equity crowdfunding campaigns are typically numerous, diffuse

investors contributing modest individual capital sums via online platforms, characterized by limited direct post-investment involvement (Belleflamme et al., 2014). Both investor types provide an alternative to traditional institutional financing, such as Venture Capital, and target ventures at early developmental stages that often face constraints in accessing traditional financial channels (Block et al., 2018; Bonini and Capizzi, 2019).

Previous research has extensively examined the role of BAs in the ventures they fund, highlighting both their financial support and their valuable non-financial contributions such as mentorship, strategic guidance, and access to networks (Månsson and Landström, 2006; Politis, 2008; 2016; Avdeitchikova and Landström, 2016; Bonini et al., 2018; 2019; Capizzi et al., 2022). Conversely, CIs are typically characterized by a more hands-off approach, offering limited advisory and strategic involvement in the post-investment phase (Hornuf and Schwienbacher, 2018). While both investor types inject equity into early-stage ventures, the differences in their engagement styles as well as financial expertise (Butticè et al., 2025) raise important questions about how they influence ventures' follow-on performance and capital structure.

This paper contributes to this literature by examining the differential impact of BAs versus CIs on a venture's ability to secure bank debt in the post-investment period. We further examine how bank financing influences subsequent venture growth, depending on the type of equity financing received. Bank debt remains a crucial funding source for small ventures, including those already backed by external equity investors. BA and crowd-backed ventures tend to be smaller, exhibit relatively slower growth, but demonstrate greater resilience, leading to a higher dependence on debt compared to ventures typically funded by VC (Hellmann et al., 2021; Croce et al., 2021; Capizzi et al., 2025). However, the effective utilization of debt is contingent upon the venture's ability to manage its repayment obligations and allocate capital efficiently. Prior studies have emphasized the challenges and potential of debt financing for startups (Cassar, 2004; Cosh et al., 2009; Deloof and Vanacker, 2018; Hanssens et al., 2016; Robb and Robinson, 2014). Concurrently, some literature suggests that the presence of external equity investors enhances a venture's credibility and financial discipline,

thereby improving its debt-servicing capacity (Capizzi et al., 2025). It is, therefore, critical to identify the factors that enable ventures to effectively secure and utilize debt for expansion. The mismanagement of borrowed funds can lead to foregone valuable investment opportunities, place strains on debt repayment, and ultimately undermine venture growth.

In this context, the involvement of sophisticated external equity investors, such as BAs, and CIs, may be a key determinant of the venture's ability to efficiently utilize bank debt, thereby enhancing subsequent performance. It is plausible that the more engaged and experienced profile of BAs helps mitigate the agency costs of debt, thereby promoting more efficient access to, and subsequent utilization of, borrowed capital compared to CIs. However, CIs may also exert monitoring and provide value, particularly when specific governance structures – such as the lead investor nominee model – are implemented to facilitate oversight and coordination (Coakley et al., 2025). Nevertheless, ventures backed by BAs and those financed through equity crowdfunding may also differ systematically in their underlying financial structures and leverage profiles. These differences can influence both their capacity to access bank debt and the ways in which they deploy such debt to support growth. For instance, variations in capital intensity, asset tangibility, or pre-investment outstanding liabilities may shape lenders' risk assessments and entrepreneurs' incentives regarding debt usage.

We empirically test these propositions using a difference-in-differences (DiD) methodology on a sample of 6,774 European ventures backed either by BAs or CIs, with data sourced from Pitchbook. First, we observe that BA- and CI-backed ventures display similar levels of debt and leverage prior to investment. After funding, both groups increase their leverage; however, the magnitude of this increase is significantly smaller for BA-backed ventures. This suggests that BAs do not accelerate debt accumulation compared to CIs. Second, BA-backed ventures appear more effective in converting debt into post-investment growth compared to CIs, confirming the positive role of BAs in fostering the efficient use of venture debt. We perform a series of additional analyses to better explore this phenomenon and notably, we show that this enhanced debt productivity is primarily associated with

more focused angel investors – those investing individually or in small syndicates with limited active portfolios – while the BAs' investment experience appears less influential.

Our study contributes to the emerging literature on investor heterogeneity and its effect on venture performance (Block et al., 2018; Bonini et al., 2019; Hornuf and Schwienbacher, 2018). By directly comparing BAs and CIs, we provide new insights into how distinct investor types differentially influence both the accumulation and the effective utilization of debt.

Our research also contributes to the extant literature on the impact of non-monetary value-added contribution provided by equity investors (Politis, 2016; Bonini et al., 2019; Croce et al., 2021; Butticè et al., 2021; Capizzi et al., 2022), highlighting how specific investor characteristics influence post-investment venture growth by shaping their capital structure.

The remainder of the paper is structured as follows. Section 2 develops the theoretical background and research domain. Section 3 presents the methodology and sample construction. Section 4 provides the results of the empirical analysis and robustness tests. In Section 5, we conclude discussing the contributions, directions for future research and implications of our study.

2. Theoretical background and research questions

External equity investors play a central role in entrepreneurial finance, particularly for early-stage ventures that face significant financial constraints and barriers to traditional debt financing, often stemming from their well acknowledged high informational opacity. Beyond the provision of capital, these investors materially influence a venture's strategic, operational, and financial decisions. This influence extends directly to their capital structure choices and, specifically, their capacity to acquire and productively utilize debt capital. The nature and extent of this influence, however, are contingent upon the investors' governance model, their level of active involvement, and the specific non-monetary resources they contribute to the venture.

Equity crowdfunding represents a "democratized" financing model, characterized by a large, diffuse base of typically non-professional investors (Ahlers et al., 2015; Drover et al., 2017; Cumming et al.,

2021; Vu and Christian, 2023). This dispersed ownership structure inherently creates a collective action problem regarding post-investment governance. Consequently, early studies documented that the engagement of CIs tends to be low (Ahlers et al., 2015; Vulkan et al., 2016), implying a limited capacity for this investor class to provide active strategic guidance or ex-post monitoring. However, more recent studies have challenged this purely passive view, demonstrating that under specific institutional conditions, CIs can assume more active governance roles. For instance, the presence of professional or accredited co-investors in a campaign enhances the quality of ex-ante due diligence and post-investment oversight (Cumming et al., 2019; Wang et al., 2019).

Furthermore, platforms often implement specific governance structures, such as the lead investor nominee model, to provide a formal channel for CI engagement. These models function to mitigate the aforementioned collective action problem by centralizing investor representation and reducing coordination costs (Coakley et al., 2025; Meoli and Vismara, 2021; Vismara, 2018). Equity CI platforms such as Crowdcube and Seedrs, for example, have adopted such models, granting special privileges and monitoring responsibilities to designated lead investors. These governance mechanisms serve to align the interests of entrepreneurs and the diffuse base of CIs. This is particularly effective in campaigns where lead investors commit substantial personal capital, as their own financial stake incentivizes them to engage in rigorous, long-term monitoring (Cumming et al., 2021; Kleinert et al., 2020). Thus, while CIs are generally passive, the implementation of structured governance can increase their involvement, subsequently influence venture development and enhance follow-on venture performance (Butticè et al., 2020; 2021).

In stark contrast, BAs are widely recognized for their "hands-on" governance and for providing both financial and non-financial value (Kelly, 2009). The extant entrepreneurial finance literature has extensively investigated the active role BAs play and their subsequent impact on venture performance (Kerr et al., 2014; Lerner et al., 2018; Levratto et al., 2018; Bonini et al., 2019; Cumming and Zhang, 2019; Blaseg and Hornuf, 2023). This value-add extends far beyond their capital investment. BAs contribute critical non-monetary resources, including deep industry expertise, prior entrepreneurial

and managerial experience, active mentorship, reputational capital, and access to proprietary networks (Månsson and Lanström, 2006; Politis, 2008; 2016; Avdeitchikova and Landström, 2016; Bonini et al., 2018; 2019; Capizzi et al., 2022). Leveraging on both the human and social capital provided to ventures in the post-investment phase, the involvement of BAs is highly valuable, inducing them to make more effective use of their resources and achieve better performance. This value-added contribution manifests in tangible functions played by BAs. These include: (i) an advisory function, facilitating access to external resources (Ehrlich et al., 1994; Madill et al., 2005; Sætre, 2003; Sörheim, 2003), establishing contacts with key business stakeholders (Paul et al., 2007), and assisting with executive recruitment (Ardichvili et al., 2002; Brettel, 2003; Prowse, 1998; Wong et al., 2009); (ii) a signaling function, whereby their involvement facilitates subsequent financing rounds (Ardichvili et al., 2002; Harrison and Mason, 2000; Madill et al., 2005; Paul et al., 2007; Prowse, 1998; Sörheim, 2003; Wong et al., 2009, Capizzi et al., 2022), and provides access to loans and guarantees (Prowse, 1998; Block et al., 2017; Capizzi et al., 2022; Capizzi et al., 2025); and (iii) a monitoring function. BAs perform active monitoring, such as gathering information through board positions (Prowse, 1998), overseeing strategy (Mason and Harrison, 1996), and monitoring financial and operational performance (Ehrlich et al., 1994; Stedler and Peters, 2003).

While prior research has explored the value-added contributions of BAs and CIs to entrepreneurial ventures, limited attention has been paid to their comparative influence on ventures' debt dynamics and post-funding outcomes. Specifically, the literature has not systematically compared how CI- versus BA-backing differentially affects a venture's capacity to secure bank debt post-investment. Furthermore, it remains an open empirical question about how these distinct investor types possibly moderate the relationship between debt financing and subsequent venture growth. This research gap is particularly relevant considering the well-documented information asymmetries that small, early-stage companies face when seeking external finance (Berger and Udell, 1998). Due to their informational opacity, entrepreneurial ventures often struggle to secure debt on favorable terms, frequently facing credit rationing. While banks, as relationship lenders, are generally more capable

than bondholders of mitigating these *ex-ante* information asymmetries (adverse selection) by collecting and processing both hard and soft information (Broecker, 1990; Boot, 2000; Petersen and Rajan, 2002), the concession of credit introduces significant agency problems related to ex-post information asymmetries. In fact, the borrower (agent) may engage in moral hazard, such as risk-shifting (asset substitution) or underinvestment, which expropriates value from the lender (principal) and can ultimately hinder efficient venture growth (Jensen and Meckling, 1976; Myers, 1977; Diamond, 1984; Gale and Hellwig, 1985; Jensen, 1986; Holmstrom and Tirole, 1997).

Accordingly, this paper posits that external equity investors, such as BAs and CIs, play a pivotal role in this dynamic. Their presence can shape not only the access to debt but, more importantly, the productivity of debt as it translates into venture performance. We argue that, through their distinct monitoring and advisory functions, these investors act as a governance mechanism to mitigate the agency costs of debt, thereby enhancing its effectiveness. However, differently from CIs, BAs are more sophisticated and engaged equity investors, and, leveraging on their previous selection and due diligence activities, they can provide a certification effect, reducing the bank's *ex-ante* screening costs. More importantly, their *ex-post* monitoring reduces the entrepreneur's incentive for moral hazard, aligning the interests of all capital providers and promoting the efficient allocation of borrowed funds. As such, given the significant heterogeneity in the governance and involvement levels of BAs and CIs, this study directly investigates whether and how these two investors differentially contribute to an efficient and growth-oriented utilization of debt.

3. Methodology

3.1. Sample construction and data

Our primary data on angel and crowd backed ventures are sourced from PitchBook, one of the most comprehensive databases in entrepreneurial finance. PitchBook provides two key advantages compared to alternative data sources. First, it captures private equity investments throughout the full

venture lifecycle, including smaller deals, which allows for comprehensive coverage of early-stage and angel investments. Second, it offers granular detail on investor attributes—such as their profiles, backgrounds, and both current and past investment portfolios (Pelucco and Vismara, 2025). Our sample construction strategy proceeds in several stages. First, we select all investment rounds labeled as "Angel (individual)," "Seed Round," "Early Stage VC," and "Later Stage VC" completed by investors labelled as "Angel (individuals)" for BA deals and all investments labelled as "Equity Crowdfunding" for CI deals. The observation window spans from January 2006 (the foundation of Pitchbook) to December 31st, 2021. We conclude the event window in 2021 to ensure a sufficient post-investment period for observing our dependent variables. Second, to explore the effect of investors' support, we focus on the first instance each venture received either a BA or CI investment. This event represents a significant, and plausibly quasi-exogenous, shock to the venture's governance structure, monitoring environment, and external certification. It thus provides an ideal setting to analyze subsequent changes in the venture's financial and investment patterns (Capizzi et al., 2022). Third, we focus on ventures operating in Europe and we only select investments for which data on the country, the industry and the age of the invested venture were available. Moreover, we exclude ventures for which we could not retrieve accounting data from Moodys' Orbis database. Finally, to isolate a clean treatment effect and avoid the confounding influence of mixed governance models, we exclude ventures that received financing in syndication between BAs and crowdfunding platforms. This selection procedure yields an unbalanced panel of 40,452 company-year observations, corresponding to 6,774 unique ventures. For each venture, we require at least one observation before the first BA or CI investment to establish a pre-treatment baseline. We then observe accounting information for each venture for a minimum of two subsequent years, with the panel extending to 2024. Of these 6,774 ventures, 4,615 (68%) are BA-backed, while the remaining 2,159 (32%) are CI-backed.

3.2. Estimation strategy and variables

Our empirical analysis proceeds in two parts. First, we investigate the differential impact of investor type on the evolution of venture debt. Secondly, we examine the productivity of debt in favouring venture growth according to different investor types.

3.2.1 Analysis 1: Investor Type and Debt Dynamic

The first part of our analysis compares the evolution of bank debt in BA-backed versus CI-backed ventures. We employ a difference-in-differences (DiD) estimation strategy as our primary identification framework. This approach allows us to compare the change in debt levels (pre- versus post-investment) for the treatment group (BA-backed ventures) to the change in debt levels over the same period for the control group (CI-backed ventures). The DiD is well-suited for this analysis because it is designed to isolate the causal effect of investor type on venture debt growth by controlling for confounding factors. Specifically, our model, which includes two-way fixed effects, accounts for all time-invariant, venture-level unobserved heterogeneity (μ_i). This specification controls for confounding factors such as the venture's business model, founder quality, or time-invariant industry characteristics that might simultaneously influence both the selection of an investor type and the venture's baseline preference for debt and leverage. Furthermore, the inclusion of year fixed effects (δ_t) absorbs common macroeconomic shocks or credit market trends that affect all ventures in a given year. The key identifying assumption of our DiD model is that of parallel trends, meaning that in the absence of the "treatment" (i.e., BA-backing), the debt trajectories of BA- and CI-backed ventures would have evolved similarly. Our DiD model thus helps control for pre-existing trends, ensuring that observed differences are not merely artifacts of diverging paths prior to the investment.

Formally, we estimate the following estimation model:

$$Debt_{i,t} = \beta_1 Debt_{i,t-1} + \beta_2 Post_t + \beta_3 Post_t * BA_i + \gamma X_{i,t} + \mu_i + \delta_t \ + \ \varepsilon_{i,t} \qquad (1)$$

Where, as dependent variable, $Debt_{i,t}$, is proxied either by the natural logarithm of the bank debt or debt ratio (i.e. the ratio between bank debt and total assets), measured on an annual basis. The main

explanatory variables are: a post-investment indicator ($Post_t$), i.e. a dummy variable taking value 1 in the post-investment period, BA_i a dummy indicating whether the venture is backed by a BA[1], and their interaction. The coefficient β_3 of the interaction term is particularly interesting in our setting as it captures the *differential* effect of BA backing on debt levels after the investment, relative to ventures funded by CI. Notably, if we want to estimate the impact of BA financing on the debt of invested venture, it is necessary to estimate the sign and the significance of the sum of $\beta_2 + \beta_3$, providing the marginal effect of BA-backing on venture bank debt after the investment.

In Equation (1), as further controls we include the lagged value of debt ($Debt_{i,t-1}$),; $X_{i,t}$ is a vector of time-varying venture-level control variables; μ_i are venture fixed effects; δ_t are time fixed effects; and $\varepsilon_{i,t}$ is the error term. The control variables in $X_{i,t}$ include: the lagged value of the ratio between cash and cash equivalents on total assets as proxy for the venture's liquidity position (Cash Ratio$_{it-1}$); the lagged value of the ratio between tangible assets to total assets, which captures the availability of collateral that can support debt financing (Tangible Ratio$_{it-1}$); the natural logarithm of venture age (ln(Age)$_{it}$), which accounts for maturity and venture track record and venture size measured by the lagged value of the natural logarithm of total assets ($Size_{i,t-1}$); and a set of year dummies included to control for macroeconomic shocks and time-specific effects that may influence debt levels across all ventures.

3.2.2 Analysis 2: Investor Type and the Productivity of Debt

In the second part of our analysis, we examine whether BAs contribute to a more efficient use of bank debt by their investee ventures, compared to ventures backed by CIs. To empirically verify this, we employ a difference-in-differences-in-differences (DiDiD) framework. This triple-difference model allows us to test a conditional hypothesis: does the marginal effect of debt on venture growth (the first difference) change after the investment (the second difference), and does this change differ

[1] This coefficient is not estimated in our model as it is time-invariant and thus included in firm fixed effects.

between BA-backed and CI-backed ventures (the third difference)? The dependent variable is venture growth, measured by the growth of total assets. Formally:

$$Size_{i,t} = \beta_1 Size_{i,t-1} + \beta_2 Debt_{i,t-1} + \beta_3 Post_t + \beta_4 Post_t * BA_i + \beta_5 Debt_{i,t-1} * Post_t +$$

$$\beta_6 Debt_{i,t-1} * BA_i + \beta_7 Debt_{i,t-1} * Post_t * BA_i + \gamma X_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \qquad (2)$$

Where, $Size_{i,t}$ is the natural logarithm of total assets for venture i at time t; while the independent variables have already been defined in Equation (1).

This model allows us to test whether BAs contribute to a more effective use of debt—in terms of post-investment growth measured by the increase in total assets—relative to CIs. More in details, β_7, the coefficient on the triple interaction term $Debt_{i,t} * Post_t * BA_i$, captures the DiDiD estimate, testing whether *differential* effect of debt on size after the investment for BA-backed ventures compared to CI-backed ones.

Notably, as to estimate the marginal effects of debt on venture size, according to the type of investors, it is necessary to estimate the sign and the significance of different linear combinations of the estimated coefficients. More in details, for CI-backed companies, β_2 represents the effect of debt on size before the investment (BA=0 post=0), while the sum of $\beta_2 + \beta_3 + \beta_5$, provides the marginal effect of debt on venture size for CI-backed ventures after the investment (BA=0 post=1). For BA-backed, the marginal effect of debt before the investment is given by $\beta_2 + \beta_6$ (BA=1 post=0), while the relationship between debt and venture size after the entry of BA in the equity capital of the invested venture is estimated by $\beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6 + \beta_7$ (BA=1 post=1).

In all estimates, we used OLS regression models with venture and year fixed effects to ease interpretation of the interaction coefficients[2].

The coefficients in linear DiD and DiDiD models directly provide an estimate of the average differential effect.

[2] We resort to OLS estimates even in Equation (1) when resorting, as dependent variable, to the debt ratio as proxy of Debt, even though it is expressed as a ratio bounded between 0 and 1. In unreported estimates we resort to fractional logit estimation for this model obtaining qualitatively similar results. These results are omitted in the text for the sake of brevity but are available from the authors upon request.

Table 1 provides comprehensive definitions for all variables employed in the analysis, while Table 2 reports summary statistics. Panel B, C and D of Table 2 report the regional and industry distribution, and the age at first funding, respectively. Table A1 in Appendix report the correlation matrix.

[Insert Tables 1 and 2 here]

4. Results

4.1. Univariate analysis

Table 3 compares key venture characteristics between CI-backed and BA-backed ventures before (Panel A) and after (Panel B) the first equity investment. Before funding, CI-backed ventures are significantly larger in terms of total assets and hold slightly more debt compared to BA-backed ventures (even if this difference is only significant at the 10% confidence level). Interestingly, in terms of debt ratio the difference in the pre-investment phase is not significantly different between CI-backed and BA-backed ventures, this suggesting that, net of size effect, the debt orientation does not significantly differ before the investment among the two groups. We also report statistics comparing the annual growth rate of debt among the two groups: notably, the growth rate of debt in the pre-investment phase is statistically indistinguishable between the two groups, which provides support for the parallel trends assumption required by our DiD methodology. CI-backed ventures are younger on average and exhibit significantly lower cash ratios, suggesting that these ventures may enter their first equity funding round with weaker pre-existing liquidity positions than BA-backed ones. Finally, the tangible asset ratio – a key proxy for collateral base – is nearly identical across the two groups.

After the first investment, the descriptive patterns reverse. BA-backed ventures become significantly larger and carry higher level of debt, indicating stronger access to bank financing. In terms of debt ratio, the difference between the two groups remains not statistically different, while, as to annual debt growth, BA-backed ventures also show higher debt growth level. Moreover, while cash ratios remain significantly higher for BA-backed ventures, the difference is reduced in economic terms,

respect to the difference estimated before the investment. BA-backed ventures also display lower post-investment asset tangibility, potentially reflecting a shift toward more intangible-heavy growth models or a reduced reliance on collateral for securing debt, consistent with the signaling and monitoring arguments surrounding our research hypotheses. Overall, these univariate post-investment patterns suggest that BA involvement may be associated with greater venture scaling and increasing use of debt.

[Insert Table 3 here]

4.2. Multivariate analysis

4.2.1. Effect of BA and CI on debt levels

We estimate Equation (1), by resorting to a DiD estimation. Table 4 reports the estimates on the effect of BA versus CI backing on debt growth, using two specifications: Debt level, i.e. the log of total debt (Column 1) and Debt Ratio, i.e. the debt-to-assets ratio (Column 2) as dependent variables. In both models, lagged debt levels are strongly persistent, as indicated by the highly significant and positive coefficients of lagged dependent variables. Among the other control variables, size has a positive effect on debt level but a negative effect on the ratio: as expected—larger ventures take on more debt in absolute terms, but not necessarily relative to their assets. A higher cash ratio reduces debt level and debt ratio, consistent with the idea that more liquid ventures rely less on external borrowing. Tangibility increases debt levels (though not significantly affecting debt ratio), and older ventures show higher debt ratio but not significant effect on debt level.

As to our principal independent variables, the coefficient of $Post_t$ is positive and statistically significant, indicating that the post-investment period for CI-backed ventures, is associated with a significant increase in the level of debt (Column 1), but not in the debt ratio (Column 2), suggesting that CI-backed ventures increase debt in line with asset growth. In other words, while CI-backed ventures increase their debt level after receiving the investment, this does not necessarily translate into higher leverage, likely because their asset base grows concurrently.

More interestingly, as to the difference between BA and CI-backed ventures, the interaction term $Post_t$*BA_i shows a negative and significant coefficient in Column 1: this result suggests that the increase in debt level after the investment is lower in BA-backed ventures than for CI-backed ones. As described in Section 3.2, if we aim to estimate the change in debt level for BA-backed ventures after the investment, we need to estimate the linear combination of $Post_t$*BA_i and $Post_t$ coefficients that is not statistically different from zero. This result indicates that BAs do not significantly alter the trajectory of debt growth for their investee ventures following their investment, whereas CI-backed ventures do experience a statistically significant post-investment increase in debt level of their investee ventures. This effect does not, however, extend to the debt ratio. In fact, the coefficients of $Post_t$ and the interaction term in Column 2 are both statistically insignificant, implying that neither CI- nor BA-backed ventures experience meaningful changes in their Debt ratio after the investment [3].

In summary, these findings suggest that while CI-backed ventures exhibit a larger increase in debt level post-funding, the increase is not significant for BA-backed ventures. Moreover, for both types of equity investors, the financing does not engender substantial differences in terms of debt ratio since asset base grows concurrently to debt level.

[Insert Table 4 here]

4.2.2. The mediating role of investor type on the relationship between debt and venture size

Estimates of Equation (2), shown in Table 5 investigate how the interaction between investor type and debt influences subsequent venture growth. This analysis employs the DiDiD framework (Equations (2)), where the dependent variable is size, measured by the natural logarithm of total

[3] Using alternatively the ratio between total equity divided by total debt (i.e., financial leverage), we obtain similarly insignificant results.

assets. We test the productivity of both the level of debt, i.e. the amount of bank debt (Column 1) and Debt ratio, i.e. the debt-to-assets ratio (Column 2).

Panel A reports the results of OLS regressions with venture and year fixed effects. The coefficient on $Size_{i,t-1}$ is positive and highly significant across both models, indicating strong persistence in venture size—larger ventures tend to remain larger over time. The other control variables behave as expected: liquidity and tangibility are positively associated with growth, while older ventures grow more slowly. The $Post_t$ variable is also positive and significant, suggesting that ventures, on average, grow (i.e., increase their level of total assets) following the equity investment, irrespective of investor type. The interaction term $Post_t{*}BA_i$ is positive and significant in both Columns, implying that BA-backed ventures experience greater post-investment growth relative to CI-backed ones. This is in line with the literature suggesting a value adding effect of BAs, who are known to be more active compared to CIs (Wang et al., 2019), possibly through monitoring, mentoring and other value adding activities.

Turning to the role of debt, Column 1 shows a positive and significant coefficient for Debt level ($Debt_{i,t-1}$), meaning that ventures with higher prior debt levels tend to grow more. The non significance of the coefficient of the interaction $Debt_{i,t-1} * BA_i$ provides a further confirmation about the validity of our approach, indicating that, before the investment, BA-backed ventures do not have a debt productivity that significantly differs from that shown by CI-backed ventures.

More interestingly for our research, the negative coefficient of $Debt_{i,t-1} * Post_t$ indicates that, for the baseline group (CI-backed ventures), the marginal productivity of debt on growth decreases in the post-investment period. Notably, this negative effect is partially offset in BA-backed ventures, as indicated by the positive and significant (although only at the 10% confidence level) triple interaction $Debt_{i,t-1} * Post_t * BA_i$. This result suggests that BAs may help ventures use debt more productively compared to CIs.

In Column 2, the results are consistent: the $Debt_{i,t-1} * Post_t$ interaction is significantly negative, reinforcing the idea that debt becomes less effective after investment, while the $Debt_{i,t-1} * Post_t * BA_i$ term is still positive and highly significant ($p < 0.01$), confirming that BA-backed ventures are better positioned to leverage debt for growth after funding compared to their CI-backed counterparts. The marginal effects, explained in Section 3.2 and reported in Panel B of Table 5 provide further insights into how the interaction between investor type and debt impacts venture growth over time. Before the investment, there is no statistically significant difference between BA-backed and crowd-backed ventures in how debt influences venture growth. Specifically, the marginal effect of lagged debt on asset growth is 0.035 ($p < 0.01$) for both BA (BA=1, Post=0) and CI-backed (BA=0, Post=0) ventures in Column (1), and the difference between them is not statistically significant. A similar effect is observed for debt ratio in Column (2). This suggests that, in the years preceding the equity funding, both groups exhibit a similar capacity to convert debt into growth.

After the investment a clear divergence emerges. For CI-backed ventures, the marginal effect of debt becomes negative and statistically significant (BA=0, Post=1) equal to –0.014 ($p < 0.1$) for debt level and equal to –0.190 ($p < 0.01$) for debt ratio, indicating that after raising funds from the crowd, higher debt levels are associated with a lower increase in assets. In contrast, BA-backed ventures (BA=1, Post=1) show a positive and highly significant marginal effect post-investment (Column 1: 0.019, $p < 0.01$; Column 2: 0.092, $p < 0.01$), suggesting that these ventures are better able to leverage debt effectively for asset growth after receiving BA support. Moreover, the difference between BA and CI ventures in the post-investment period is statistically significant at the 1% level in both specifications, highlighting a positive moderating role of BAs on the debt-asset relationship. Finally, if we compare BA-backed ventures before (BA=1, Post=0) and after investment (BA=1, Post=1), the difference is not statistically significant, indicating a relatively stable relationship between debt and growth. By contrast, the shift for CI-backed ventures is negative and significant ($p < 0.01$), underscoring a deterioration in the effectiveness of debt on asset growth following crowd investment.

Overall, our DiDiD estimates provide strong evidence for our core hypothesis. It indicates that BAs offset the negative post-investment relationship between debt and growth found in CI-backed ventures. In other words, BA-backed ventures are significantly better positioned to productively convert debt financing into asset growth. This supports the theoretical argument that BA equity and bank debt function as complements: the monitoring and advisory functions of BA mitigate the agency costs of debt, unlocking its productive potential.

[Insert Table 5 here]

4.3. Robustness tests

To ensure the validity of our findings, we conducted a series of robustness checks.

First, we address potential omitted variable bias by adding the deal amount to capture potential heterogeneity in ventures' capacity to take on further debt, which may stem from the stronger signaling effects associated with larger investment sizes. Results are shown in the first two columns of Table 6 for analyses on debt (Equation (1)) and in the last two columns of Table 6 for estimates on venture size (Equation (2)). Deal amount shows positive and significant coefficient in Column 1, indicating a correlation between the investment size and debt level. Conversely, the amount of financing received does not influence Debt ratio (Column 2 of Table 6) neither size (Columns 3 and 4 of Table 6). This confirms that larger funding rounds correlate with higher post-investment debt levels, as expected, while they do not affect venture growth per-sè. Crucially, the inclusion of this variable did not substantially affect the sign and significance of our key variables: again BA-backed ventures are associated to lower debt levels than CI-backed ones after the investment (i.e. the coefficient of $Post_t{*}BA_i$ is still negative and significant in Column 1 of Table 6) and debt productivity for BA-backed ventures is significantly higher, after the investment, than for CI-backed ventures (i.e. the coefficient of $Debt_{i,t-1} * Post_t * BA_i$ is still positive and significant for debt ratio as indicated in Column 4 of Table 6), suggesting that our results are not driven by differences in the size of equity financing rounds.

[Insert Table 6]

Second, we test the sensitivity of our results to the observation window. We restrict the panel to a narrower window of two years before and two years after the investment. This test mitigates concerns that our main findings are driven by long-term confounding events or structural breaks unrelated to the equity investment, ensuring the effect is temporally proximate to the "treatment". The main findings previously discussed remain robust in this subsample (Table 7).

[Insert Table 7 here]

4.4. Additional analyses

4.4.1. Long-term debt

Aiming to explore the channels through which investors influence capital structure, we analyze whether the involvement of different investor types affects the structure of debt financing rather than its overall volume. To this aim, we replace the amount of total debt with long-term debt and debt ratio with long term debt ratio (long term debt/total assets). More specifically, this specification sheds light on whether the observed positive effects on debt growth and asset growth are driven by a strategic shift in capital structure—specifically, a rebalancing toward long-term debt over short-term obligations.

Results, reported in Table 8, show that BAs do not seem to have a differential effect compared to CIs in the increase of long-term debt after the investment (Column 1) as indicated by the non-significance of the coefficient of the interaction $Post_t$*BA_i. In accordance, the linear combination of $Post_t$ + $Post_t$*BA_i is still positive and significant (even though at 10% significance level). Instead, we observe that BA-backed ventures exhibit a lower long-term debt ratio compared to CI-backed ventures post investment (Column 2), possibly because BAs do not favor the acquisition of additional long-term debt.

When we focus on the relationship between long-term debt and growth (Column 3), the interaction term $Long-term\ Debt_{i,t-1} * Post_t * BA_i$ becomes non-significant. However, looking at Panel B

of Table 9 (Column 3), the marginal effect of long-term debt on asset growth remains positive and statistically significant for BA-backed ventures after the investment (0.006, $p < 0.05$) even though the effect is economically much smaller compared to our baseline models on total debt as shown in Table 5, indicating that the contribution of long-term debt to growth is more limited for BA-backed ventures in the post-investment period compared to what we obtained considering total debt.

When focusing on the effect of long-term debt ratio on growth, still the interaction term $Long-term\ Debt_{i,t-1} * Post_t * BA_i$ is non-significant. However, as indicated in Panel B (Column 4), for BA-backed ventures in the post-investment period (BA=1, Post=1), the marginal effect of the long-term debt ratio on growth is positive and significant, even if only at the 10% statistical level (0.016, $p<0.1$). Moreover, for BA-backed ventures, the change in the marginal effect compared to the pre-investment period (where the coefficient of debt productivity is equal to -0.017 and not significant) is positive and statistically significant (the increase is equal to 0.033, $p < 0.05$), indicating that BAs may help ventures use long-term debt more efficiently over time.

Summarizing, for BA-backed ventures, compared to CI-backed ones, the level of long-term debt does not significantly increase in the post-investment period but, instead, long-term debt ratio shows a significant decrease. Moreover, there is still a positive differential effect in the marginal contribution on assets growth of long-term debt ratio relative to CI-backed ventures. This implies that BAs influence the composition and quality of debt financing, rather than just its quantity, to improve its productive use.

[Insert Table 8 here]

4.4.2. Disentangling monitoring: BA vs. Nominee-model CI

To further validate our findings and try to isolate the BA "value-added", we conduct an analysis comparing BA-backed ventures to a specific subsample of CI-backed ventures: those that utilize a Nominee governance structure. The Nominee model, by centralizing investor representation, is explicitly designed to solve the collective action problem and facilitate post-investment monitoring

and coordination. This model thus serves as an ideal "placebo" group, allowing us to test whether the superior performance of BA-backed ventures is driven merely by enhanced monitoring, or by other, more active value-added contributions (e.g., strategic advice, network access) that BAs provide.

We restrict the sample to UK-based ventures for which we may identify Nominee CI-backed ventures through Seedrs campaigns, where the governance structure is unambiguously Nominee[4]. We resort to these sample of UK Nominee CI-backed ventures as control group and we matched them with UK BA-backed ventures using propensity score matching technique (1:3) based on pre-treatment characteristics and requiring common support: venture age, total assets, bank debt level, tangible ratio, cash ratio, asset growth, and industry (NACE rev.2 code). Covariate balance is achieved post-matching. We managed to match 343 Nominee- CI backed ventures with 892 BA-backed ones.

Table 9 reports the results of both Equation (1) (Column 1 and 2, for debt level and debt ratio respectively) and Equation (2) (Column 3 and 4, for debt level and debt ratio respectively) on this subsample. Results are highly consistent with our main models. We find that BA-backed ventures do not exhibit significantly higher levels of debt or debt ratios relative to matched Nominee CI-backed ventures post-investment (Columns 1–2). Interestingly, the effect of BA investment on assets growth, as indicated by the coefficients of $Post_t * BA_i$ in Columns 3–4 of Table 9, are strongly positive and statistically significant, with similar magnitudes to those obtained the main models shown in Table 5. This confirms the positive effect of BA financing on growth even when compared to Nominee CI investments.

As to the effect on the relationship between debt and growth, the interaction term $Debt_{i,t-1} * Post_t * BA_i$ is still positive and significant when considering debt ratio. Moreover, when looking at the marginal effects reported in Panel B of Table 9, for BA-backed ventures post-investment (BA=1, Post=1), both the total amount of debt (0.023, $p < 0.01$) and debt ratio (0.128, $p < 0.01$) significantly and positively influence assets growth. This evidence is highly suggestive: even when CIs are

[4] Since Pitchbook does not provide information on the type of shareholding structure adopted, we are unable to conduct a comprehensive analysis of CI-backed ventures by governance structure.

organized under a formal monitoring structure, they fail to achieve the same debt productivity as BA-backed ventures. This implies that the BA contribution may be not limited to monitoring but may stem from the other "hands-on" channels identified in our theoretical framework, such as active strategic guidance, financial expertise, and network provision[5].

[Insert Table 9 here]

4.4.3. BA Unpacking the "BA effect": channels of increased debt productivity

Having established that BAs enhance debt productivity, our final additional analyses investigate which BAs are most effective. We explore this heterogeneity within the BA-backed subsample. We test whether specific BA characteristics moderate the relationship between debt and subsequent growth by including several moderating factors in Equation (2).

First, we consider whether the investment was made through a syndicate. Syndicated investments, where multiple BAs co-invest, may provide access to broader expertise and coordinated post-investment support. Secondly, we measure BAs' investment experience using a dummy equal to one if the cumulative number of past deals by BAs involved in the focal deal exceeds the 75th percentile of the sample distribution. This serves as a proxy for more experienced and professional investors. Finally, we evaluate how much attention and engagement BAs may be able to dedicate to each portfolio venture. To proxy this aspect, we measure the average number of active portfolio companies per BA. We then include an indicator for lower BA active involvement taking value 1 when the number of portfolio companies falls above the 75th percentile, assuming that a higher average portfolio size is associated with lower potential attention per venture that a BA is able to provide. These variables were converted into step variables, maintaining their observed values after the BA

[5] We interpret these results with caution since the analysis is performed on a particular sub-sample of ventures and unobserved platform-specific factors may still be present, preventing us from stating formal causal relationships yet.

investment and set to 0 beforehand, to facilitate estimation in fixed effects models. We employ standard OLS estimations incorporating venture fixed effects for this analysis.

The results in Table 10 indicate that specific BA characteristics moderate the relationship between debt and post-investment venture growth.

When syndication size is considered, first results show that larger syndicates are associated to higher venture growth. However, when focusing on the estimates of marginal effects reported in Panel B of Table 10, we observe that debt is more productive in ventures backed by smaller BA syndicates. In particular, the marginal effect of debt on venture growth is positive and significant only for individual and small syndicates: the marginal effect of debt on assets growth is 0.022 at syndicate size = 1 (i.e., individual investors) and declines in magnitude and significance as syndicate size increases. By syndicate size equal to 5, the effect becomes small and non-statistically significant, suggesting that the benefits of BA involvement for debt productivity diminish with larger and potentially less coordinated investor groups.

In contrast, BA investment experience does not significantly influence the relationship between debt and assets growth. While BAs with investment experience are associated with higher growth levels, the marginal effects of debt are statistically similar between experienced and non-experienced BAs, indicating that investment background does not meaningfully influence debt effectiveness.

Finally, BAs with a low active involvement (i.e. with higher number of portfolio ventures) are associated to higher venture growth but also to lower debt productivity. Ventures backed by BAs with a more focused portfolio ($BA\ low\ active\ involvement$=0) exhibit significantly stronger marginal effects of debt on assets growth (0.032, $p < 0.01$ for total debt; 0.125) compared to those with higher number of active portfolio ventures, and consequently lower active involvement in the invested ventures ($BA\ low\ active\ involvement = 1$), where the effect becomes non-significant. This supports the idea that attention constraints reduce BAs' capacity to enhance debt effectiveness.

[Table 10 here]

5. Discussion and conclusions

5.1. Summary of results and contributions

This paper investigates the differential impact of two distinct classes of external equity investors, BAs and CIs, on the borrowing decisions and subsequent growth of early-stage ventures. In doing so, we provide new empirical evidence on how investor heterogeneity shapes the capital structure of entrepreneurial ventures and, more critically, moderates the productivity of debt financing.

Our empirical analysis yields three primary findings. First, regarding debt borrowing, we find that BA-backed ventures experience a smaller increase in debt after the investment compared to CI-backed ventures, even though both types of ventures exhibit similar debt levels and debt ratios beforehand. This suggests that BAs do not substantially alter the debt growth trajectory of their portfolio companies' post-investment, compared to CI-backed ventures that exhibit an increase in debt access following a successful funding round. The central contribution of this paper, however, lies in identifying the productivity of debt. We demonstrate a sharp divergence in the post-investment debt-growth relationship. For CI-backed ventures, the marginal effect of debt on venture growth becomes statistically insignificant, or in some specifications, negative. This is consistent with a theoretical framework where unresolved agency problems and a lack of sophisticated oversight render debt financing inefficient or even detrimental to growth. In stark contrast, BA-backed ventures maintain a positive and significant debt-growth relationship. This finding provides strong empirical support for the hypothesis that BA equity and bank debt function as complements. We argue that the active, post-investment involvement of BAs – which includes advisory, signalling, and monitoring functions – serves to mitigate the ex-post agency costs of debt, thereby unlocking its productive potential.

In additional estimates, we unpack the "BA effect" and find that this enhanced debt productivity is not homogenous, rather appears to be linked to specific BA characteristics: smaller and more focused investors – those operating individually or in small syndicates, and with more limited active portfolios

– are more effective in supporting debt-financed assets growth. In contrast, BA investment experience do not significantly influence this effect. Overall, these results suggest that BAs not only provide capital but also play a critical role in enhancing ventures' managing of external debt finance.

Our research makes several distinct contributions. First, we contribute to the literature on investor heterogeneity by moving beyond a simple BA vs. VC comparison and providing a theoretically grounded analysis of BAs versus CIs. Second, we show that the *type* of equity investor is a critical determinant of the *efficiency* of debt, not just access to it. Third, our study contributes to the growing literature on the non-financial value-added roles of BAs and CIs (Politis, 2016; Bonini et al., 2019; Croce et al., 2021; Capizzi et al., 2022; Pelucco and Vismara, 2025). Fourth, we make a significant contribution to the entrepreneurial finance literature on capital structure, which has historically focused more on equity, neglecting the role played by banks in the context of early-stage ventures (Capizzi et al., 2025). Finally, by empirically demonstrating that BA involvement enhances debt productivity, we provide a new and specific channel through which sophisticated investors create value in the context of entrepreneurial ventures' borrowing decisions.

5.2. Limitations and future research

While our study offers robust evidence on the effects of CI and BA financing on venture debt and future assets growth using a large sample of European ventures, several limitations open avenues for future research. First, while we capture overall changes in debt levels and venture growth, we do not account for heterogeneity in the characteristics of debt contracts. Future studies could investigate how specific features—such as loan maturity, presence of collateral, interest rates, or type of lender—mediate the relationship between early-stage equity financing and venture outcomes. Second, although we examined the influence of selected investor characteristics, such as the presence of a Nominee structure for CI and several BA characteristics, those represent only part of the mechanisms through which investors support ventures. Future research could further explore how affiliations to

BA networks or investment clubs shape the effectiveness of BAs, particularly in terms of post-investment support and venture development and their interaction with bank debt. On the CI side, a limitation of our study is the lack of access to platform-level information, which prevents us from identifying the presence and role of lead investors in CI-backed ventures. This restricts our ability to disentangle the heterogeneity in CIs influence that may arise from differences in syndicate leadership or platform governance. Future research could build on our findings by incorporating such data. Although our results provide only indirect evidence regarding Nominee CI models, it is worth considering their potential role. Given that Nominee governance structures typically involve a single representative holding shares on behalf of a group of investors, this arrangement might influence post-investment ability to provide focused support as shown in other contexts (e.g., Butticè et al., 2020; Coackey et al., 2025), potentially bridging some of the gaps observed between traditional CIs and BAs. Future research could explore whether Nominee enhances the alignment of investor incentives and improves the productive use of debt, thereby contributing to better venture performance.

5.3. Practical implications

The findings of this study offer several practical implications for the stakeholders involved in early-stage financing. For entrepreneurs, the results underscore the importance of not only securing funding but also choosing the right type of investor. While both BAs and CIs support access to bank debt, only BA-backed ventures appear to use such debt more productively, translating it into meaningful post-investment growth. This suggests that entrepreneurs seeking to optimize the long-term performance of their ventures should consider the added value of angel investors' involvement beyond capital. For BAs, the evidence highlights that the effectiveness of their support depends on the degree of attention they can devote to each investment—those operating individually or with limited active portfolios seem better positioned to enhance the venture's financial structure and debt productivity. To be effective, BAs must ensure they have sufficient bandwidth to provide the

dedicated, active engagement required to mitigate agency costs and guide financial strategy. Lastly, for CI platforms and investors, our findings indicate that while CIs can facilitate debt access, they may not yet match BAs in fostering growth-oriented use of bank financing. This presents an opportunity for platforms to rethink their post-investment support mechanisms and better structure investor engagement to improve the outcomes for funded ventures. For instance, promoting the participation of BAs in equity CI rounds could improve this relationship or offer better structured governance mechanisms. The real challenge, however, lies in replicating the active, hands-on advisory function that, as our evidence suggests, is the key to making debt productive.

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Tables

Table 1. Variable definitions

Variable	*Definition*
Size	Natural logarithm of the firm's total assets (thousands €)
BA	Dummy variable indicating if the firm is backed by a BA (1 = yes, 0 = no)
Post	Dummy variable for post-investment period (1 = after investment, 0 = before)
Debt	Natural logarithm of debt in thousands € (Debt Level) or ratio between debt and total assets (Debt Ratio)
Cash ratio	Cash and cash equivalents divided by total assets
Tangible ratio	Tangible assets divided by total assets
Age	Natural logarithm of firm age in years
Variables for Robustness checks and additional analyses	
Long-term Debt	Natural logarithm of long-term debt in thousands € (Long-term Debt Level) or ratio between long-term debt and total assets (Long-term Debt Ratio)
Deal amount	Total amount raised in the investment round (thousands €)
Syndication size	Size of the investor syndicate (number of investors participating)
BA Investment experience	Dummy variable indicating if the BA has high investment experience (1 = above the median of the distribution, i.e. 1.5 prior investments)
BA low active involvement	Dummy variable indicating if BA has a high number of active investments (1 = above the median of the distribution, i.e. 2.5 investments)

Table 2. Summary statistics

Panel A – Descriptive statistics	***N***	***Mean***	***SD***	***Min***	***Max***
Size	40452	6.366	1.974	0	10.84
BA	40452	0.645	0.479	0	1
Post	40452	0.857	0.350	0	1
Debt Level	40452	1.801	2.482	0	8.730
Debt Ratio	40452	0.136	0.539	0	4.398
Cash ratio	40452	0.410	0.909	0	1
Tangible ratio	40452	0.094	0.195	0	1
Age	40452	1.824	0.534	0	3.219
Long-term Debt Level	31371	3.020	2.937	0	9.163
Long-term Debt Ratio	31371	0.408	1.519	0	15.333
Deal amount	33053	0.561	2.713	0	158.1
Syndication size	6299	1.963	1.913	0	19
BA Investment experience	4803	0.890	0.313	0	1
BA low active involvement	5637	0.492	0.500	0	1
Panel B – Regional distribution	N	%			
UK & Ireland	3,318	48.98%			
France & Benelux	1,209	17.85%			
Southern Europe	898	13.26%			
Northern Europe	782	11.54%			
Germany & Austria	310	4.58%			
CEE	257	3.79%			
Panel C – Industry distribution	N	%			
Information and Communication	2,604	38.64%			
Professional, Scientific and Technical Activities	1,057	15.68%			
Manufacturing	857	12.72%			
Wholesale and Retail Trade	729	10.82%			
Administrative and Support Service Activities	412	6.11%			
Financial and Insurance	240	3.56%			
Accommodation and Food Service	145	2.15%			
Other Services	110	1.63%			
Other	586	8.69%			
Panel D – Age at first funding	N	%			
0	1100	16.24%			
1	1544	22.79%			
2	1265	18.67%			
3	909	13.42%			
4	657	9.70%			
5	436	6.44%			
6	319	4.71%			
7	201	2.97%			
8	155	2.29%			

9	99	1.46%
10	89	1.31%

Table 3. Univariate analysis

Panel A: Before the first investment

	CI-backed		***BA-backed***		***CI vs BA-backed***
	N	Mean	N	Mean	Difference
Size	3,326	5.679	2,459	5.191	0.488***
Debt Level	3,326	1.083	2,459	0.989	0.094*
Debt Ratio	3,326	0.094	2,459	0.106	-0.012
Debt growth	*3,323*	*0.240*	*2,454*	*0.278*	*-0.038*
Cash ratio	3,326	0.465	2,459	0.561	-0.096**
Tangible ratio	3,326	0.133	2,459	0.133	0.001
Age	3,326	1.296	2,459	1.349	-0.052***

Panel B: After the first investment

	CI-backed		***BA-backed***		***CI vs BA-backed***
	N	Mean	N	Mean	Difference
Size	11,043	6.282	23,624	6.624	-0.343***
Debt Level	11,043	1.860	23,624	1.960	-0.099***
Debt Ratio	11,043	0.148	23,624	0.139	0.009
Debt growth	*11,022*	*0.206*	*23,598*	*0.254*	*-0.048***
Cash ratio	11,043	0.383	23,624	0.399	-0.016**
Tangible ratio	11,043	0.110	23,624	0.077	0.033***
Age	11,043	1.900	23,624	1.912	-0.013**

*, **, *** denote significance at the 10%, 5%, and 1% levels.

Table 4. Effect of BA vs CI on debt

	Debt Level	***Debt Ratio***
	(1)	(2)
$Size_{i,t-1}$	0.116***	-0.016***
	(0.010)	(0.003)
$Debt_{i,t-1}$	0.381***	0.342***
	(0.008)	(0.023)
$Post_t$	0.108**	-0.013
	(0.049)	(0.013)
$Post_t$*BA_i	-0.131**	-0.008
	(0.064)	(0.017)
$Cash\ ratio_{i,t-1}$	-0.016*	-0.013***
	(0.009)	(0.004)
$Tangible\ ratio_{i,t-1}$	0.235***	-0.034
	(0.060)	(0.024)
$Age_{i,t}$	0.060	0.044**
	(0.070)	(0.019)
Firm FE	yes	yes
Year FE	yes	yes
Panel B		
$Post_t$ + $Post_t$*BA_i	-0.024	-0.021
	(0.633)	(0.102)
Log-Likelihood	-7.10E+04	-1.51E+04
R-quadro	0.514	0.376
N Obs	40,452	40,452
N firms	6,774	6,774

The dependent variable is either Debt Level (Column 1) or Debt Ratio (Column 2). Firm and year fixed effects included. Robust standard errors clustered at the firm level in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels.

Table 5. Effect of debt on venture size: BA vs CI

	Size (Debt Level)	*Size (Debt Ratio)*
Panel A – Estimates	***(1)***	***(2)***
$Size_{i,t-1}$	0.563***	0.565***
	(0.009)	(0.009)
$Debt_{i,t-1}$	0.035***	0.066
	(0.011)	(0.062)
$Post_t$	0.206***	0.167***
	(0.033)	(0.029)
$Post_t$*BA_i	0.173***	0.194***
	(0.045)	(0.040)
$Debt_{i,t-1} * Post_t$	-0.049***	-0.256***
	(0.011)	(0.078)
$Debt_{i,t-1} * BA_i$	0.000	-0.096
	(0.017)	(0.095)
$Debt_{i,t-1} * Post_t * BA_i$	0.032*	0.378***
	(0.017)	(0.108)
$Cash\ ratio_{i,t-1}$	0.063***	0.063***
	(0.011)	(0.011)
$Tangible\ ratio_{i,t-1}$	0.231***	0.238***
	(0.056)	(0.056)
$Age_{i,t}$	-0.140***	-0.133***
	(0.045)	(0.045)
Firm FE	yes	yes
Year FE	yes	yes
Panel B – Marginal effects		
BA=0, Post=0	0.035***	0.066
	(0.011)	(0.062)
BA=1, Post=0	0.035***	-0.030
	(0.014)	(0.072)
BA=0, Post=1	-0.014*	-0.190***
	(0.007)	(0.050)
BA=1, Post=1	0.019***	0.092***
	(0.003)	(0.023)
Log-Likelihood	-4.45E+04	-4.45E+04
R-quadro	0.771	0.770
N Obs	40,452	40,452
N firms	6,774	6,774

The dependent variable is ln(Total Assets). Firm and year fixed effects included. Robust standard errors clustered at the firm level in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels.

Table 6. Robustness check: Controlling for deal amount.

	Debt Level	*Debt Ratio*	*Size (Debt Level)*	*Size (Debt Ratio)*
Panel A – Estimates	***(1)***	***(2)***	***(3)***	***(4)***
$Size_{i,t-1}$	0.131***	-0.023***	0.604***	0.604***
	(0.013)	(0.005)	(0.011)	(0.011)
$Debt_{i,t-1}$	0.341***	0.335***	0.020*	0.026
	(0.009)	(0.027)	(0.012)	(0.077)
$Post_t$	0.030	-0.006	0.177***	0.153***
	(0.068)	(0.016)	(0.040)	(0.035)
$Post_t{*}BA_i$	-0.253***	-0.014	0.123**	0.121**
	(0.091)	(0.023)	(0.057)	(0.051)
$Debt_{i,t-1} * Post_t$			-0.030***	-0.236**
			(0.012)	(0.092)
$Debt_{i,t-1} * BA_i$			0.029	-0.021
			(0.019)	(0.126)
$Debt_{i,t-1} * Post_t * BA_i$			0.001	0.345**
			(0.019)	(0.138)
$Cash\ ratio_{i,t-1}$	-0.036***	-0.009	0.026*	0.027*
	(0.013)	(0.006)	(0.014)	(0.014)
$Tangible\ ratio_{i,t-1}$	0.260***	-0.032	0.187***	0.191***
	(0.081)	(0.033)	(0.069)	(0.069)
$Age_{i,t}$	0.198*	0.040	-0.126*	-0.124*
	(0.114)	(0.032)	(0.069)	(0.069)
$Deal\ Amount_{i,t-1}$	0.123***	0.002	0.002	0.000
	(0.036)	(0.004)	(0.011)	(0.011)
Firm FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Panel B – Marginal effects				
$Post_t$ + $Post_t{*}BA_i$	-0.223**	-0.020		
	(0.004)	(0.154)		
BA=0, Post=0			0.020*	0.026
			(0.012)	(0.077)
BA=1, Post=0			0.048***	0.005
			(0.015)	(0.100)
BA=0, Post=1			-0.011	-0.210***
			(0.007)	(0.052)
BA=1, Post=1			0.019***	0.115***
			(0.003)	(0.027)
Log-Likelihood	-5.79E+04	-1.17E+04	-3.43E+04	-3.42E+04
R-quadro	0.464	0.411	0.804	0.804
N Obs	33,053	33,053	33,053	33,053
N firms	6,111	6,111	6,111	6,111

The dependent variables are ln(Debt), Debt Ratio, and ln(Total Assets). Firm and year fixed effects included. Robust standard errors clustered at the firm level in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels.

Table 7. Robustness check: restricted sample, 2-years before and after the investment.

	Debt Level	*Debt Ratio*	*Size (Debt Level)*	*Size (Debt Ratio)*
Panel A – Estimates	***(1)***	***(2)***	***(3)***	***(4)***
$Size_{i,t-1}$	0.106***	-0.014***	0.626***	0.624***
	(0.013)	(0.005)	(0.013)	(0.013)
$Debt_{i,t-1}$	0.456***	0.388***	0.026**	0.088
	(0.012)	(0.033)	(0.011)	(0.065)
$Post_t$	0.101*	-0.001	0.171***	0.152***
	(0.053)	(0.014)	(0.036)	(0.033)
$Post_t * BA_i$	-0.127**	-0.007	0.155***	0.155***
	(0.062)	(0.017)	(0.047)	(0.041)
$Debt_{i,t-1} * Post_t$			-0.039***	-0.334***
			(0.012)	(0.089)
$Debt_{i,t-1} * BA_i$			0.007	-0.142
			(0.018)	(0.101)
$Debt_{i,t-1} * Post_t * BA_i$			0.026	0.550***
			(0.018)	(0.128)
$Cash\ ratio_{i,t-1}$	-0.017	-0.013**	0.059***	0.059***
	(0.011)	(0.006)	(0.015)	(0.015)
$Tangible\ ratio_{i,t-1}$	0.258***	-0.007	0.192**	0.193**
	(0.077)	(0.031)	(0.076)	(0.075)
$Age_{i,t}$	0.069	0.023	-0.023	-0.019
	(0.096)	(0.028)	(0.070)	(0.069)
Firm FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Panel B – Marginal effects				
$Post_t$ + $Post_t * BA_i$	-0.026	-0.008		
	(0.645)	(0.232)		
BA=0, Post=0			0.026**	0.088
			(0.011)	(0.065)
BA=1, Post=0			0.033**	-0.054
			(0.015)	(0.078)
BA=0, Post=1			-0.013*	-0.246***
			(0.008)	(0.063)
BA=1, Post=1			0.020***	0.162***
			(0.007)	(0.052)
Log-Likelihood	-3.06E+04	-6587.208	-2.07E+04	-2.07E+04
R-quadro	0.562	0.350	0.769	0.770
N Obs	17,708	17,708	17,708	17,708
N firms	2,404	2,404	2,404	2,404

Table 8. Long-term debt

	Debt Level	*Debt Ratio*	*Size (Debt Level)*	*Size (Debt Ratio)*
Panel A – Estimates	***(1)***	***(2)***	***(3)***	***(4)***
$Size_{i,t-1}$	0.115***	-0.010	0.532***	0.533***
	(0.013)	(0.012)	(0.010)	(0.010)
$Long-term\ Debt_{i,t-1}$	0.464***	0.414***	0.022**	-0.028*
	(0.009)	(0.022)	(0.010)	(0.015)
$Post_t$	0.130**	-0.033	0.272***	0.188***
	(0.064)	(0.047)	(0.044)	(0.034)
$Post_t{*}BA_i$	-0.030	-0.158**	0.111*	0.134***
	(0.076)	(0.070)	(0.058)	(0.044)
$Long-term\ Debt_{i,t-1} * Post_t$			-0.029***	0.006
			(0.010)	(0.027)
$Long-term\ Debt_{i,t-1} * BA_i$			0.002	0.011
			(0.015)	(0.019)
$Long-term\ Debt_{i,t-1} * Post_t * BA_i$			0.011	0.027
			(0.015)	(0.031)
$Cash\ ratio_{i,t-1}$	-0.020	-0.030*	0.059***	0.059***
	(0.012)	(0.018)	(0.012)	(0.012)
$Tangible\ ratio_{i,t-1}$	0.217***	-0.045	0.212***	0.221***
	(0.069)	(0.102)	(0.059)	(0.059)
$Age_{i,t}$	0.097	0.143*	-0.008	0.000
	(0.086)	(0.073)	(0.049)	(0.049)
Panel B – Marginal effects				
$Post_t$ + $Post_t{*}BA_i$	0.100*	-0.190**		
	(0.074)	(0.001)		
BA=0, Post=0			0.022**	-0.028*
			(0.010)	(0.015)
BA=1, Post=0			0.024**	-0.017
			(0.011)	(0.013)
BA=0, Post=1			-0.007	-0.022
			(0.007)	(0.022)
BA=1, Post=1			0.006**	0.016*
			(0.003)	(0.008)
Log-Likelihood	-5.54E+04	-4.53E+04	-3.16E+04	-3.16E+04
R-quadro	0.659	0.463	0.771	0.771
N Obs	31,371	31,371	31,371	31,371
N firms	5,243	5,243	5,243	5,243

The dependent variables are ln(Long-term Debt), Long-term Debt Ratio, and ln(Total Assets). Firm and year fixed effects included. Robust standard errors clustered at the firm level in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels.

Table 9. CI Nominee vs sample of matched BA-backed ventures

	Debt Level	*Debt Ratio*	*Size (Debt Level)*	*Size (Debt Ratio)*
Panel A – Estimates	***(1)***	***(2)***	***(3)***	***(4)***
$Size_{i,t-1}$	0.046***	-0.022***	0.536***	0.535***
	(0.018)	(0.007)	(0.018)	(0.019)
$Debt_{i,t-1}$	0.418***	0.291***	-0.004	-0.153
	(0.017)	(0.034)	(0.036)	(0.105)
$Post_t$	0.048	-0.062*	0.192**	0.136*
	(0.103)	(0.035)	(0.088)	(0.080)
$Post_t * BA_i$	-0.110	0.038	0.273***	0.309***
	(0.116)	(0.041)	(0.100)	(0.091)
$Debt_{i,t-1} * Post_t$			-0.039	-0.190
			(0.039)	(0.163)
$Debt_{i,t-1} * BA_i$			0.055	0.148
			(0.045)	(0.138)
$Debt_{i,t-1} * Post_t * BA_i$			0.011	0.322*
			(0.047)	(0.190)
$Cash\ ratio_{i,t-1}$	-0.009	-0.009	0.071***	0.073***
	(0.013)	(0.007)	(0.016)	(0.016)
$Tangible\ ratio_{i,t-1}$	0.177*	-0.025	0.122	0.122
	(0.094)	(0.043)	(0.100)	(0.099)
$Age_{i,t}$	0.054	0.116**	-0.214*	-0.213*
	(0.148)	(0.051)	(0.117)	(0.117)
Panel B – Marginal effects				
$Post_t$ + $Post_t * BA_i$	-0.062	-0.024		
	(0.105)	(0.036)		
BA=0, Post=0			-0.004	-0.153
			(0.036)	(0.105)
BA=1, Post=0			0.051*	-0.005
			(0.027)	(0.091)
BA=0, Post=1			-0.043**	-0.343***
			(0.020)	(0.129)
BA=1, Post=1			0.023***	0.128***
			(0.008)	(0.041)
Log-Likelihood	-1.45E+04	-4831.608	-1.10E+04	-1.09E+04
R-quadro	0.480	0.277	0.666	0.665
N Obs	8,344	8,344	8,344	8,344
N firms	1,235	1,235	1,235	1,235

The dependent variables are ln(Debt), Debt Ratio, and ln(Total Assets). Firm and year fixed effects included. Robust standard errors clustered at the firm level in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels.

Table 10. Moderating effect of BA characteristics on the relationship between debt and venture size

	Syndication size	*Investment experience*	*Active involvement*
Panel A – Estimates	**(1)**	**(5)**	**(7)**
$Size_{i,t-1}$	0.485***	0.468***	0.479***
	(0.021)	(0.025)	(0.023)
$Debt_{i,t-1}$	0.024***	0.050*	0.032***
	(0.008)	(0.026)	(0.008)
$Syndication\ size$	0.095***		
	(0.026)		
$Debt_{i,t-1} * Syndication\ size$	-0.003		
	(0.003)		
$BA\ Investment\ experience$		0.332***	
		(0.085)	
$Debt_{i,t-1} * BA\ Investment\ experience$		-0.034	
		(0.027)	
$BA\ low\ active\ involvement$			0.283***
			(0.100)
$Debt_{i,t-1} *\ BA\ low\ active\ involvement$			-0.027**
			(0.012)
$Cash\ ratio_{i,t-1}$	0.043	0.034	0.040
	(0.031)	(0.041)	(0.033)
$Tangible\ ratio_{i,t-1}$	0.195	0.165	0.164
	(0.142)	(0.175)	(0.155)
$Age_{i,t}$	-0.108	-0.129	0.018
	(0.131)	(0.160)	(0.137)
Panel B – Marginal effects			
$Syndication\ size$= 1	0.022***		
	(0.006)		
$Syndication\ size$= 3	0.016***		
	(0.006)		
$Syndication\ size$= 5	0.011		
	(0.009)		
$BA\ Investment\ experience = 0$		0.050*	
		(0.026)	
$BA\ Investment\ experience$ =1		0.016**	
		(0.007)	
$BA\ low\ active\ involvement$= 0			0.032***
			(0.008)
$BA\ low\ active\ involvement$= 1			0.005
			(0.008)
Log-Likelihood	-5453.371	-4187.446	-4873.494
R-quadro	0.775	0.794	0.788
N Obs	6,299	4,803	5,637
N firms	1,247	957	1,118

The dependent variables is ln(Total Assets). Debt = ln(Total Debt). Firm and year fixed effects included. Robust standard errors clustered at the firm level in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels.