Spatial Proximity in Venture Capital Investments and Assets Intangibility

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Highlights:

- Accounting value of intangible assets has negative effects on investor-investee distance.
- Patent applications can mitigate the spatial proximity of investments in both tech and non-tech sectors.
- The positive effects of patents on investment distance are superior for younger VCs.
- Number of registered trademarks is only affecting investment distance for non-tech investees which are at the seed stage.

Abstract:

This study investigates the investment distance between Venture Capital funds (VCs) and their investable ventures focusing on the relevance of intangible assets. We find that investees with a higher level of intangible assets in their balance sheet receive VC finance from more proximate VC funds. However, patents, reflecting the economic value of intangibles, mitigate this spatial proximity in both tech and non-tech sectors. Moreover, the positive effects of patents on investment distance are stronger for younger VCs. On the other hand, the number of registered trademarks is only affecting investment distance for non-tech investees which are at the seed stage.

1. Introduction

It is well-documented that venture-capital funds raise money from individuals and institutions to provide equity investment in early-stage businesses with high potential but high risk. Most of these business ventures involve the development of new technologies, innovations and are

knowledge intensive. Venture capitalists are involved actively in managing the business they fund, such as becoming members of the board of directors, appointing management, overseeing decision-making and developing strategy in addition to their ownership rights. In fact, venture capital is available for not only enhancing technology development (Kortum and Lerner, 2001) but also nurturing the growing business through the various stages towards commercialisation (Robbie et al., 1997). The British venture capital market, which this study focuses on, has exhibited an enormous expansion since the 1980s, becoming the second-largest market in the world. The nature of VC investments changes with technological and market developments and opportunities. In recent years there has been a remarkable rise in the intangible economy and the major developed economies now invest more in intangible assets (design, branding, R&D, software, networks) than in tangible assets (machinery, buildings, hardware) and the deployment of these intangible assets is often the main source of long-term success (Haskel and Westlake, 2018).

Traditional financiers seek both collateral and evidence of a clear trajectory of revenue and cash flow prior to investment, whereas venture capital (equity investment) is better suited to ventures with high levels of intangibility i.e., 'knowledge intensive' firms. However, the VC investors may have considerable sunk costs from several rounds of investment which can only be recovered through increases in company value and share price when the business reaches successful commercialization. It is, of course, more challenging to recover the investment costs by selling intangible assets compared with tangible assets if the firm does not commercialize and succeed. Consequently, venture capitalists can construct both formal and informal links between their portfolio companies, allowing them to exploit the synergies of intangibles. Commercialization might be achieved by combining the technologies and innovations of several portfolio companies if it is apparent that none or few of the individual companies might

succeed. This way the VC can recover some of the sunk costs incurred by investments in ventures that ultimately close.

There is extensive literature on the spatial proximity in venture capital investments in both the UK (e.g., Wilson et al. (2019)) and other countries (e.g., Colombo et al. (2019)). The literature suggests that investing in nearby ventures can be beneficial to reduce informational asymmetries i.e., where the risk, timing and scale of the business return are difficult to assess for lenders. These asymmetries can be more severe for venture capitalists than other financial intermediaries in both the pre-investment and post-investment (e.g., Amit et al. (1998); Arthurs and Busenitz (2003)). Previous studies have indicated that characteristics of VCs can influence the spatial distribution of investments, e.g., reputation and syndication networks (Sorenson and Stuart, 2001). Industries and stages of startups are considered to be associated with the investment distance (Cumming and Dai, 2010). Also, connections between investors and investees could play as a channel to reduce the local bias (Jääskeläinen and Maula, 2014). Notably, there is a gap in the literature about whether the intangibility of the assets of these ventures can influence the geographic distance of VC investments.

This study contributes to the existing literature by investigating the investment distance between VC's and their investable ventures. We distinguish between accounting values of intangible assets on the balance sheet and economic value of intangible assets focusing on the intellectual property rights (IPRs), i.e., patents and trademarks. On the one hand, there would be more severe informational asymmetries between VC investors and startups when startups have a higher level of intangible assets in balance sheet, because classical valuation techniques are difficult to be applied without credible indicators. It would be argued that spatial proximity helps to reduce the information asymmetries as VC investors can access the tacit information within local networks (e.g., Colombo et al. (2019); Jääskeläinen and Maula (2014)). On the

other hand, the financial-reporting system, including accounting standards in the UK (e.g., GAAP), for intangible assets is criticized by some accounting studies as it struggles to reflect economic values of intangibles (e.g., Høegh-Krohn and Knivsflå (2000); Powell (2003)). More specifically, resources spent on intangibles (e.g., R&D activities, design, licenses) tend to be written off when incurred thus being regarded as expenses on the income statement rather than investments with book value, i.e., the value of intangible assets in the balance sheet. Although they can be capitalized if they satisfy certain criteria, these criteria are rather strict, and the capitalization of such assets is rare in practice. Therefore, in this study, we apply two intellectual property rights, i.e., patents and trademarks, to measure the economic values of intangible assets. Patents and trademarks, as critical legal approaches to protect intangible assets, have both a protection value and a signal value of innovation abilities (e.g., Block et al. (2014); Thomä and Bizer (2013)). However, there are scant studies that analyze whether actions to protect intellectual property influence the geographic distance of VC investments.

In this study, we aim to identify, empirically, how intangibles influence the geographic proximity of venture capital investments in the UK. Based on the pool of UK venture capital investments from 2011 to 2018 and after controlling deal year fixed effects and region fixed effects, we find that investees with a higher accounting value of intangible assets (low liquidation value) receive closer VC fundraising. Moreover, such geographic proximity of VCs seems to be more prevalent in the tech sector, and the adverse effect of intangible assets on geographic distance accelerates when the tech investees are in the early stage rather than the late stage. Furthermore, the number of patent applications, capturing the economic value of intangibles as the signal of targeted firms' innovation abilities, can mitigate the spatial proximity of investments in both tech and non-tech sectors. For investees in the tech sector, possessing at least one patent application in the seed (earliest) stage stimulates a greater shift in investment distance than in the later stage of financing. Number of registered trademarks

only affects the investment distance for non-tech investees which are at the seed stage. More specifically the investment distance is greater for those non-tech ventures at the seed stage with at least one registered trademark. Lastly, our results demonstrate the positive effects of patents on the investment distance decrease with VCs' age, which indicates younger VC funds rely more on patents as signals to actively screen promising firms than experienced VCs.

We contribute to the venture capital and innovation literature in several ways. Firstly, our research advances the current understanding of the spatial distribution of VC investments. (e.g., Colombo et al. (2019); Cumming and Dai (2010); Jääskeläinen and Maula (2014); Mingo et al. (2018); Sorenson and Stuart (2001)). The uneven distribution of venture capital investments can be attributed to the strong geographic concentration of VC funds and their preference to invest locally. We believe it is the first research to analyze empirically how intangible assets can intensify this uneven distribution in equity finance, as the importance of intangibles and combinational technologies in the economy has increased over time. Secondly, we contribute to the intersecting literature on *signal functions* of intellectual property rights and the venture capital area by showing how patents/trademarks help reduce information gaps between investors and investees as signaling devices to reflect the innovations and commercialization abilities of firms. Thirdly, our last contribution relates to our unique datasets. We collect trademarks and patents data from UK Intellectual Property Office (UKIPO) and merge this dataset with our VC investments data from Beauhurst based on firm names as the identifier. We have a unique dataset of the characteristics of VC-backed firms from a credit reference agency, CreditSafe, which allows us to capture a set of variables (firm characteristics) on which VCs will make their investment decision.

The remainder of this study proceeds as follows. The second section discusses the background on the characteristics of 'intangible assets'. The third section develops hypotheses related to

the effect of intangibles asset and intellectual property rights (i.e., patents and trademarks) on investment distance. The fourth section outlines the data and sample selection, including datasets used, data sample, and descriptive statistics. The fifth section presents the empirical results and discussion, and the final section concludes.

2. Background: Characteristics of Intangibles

In recent years, the investment in intangible assets has exceeded the investment in tangible assets in some developed markets. The characteristics of tangible assets and intangible assets are very different, thereby causing distinct economic behaviors. One of the main characteristics of intangibles is 'sunkenness', which means the costs of investments in intangible assets seem to be irrecoverable. In other words, it is more challenging to recover the investment costs by selling intangible assets compared with tangible assets. The most important reason is that intangible assets are usually 'context-specific' to the company which owns them and interrelated (Haskel and Westlake, 2018). A patent, for example, is more valuable for the company that develops them than for others. Furthermore, if the knowledge is not governed by formal intellectual property rights (e.g., tacit information) or if it is distributed among the company's employees (e.g., through training), it becomes more difficult to sell to all intents and purposes (Haskel and Westlake, 2018).

Considering the sunkenness of intangibles, it is difficult for ventures with high intangibles to get sufficient finance on the path to commercialization. In the empirical studies on capital structure, many researchers use the ratio of tangible assets to total assets as a measure of liquidation value (collateral) (e.g., Friend and Lang (1988); Rajan and Zingales (1995)). Higher liquidation values imply that default is less costly, and the use of debt increases with asset tangibility (Gompers, 1995). Most sources of external finance, such as banks, usually prefer

debt because their debt is secured by valuable tangible assets (fixed or floating charges), generates regular repayments, and can be repossessed and sold to make up the loss if the business fails. However, debt finance is criticized by many small business owners as being risk averse. Firms with intangible investments have a more severe problem accessing finance because of irrecoverable costs (lack of perceived collateral) when the investment fails, and they do not have the even cash flows to repay regular interest charges. One way for businesses with more intangible assets is to change their source and nature of finance: relying more on equity and less on debt. Equity owners are more interested in growing company value and less so in the liquidation value of assets, as they can get considerable returns through IPO or M&A when the businesses reach successful commercialization.

Synergy is another critical characteristic of intangible assets. Solutions to complex innovation problems tend to require the integration and synthesis of diverse knowledge and resources (Nickerson and Zenger, 2004). More specifically, it is interpreted, by Varian et al. (2004: 5), as 'combinatorial innovation', which means *"Every now and then a technology, or set of technologies, emerges whose rich set of components can be combined and recombined to create new products."* For new ventures, they often innovate by drawing on and extending the underexploited existing technologies (e.g., Agarwal et al. (2007); Kim et al. (2019)). It is still worth noting that the potential synergies of intangibles are not predictable. Intangible assets, whether they relate to new ideas or new structures of a business, can make a huge difference when they have synergies with one another. Compared to tangibles, there are no physical constraints for intangibles to proceed rapidly, such as shipping costs and inventory problems (Varian et al., 2004). The Internet boom is an instance of the synergies of intangibles. Rather than physical devices, the components of the Internet revolution are 'just bits', and they can be programming languages, ideas, protocols, etc. A new piece of software can never run out and

can be delivered to the world in seconds and can be recombined with other components to create new applications.

Venture capital can facilitate the synergies of intangibles as they can transfer knowledge over organizational boundaries, especially when the knowledge is tacit (e.g., Wadhwa et al. (2016); Yang et al. (2009); Yang et al. (2014)). The ability to transfer knowledge between organizations is critical for the organizational processes and performance outcomes (e.g., Hargadon (2003); Tortoriello et al. (2012)). As organizations often process different stocks of expertise and knowledge, acquiring knowledge from outsiders gives opportunities to maximize synergies. Venture capital investments are formalized interfirm relationships that can provide access to each other's resources. This helps facilitate knowledge-sharing to generate synergies within both portfolio companies and syndication partners. Several aspects can promote knowledge-sharing in VC investments, which are both within and beyond strictly technological information typically protected by intellectual property. Firstly, due diligence is often conducted by investors in the pre-investment stage. This provides venture capitalists with a sight into various fields of knowledge of ventures, including business plans, management teams, technology, and products (e.g., GARY (2006); Wadhwa et al. (2016)). Secondly, in the post-investment stage, venture capitalists generally secure either board seats or board-observer rights to get involved in the venture's core technologies and activities (De Clercq and Sapienza (2005); Hill et al. (2009)). Thirdly, venture capitalists tend to undertake frequent visits and closely monitor their portfolio firms (Yang et al., 2014). Such intensive interactions stimulate inter-organizational learning between investors and portfolio firms. Additionally, knowledge transfer also exists in the syndication. Syndication partners share information and experience, leading to selecting better investments (Hochberg et al., 2007) and adding more value to their target companies (Meuleman et al., 2010). In this way, venture capitalists can gain valuable

experience in the selection, valuation, and nurturing of ventures from each other in the syndicated investment (Yang et al., 2014).

Furthermore, several studies have provided empirical evidence of the cross-company interactions inside venture capital portfolios. For example, Lindsey (2008) is the first study to indicate there is a higher probability of two firms collaborating as strategic alliances or through a joint venture if they are sharing a common venture capitalist. González-Uribe (2020) constructs proxies related to exchanges of innovation resources amongst the portfolio of venture capitalists in various dimensions, i.e., patent citations, patent reassignments, cross-company worker mobility, alliances as well as mergers and acquisitions. Results discover that after the first-time companies enter the VC's portfolio, proxies of exchanges between them and other portfolio companies increase by an average of 60%, compared with matched nonportfolio companies. In conclusion, these venture capitalists construct both formal and informal links between their portfolio companies, allowing them to exploit synergies of intangibles. Additionally, venture capitalist also can increase the value of contested assets as the value of intangibles are highly relative to how it fits into a broader ecosystem. Well-connected VCs will ensure their ventures have access to more open innovation networks. Importantly, this advantage reinforces over time as their investment portfolios grow (Haskel and Westlake, 2018).

3. Theory and Hypotheses

A number of studies have suggested that a central distinction between venture capitalists and other financial intermediaries is that venture capitalists operate in situations where asymmetric information is particularly significant (e.g., Arthurs and Busenitz (2003); Gompers et al. (2020)), resulting in problems in both distinguishing ventures that might succeed and

estimating the time path to commercialization. Thus, when exploring the reasons for spatial proximity of VC investments, it may be useful to start with the functions of venture capitalists from the 'information asymmetry lens', in both pre-investment and the post-investment stages. In this study, we focus on the screening function of venture capitalists in the pre-investment stage.

VCs do not invest randomly and select firms by continuously screening the market to find good investment opportunities, the combination of capable entrepreneurs and viable business ideas. New ventures that VCs invest in have little 'explicit or codified knowledge[1]', such as public information, track record, or tangible assets to be evaluated (Ferrary, 2010). In the absence of perfect information, insider parties (investees) know more about future expectations than outsiders (potential investors). Therefore, VCs will seek evidence of business viability and confidence in the entrepreneur's ability to deliver. In addition, the investees, seeking funding, will attempt to signal to investors the quality of their team and business potential (e.g., Block et al. (2014); Gompers et al. (2020); Hoenig and Henkel (2015); Kaplan et al. (2009)). These problems are likely to be heightened in *"knowledge intensive firms that require greater sunk cost investment, involve combinatorial technologies, and are likely to take longer to generate revenue after product/service development. For these firm's delivery channels, customer bases and offerings are complex and/or client specific assets are largely intangible*" (Wilson et al., 2018: 626).

Corresponding with the functions of venture capitalists, explanations that account for the spatial proximity of VC investments can also come from the screening process where finding a matching investment is critical. Jääskeläinen and Maula (2014) suggest that the distribution

[1] Explicit or codified knowledge refers to knowledge that is easy to transfer in the formal and systematic language (Ferrary, 2010).

and receipt of information contribute to the preference for proximate investments. Theoretically, advances in communication technologies have allowed investors to access information globally and have helped to eliminate time and distance as obstacles to communication, however the communication process for VC investors is more complicated. The key driver of the demand for VC is still the 'word-of-mouth' effects generated by other local VC-backed ventures (Colombo et al., 2019). Martin et al. (2016) also describe that the information of the VC market mainly spreads through local business networks. This effect in relation to VC investees may in part be due to the secrecy required to establish the new ventures whilst protecting the idea and the IP. More specifically, venture capitalists typically rely on their local information network, which is also more likely to be geographically concentrated, to screen the investment opportunities (e.g., Sorenson and Stuart (2001); Stuart and Sorenson (2003)) and rarely make investments without referrals from trusted parties (Fiet, 1995). The lack of access to the information of distant investment opportunities results in ignoring opportunities or reducing the confidence in the trustworthiness and completeness of the information on target ventures. Furthermore, lacking explicit information of ventures, investors rely on tacit information to handle the uncertainty of projects. It is difficult to formalize and communicate tacit information, which is deeply embedded in actions and commitments (Ferrary, 2010). Thus it is expected that the marginal cost of information transmission and collection increases with distance (Kolympiris et al., 2017).

There is limited evidence on the factors affecting the distance between investors and investees. Sorenson and Stuart (2001) analyze the relationship between syndication networks and VC investments' distribution. The results reveal that VC firms which do not have central positions in the industry's co-investment network and have a history of provincial investment patterns prefer more proximate investments. Cumming and Dai (2010), using a sample of U.S. VC investments between 1980 and 2009, find that more reputable VCs (older, larger, more

experienced, and with stronger IPO track record) and VCs with broader syndication networks have less local bias. Moreover, VCs specializing in investing in technology-sector ventures, with greater uncertainty, prefer closer investments. Consistent with the prior two studies of syndication networks' effects, Mingo et al. (2018) suggest that the syndication network's centrality becomes relatively more important when the geographic distance of investments is high. Additionally, research also demonstrates connections between investors and investees would be a channel for information acquisition and reduction in information asymmetries with distance, particularly for cross-country investments (Jääskeläinen and Maula, 2014).

Given the above discussions, it is apparent that there is scant evidence on the characteristics of investees, especially related to intangibles, and this can influence the investment distance of venture capital. In this study, we try to fill this gap by controlling the detailed VC fund-investee pair level characteristics.

3.1 Accounting Values of Intangibles and Spatial Proximity

Although venture capital is a viable source of finance for ventures with intangible assets, as opposed to debt finance, we acknowledge that there will be more informational asymmetries when VCs invest in start-ups with more intangible assets. As mentioned earlier, start-ups have more knowledge about their enterprise than investors, and asymmetric information can be reduced if start-ups can send credible signals to outsiders (Janney and Folta, 2003). However, due to the lack of codified indicators, (e.g., the market value of intangible assets) and the difficulty of predicting market size and time to commercialization, classical valuation techniques are difficult to be applied. Of course, it is not possible for VCs to access all the relevant information about a specific venture or fully understand context-specific knowledge. Hence, asymmetric information is more difficult to overcome for investments with more intangible assets. In addition, it is likely for startups not to disclose the information that may

reduce the value of ventures, and hence VCs face increasing uncertainties of their irrecoverable costs. The empirical results of Gompers (1995) indicate firms in the industries with a greater fraction of intangible assets receive more rounds of venture financing, suggesting that intangible assets would be associated with greater agency costs and increase the need to monitor tightly.

In this regard, spatial proximity can compensate for this disadvantage as it enables VC investors to access the soft information which is rooted in their social network. In the due diligence process, VCs rely more on social ties to collect information especially when the evaluation is mostly based on tacit information rather than tangible information (Ferrary, 2010). For example, directors' information such as business integrity and managerial abilities which are important factors for the success of a business is 'subtle, nuanced and difficult to verify', hence investors are more likely to rely on someone they know in their local business networks (Granovetter, 2005). Therefore, considering our above discussion on information asymmetries, we hypothesize that,

Hypothesis 1: Geographic distance between investees and VCs is less when investees have an asset base that is intangible.

3.2 Economic Values of Intangibles and Spatial Proximity

Intellectual property rights (IPR) compose a crucial set of intangible assets and resources for firms and influence startups' strategies. Both patents and trademarks play an important role in IPRs, while differing in some ways. Generally, patents are related to the technological aspects of the ventures' business model, with the definition that *"A patent is an exclusive right granted for an invention, which is a product or a process that provides, in general, a new way of doing*

something, or offers a new technical solution to a problem."[2] Trademarks refer to marketing aspects, such as the protection of a startups' brands or the commercialization of productions (e.g., Block et al. (2014); De Vries et al. (2017)). A trademark is typically a word, phrase, logo or symbol, but it can also reflect a smell, color and sound as long as a graphical representation is realistic (Mendonça et al., 2004). Thus, there is a common assumption that startups that are specialized in technology-oriented industries prefer to apply for patent applications, whereas firms that are active in consumer-related and service-related industries typically file for trademark protection (Block et al., 2015). Previous research observes that SMEs are relatively more active in trademarking than large firms (e.g., Block et al. (2014); Helmers and Rogers (2010)). Block et al. (2015) explained this for two reasons: Firstly, SMEs are more likely to focus on product differentiation or niche strategies when considering their small size, and the pivotal role of trademarks in distinguishing SMEs' products from their competitors. Additionally, patents are more costly to acquire than trademarks.

As stated before, venture capitalists face severe information asymmetries. Information asymmetries can be reduced when the party with information advantages sends a signal of their unobserved and potential quality to the less informed party (e.g., Busenitz et al. (2005); Hoenen et al. (2014); Zhang and Wiersema (2009)). Patents and trademarks conform well to the criteria for a quality signal. Firstly, a credible signal should be observable and costly to imitate (Cohen and Dean (2005); Spence (1978)). Information on both patents and trademarks is freely available from public resources, while patents and trademarks themselves are costly to acquire and maintain. For example, Graham et al. (2009) suggest that the direct cost of getting a typical U.S. patent is $35,000, including attorney fees, which is relatively high for a new venture. Secondly, signals need to be governed by strong institutions and hence satisfy certain

[2] Definition from World Intellectual Property Organization (WIPO)

institutional standards, which can reduce the differences between signals and can thereby limit the impact of receiver subjectivity on signal evaluation (Janney and Folta, 2003). As we know, both patents and trademarks are governed and examined strictly by official institutions.

Patents, as signal devices, reflect innovations and inventions of firms, which are the outputs of technologies development effort (e.g., Hsu and Ziedonis (2013)). There is a scarcity of empirical research to support the signal function of patents because of methodological difficulties to disentangle them from productive functions. Hsu and Ziedonis (2013), which study the U.S. semiconductor device firms founded from 1975-1999 that received at least one round of VC investment by the end of 2005, seems to be the first study to analyze the dynamics in the signaling function of patents. Results suggest that patents are more critical as signal devices when there are more severe information asymmetries. More specifically, Hsu and Ziedonis (2013) demonstrate that patents are more influential for founders without prior entrepreneurial success or ventures in earlier rounds. Hoenen et al. (2014) study a dataset of more than 580 U.S.-based biotechnology firms financed by venture capital. Consistent with Hsu and Ziedonis (2013) they find that patent applications substantially increase the amount of venture capital funds in the first round, whereas there is no significant effect on the second round. They suggest that information asymmetry between investors and investees decreases as ventures mature making the hidden quality of ventures more apparent. Therefore, the effectiveness of patents as signals is expected to be limited in the second round. Kolympiris et al. (2017), relying on a dataset of first-round venture capital investments in 586 U.S.-based biotechnology firms from 2001-2011, indicate that patents as signals play a more valuable and effective role in the longer-distance transactions. The results corroborate the idea that the value of signals tends to diminish in proximate transactions as tacit knowledge can circulate within local circles rather than long distances. Thus, for long-distance transactions with more severe information asymmetries, patents as signal devices are useful to reduce information gaps

between investors and investees. However, Hoenig and Henkel (2015) use a conjoint-based survey of 187 individual VCs from Germany and the United States, arguing that patents affect the venture capitalists' decision only in property rights function rather than signal function.

In conclusion, existing studies provide evidence on the signaling function of patents. From the signaling theory perspective, patents can reduce the information gaps between investors and investees by reflecting innovational potential, one of the critical abilities for business success. Such signals can be received by distant potential investors to overcome the information asymmetries associated with distance. Following most of the empirical literature about innovation (e.g., Audretsch et al. (2012); Bronzini et al. (2020); Haeussler et al. (2014); Hoenig and Henkel (2015)), this study utilizes the patent applications. Patent applications can be regarded as useful signals because technical information conveyed by applications also allows potential venture capital investors to evaluate the inventions (Audretsch et al., 2012). Besides, information on patent applications is more rapidly available (Bronzini et al., 2020). As patents take several years to be granted after applications[3], the number of granted applications would be underestimated in the later period of the sample. Therefore, we propose our second hypothesis:

Hypothesis 2: Geographic distance between investees and VCs is greater when investees have a higher number of patent applications.

Trademarks signal start-ups' awareness of protecting their marketing assets to potential venture capitalists before receiving funding. Prior research has proved that marketing strategies are highly relevant to the survival of emerging ventures (Gruber, 2004). Findings related to VC studies also support this opinion by indicating that the market orientation of startups is key to

[3] Application process usually takes 5 years in the UK Intellectual Property Office (IPO).

venture capitalists' decisions (e.g., Douglas and Shepherd (2002)). Trademarks can serve as a credible signal of intrinsic firm value to outsiders, conveying information of products/serves and achieving a competitive advantage by differentiating from other products/services to some extent. Block et al. (2014) indicate the value of trademarks as signals of market and growth orientation decreases at later stages. Trademarks might lose their signaling value when startups are in more advanced development stages because trademarks as signals can be replaced by more tangible, credible, and costly signals. Zhou et al. (2016) find that both patents and trademarks directly affect the valuation of VC investments and have complementary effects with each other. However, on the other hand, some disadvantages related to trademarks have been emphasized by several studies. Flikkema et al. (2014) suggests that a strong trademark position decreases startups' incentive to continue innovating further as it might create a false sense of security for managers. Furthermore, Hsu et al. (2021) claim that firms with more new trademarks may suffer higher systematic risk because the launch of new trademarks requires firms to adjust their production lines and marketing activities, which incurs high adjustments costs related to the reallocation of resources and operations. In addition, He et al. (2018) argue that SMEs, who lack resources and market orientation and use agents and distributors as an alternative channel of marketing, do not require trademarks as they would not be facing much asymmetric product information given their choice of marketing channel. Athreye and Fassio (2020) regard trademarks as constraints in collaborative innovation. One possible reason is that the innovating firms might not completely own the property rights of the cooperative products/services. As stated above, VCs will ensure their ventures have access to more open innovation networks, allowing them to exploit synergies of intangibles. Therefore, trademarks may hinder collaboration with other firms. As discussed above, there is still no agreed conclusion about the effects of trademarks. Given the mixed results on the effect of trademarks on the innovative behavior of firms, we conjecture trademark activities are not useful signals

for VCs in the open innovation network environment. This study applies the number of registered trademarks rather than trademark applications because marketing investments is only undertaken after the trademark is granted (Sandner and Block, 2011). Besides, compared with the patent application process, there is a much shorter period for trademarks to be granted[4], and the truncation bias in registered trademark counts is less likely to exist in our sample. Therefore, we propose our third hypothesis:

Hypothesis 3: There is no significant effect of registered trademarks on the geographic proximity of portfolio firms.

4. Data, Variable Construction and Methodology

4.1 Datasets and Sample Selection

The venture-capital transaction data, including the characteristics of deals and venture capital funds and VC-backed investees (except directors' data), is downloaded from Beauhurst database for the period 01/01/2011 to 31/12/2018[5]. We select deals where the fund type is 'Private Equity and Venture Capital', the recipient company is in 'United Kingdom', and the head office location of the fund is also in 'United Kingdom'. We then exclude PE deals from Beauhurst database based on both the registration number and name of companies using our unique PE deals database[6] from 2011-2018. Finally, the final database contains 3,546 deals, 435 VC funds, 2545 VC-backed investees, and 4455 VC fund-investee pairs.

[4] Based on the whole trademark data in UKIPO since 2005, there is around a five-month gap between the filing date and registered date.

[5] The sample period starts in 2011 considering the incomplete data in the earlier years in Beauhurst.

[6] One of the authors ran a university spin-out company (2001-2010) involved in corporate risk modelling, in association with ICC Credit, and developed the company panel database via bulk access to the processed Companies House filings.

Patents and trademarks data are downloaded from UK Intellectual Property Office (UKIPO). To combine the intellectual property data with venture-capital transaction data, this study constructs the following three steps: 1) Combing all historical names and postcodes of investee companies from both CreditSafe and Beauhurst; 2) Doing fuzzy matching[7] on companies' registered names (including historical name) and keeping when similarity score is higher than 0.6. Before doing matching, names are standardized, e.g., lowercasing names, dropping limited, ltd, and plc from name to increase the matching speed and accuracy. 3) Using information (location, registered number) from Companies House to double-check manually.

This study follows Wilson et al. (2018) utilizing the director dataset of VC-backed investees from CreditSafe. CreditSafe provides the unique identification number of each director which can be used to track their current and past directorships. It includes information of director title, director surname and forename, date of birth, nationality, appointment date, and resignation date.

4.2 Variable Construction

Dependent Variables

The dependent variable in our regression analysis is the natural logarithm of geographic distance (km), which is measured by the shortest distance[8] from VC-fund office to investee office. The traveling model is specified as transit, based on Google Map Distance Matrix API and R software (Colombo et al., 2019). Firstly, following Wilson et al. (2019), geographic distance is calculated at the VC fund-investee-pair level. There are some pairs where both the

[7] This study applies the '*matchit*' code in Stata to achieve fuzzy matching. The following is the specific setting: *'weights (root)',* is particularly recommended for large datasets where some grams, e.g., 'Inc' are frequently found, because if not they increase the false positive matches*; 'threshold (0.6)*' is the lowest similarity scores to be kept in final results; '*sim(token)*' means algorithm splits a text string simply by its blank spaces. For example, 'Icon Aerospace' is considered as two elements (or grams): 'Icon' and 'Property', which can reduce the size of index.
[8] This study considers all office addresses of both VC-funds and investees, and then chooses the shortest distance.

investee and investor postcodes are valid, but Google Maps does not provide the transit route. In this case, the distance is calculated using the 'driving model' from the investor to the investee. Furthermore, this study also uses syndication distance at the deal level, which is the distance from the investee to the closest VC-fund syndication member (e.g., Cumming and Dai (2010); Kolympiris et al. (2017)). Typically, in syndication schemes, the closest VCs assume most of the monitoring and consulting roles (Ferrary, 2010).

Main Independent Variables

Intangible assets: It is measured by ln (Intangible assets (t-1)) / (tangible assets (t-1)). We use the one plus the intangible assets/tangible assets given the high number of observations with intangible assets/tangible assets being equal to zero before receiving fundraising.

Patents: Following previous studies (e.g., Bronzini et al. (2020); Haeussler et al. (2014)), we use the total number of patent applications from the firms' foundation year to one year before VC investment year (t-1). Besides, the patent is also measured by a dummy variable (*Patent_dummy*), with a value of 1 if there is at least one patent application before the investment year.

Trademarks: This study only considers trademarks that are successfully registered and not expired in the fundraising year. It is calculated as the total number of registered trademarks from the firms' foundation year to one year before the investment (t-1). Besides, the trademark is also presented by a dummy variable (*Trademark_dummy*), with a value of 1 if there is at least one registered trademark before the investment year.

Control Variables

The following control variables are adopted to measure the influence of VC-backed firms, deals, and VC-funds characteristics on investment distance based on the extant literature. In terms of

ventures, we control for *Stage* (e.g., Cumming and Dai (2010); Sorenson and Stuart (2001)), which is a dummy variable to measure the maturation of investees, taking the value of 1 if investees are in the late stage (growth or established) and zero otherwise (seed or venture). *Seed* is a dummy variable, equal to 1 if investees are in the earliest (seed stage) and zero otherwise. *Technology/IP-based businesses sector* is dummy taking the value of 1 if investees in Technology/IP-based businesses sector[9] and zero otherwise. *Trade creditor ratio* and *Trade debtors ratio*, calculated as trade creditor/debtors (t-1) to total asset(t-1), capturing debt finance that ventures are able to raise. *Audited* is the dummy variable, equal to one if the last account before fundraising (t-1) of investees is audited and zero otherwise (Wilson et al., 2020). *Big 4* indicates whether the auditor is from Big 4 accounting firms.

Characteristics of investees' directors are considered as well (e.g., Hsu (2007); Wilson et al. (2018)), including *average and standard variation of individual directors[10]' age*, *percentage of individual directors with doctoral degree*[11], *average tenure time of individual directors*, *percentage of non-UK (nationality) directors*, *percentage of female directors*[12], *average number of multiple directorships*[13] for each board and whether there are *PE/VC directors*[14] on board. Regarding the features of deals, this study controls for *ln (Amount raised by deal)* (Lutz et al., 2013). *Number of investors* measures the total syndication partners in the deal, and there

[9] Technology/IP-based businesses sector is assessed by Beauhurst, including the following subsector: clean technology, hardware, life sciences, materials technology, medical technology, nanotechnology, software and other technology/IP-based businesses.

[10] As companies, trusts, and organizations (non-individual) can also be registered as directors. We distinguish individual and non-individual directors by their names.

[11] We define directors with the doctoral degrees based on their titles, i.e., Dr. or Prof.

[12] Female directors are firstly defined by their titles, e.g., Miss, Baroness, Lady, Mrs., Ms. And then, we also use a female forename lookup-table (based on the whole director data) as the supplement for some directors without title data and doing double-check.

[13] Multiple directorships mean individual directors also have directorships in other companies when the investment is made.

[14] PE/VC directors are recognized by names, e.g., including words 'invest', 'development', 'capital' and 'venture', as well as manually checking is needed, through the information on SIC07 code, SIC07 description, principal activities, official websites and social media from Creditsafe, Company House, Beauhurst, Dun & Bradstreet and Bloomberg, etc.

could be *Government involvement*, *University involvement*, and *Business Angels involvement.* Lastly, we identify *Regions of VCs*[15] and *Deal year*. Appendix Table A3.1 lists the detailed definition of each variable and the data sources.

4.3 Methodology

This study applies multivariate least squares regressions to test the hypotheses. We run the following model specification (1):

$$(1) \quad \ln(Geographic\ distance_{it}) = a_0 + b_1 Intangibles_{it-1} + b_2\ Char.of\ investors_{it-1} + b_3\ Char.of\ investees_{it-1} + b_4\ Char.of\ deals_{it} + Dealyear\ FixedEffects + Region\ FixedEffects$$

Where the dependent variable is the natural logarithmic form of distance at the VC fund-investee-pair level and syndication distance at the deal level. $Intangibles_{it-1}$ is the main independent variable, and we control the characteristics of investees, investors and deals. Firstly, we use the *ln (intangibles/tangibles)* to capture the accounting value of $Intangibles_{it-1}$ for analyzing our first hypothesis. Then, this study utilizes the number of *patent applications* and *registered trademarks* to measure the economic value of $Intangibles_{it-1}$, testing our second and third hypotheses, respectively.

5. Empirical Results and Discussion

5.1 Univariate Analysis

Table 1 reports descriptive statistics of the whole sample at the VC fund-investee-pair level. In Panel A of **Table 2**, we show the t-test between the subsamples of VC-backed investees by sectors, i.e., Non-Technology/IP-based business sector and Technology/IP-based business

[15] 12 NUTS statistical regions in the UK.

sector. It is expected that there are some differences between these two sectors. Compared with non-tech startups, firstly, tech startups provide VCs with a potential for higher returns but also higher risk and uncertainty as they are facing hard scientific problems related to long research cycles, greater sunk cost investments, and complex market environments (Hoenen et al., 2014). Moreover, venture-related knowledge is more difficult to be conveyed to VCs, which created a greater mismatch of information between investors and investees. Furthermore, non-tech and tech firms seek different IP protections. Tech startups prefer to apply for patent applications, whereas firms that are active in consumer-related and service-related industries typically file for trademark protection (Block et al., 2015). Considering the above diversities between tech and non-tech firms, it is worth exploring the different behavior of VCs across tech and non-tech sectors. Panel A shows, firstly, investees in the Non-Technology/IP-based business sectors receive longer distance fundraising which is consistent with our assumption that geographic proximity is greater when investees suffer more asymmetric information in the high-tech sector. Secondly, investees in the tech sector have a lower number of registered trademarks while a higher number of patent applications. It supports the theory that technology-oriented startups prefer to apply for patent applications, whereas non-tech firms are more likely to seek trademark protection (Block et al., 2015). Thirdly, there are significant differences in directors' characteristics and financial indicators between investees from tech and non-tech sectors. For example, tech-investees have a higher probability to have directors who are with a doctoral degree, non-UK nationalities, and fewer females. Lastly, for deal characteristics, non-tech investees have a small syndication size and are less likely to receive capital from other types of investors (government, university and business angels). Following previous studies (e.g., Cumming and Dai (2010); Hoenen et al. (2014)), Panel B of Table 2 indicates different features also exist across stages of investees. For instance, early investees have a higher probability to be financed by closer VCs because VCs face higher risks where the timing and scale of the

business return are more difficult to assess. Besides, early-stage investees are with higher intangible assets, fewer patents/trademarks, more directors with a doctoral degree, less audited accounts, smaller deal sizes, and more various investors involved.

Please insert (Table 1 and 2 here)

5.2 Accounting Values of Intangible Assets

Table 3 presents the regression results of our primary analysis on the first hypothesis, i.e., the negative relationship between intangible assets and investment distance. The data sample in Panel A is at the VC-fund-investee-pair level. In model 1, after controlling year and region fixed effects, we regress the dependent variable on our set of basic controls: stage, sector, board characteristics. In model 2, we include variables to control the financial statement indicator of investees. In model 3, we add some variables of deal features, including deal size (i.e., the total number of investors and the total amount of the deal) and dummy variables to test whether other types of investors influence spatial proximity. The coefficient of the main variable, *ln (Intangibles/Tangibles)*[16], is statistically significant at the 1% level and has the expected negative signs, which is consistent with **H1**. Model 3 suggests that with every 1% increase in the intangible ratio of investees, our investment distance is going to decrease by about 0.0179%.

Regarding control variables in Panel A, the percentage of directors holding the doctorate degree, directors' age and tenure are positively affecting investment distance. This is consistent with previous studies suggesting the signaling function of management teams of investees (e.g., Eddleston et al. (2016); Franke et al. (2008)). Startups with audited accounts are more likely to attract distant VCs, which indicates clean accounts are important for investors (Wilson et al., 2020). On the other hand, the total amount of deals has negative effects on the distance. A

[16] Our results remain robust when using intangible assets to total fixed assets to measure intangible ratio, at both the VC-fund-investee-pair level and the deal level.

larger investment sum with a higher relative impact on the portfolio's overall performance would lead to more frequent onsite monitoring of VCs, thus spatial proximity can reduce the travelling costs (Lutz et al., 2013). Additionally, multiple directorships of individual directors, percentage of foreign directors and trade debtor ratio are negatively related to distance. Furthermore, with respect to other types of investors, university involvement can mitigate the spatial proximity because the university can provide technical knowledge that can help venture capitalists reduce risks both in screening and monitoring stages. In contrast, business angels' involvement has the opposite effects on distance. Panel B runs the regression on the syndication distance at the deal level, i.e., distance from the investee to the closest VC-fund syndication member. The coefficient of *ln (Intangibles/Tangibles)* is not significant in the first two models of Panel B. However, *ln (Intangibles/Tangibles)* becomes negatively significant with syndication distance at the 5% level when the characteristics of deal features are included in model 3. This finding is consistent with results in Panel A, supporting the first hypothesis.

Please insert (Table 3 here)

Tables 4 divides samples into two subsamples, investees in Technology/IP-based business (model 1-3) and Non-Technology/IP-based business (model 4-6), analyzing whether the influence of intangible assets on distance differ across sectors. More specifically, results in Panel A show that the negative effects of intangible assets only exist in the tech sector, where distance decreases by about 0. 0233% with every 1% increase in the intangible ratio of investees (model 3). Panel B, with sample at the deal level, holds similar results that the estimator of *ln (Intangibles/Tangible)* is negatively related to the syndication distance in the tech sector (model 3). We believe that this is due to the fact that information asymmetry problems would be more severe for high-tech firms. In addition, high-tech startups require greater sunk cost investment, compared with non-tech startups, causing more uncertainty and

risks for potential venture capitalists. Consequently, venture capital investment in tech startups with a high intangible ratio (low liquidation value) would be with more cautions, and spatial proximity is aggravated. In the non-tech sector, investees that have *PE/VC firms as directors* attract distant VCs. This seems to be the case as PE/VC directors can be regarded as an endorsement of ventures' quality and hence asymmetric information is less for such ventures. Investees with auditors from *Big 4* are more likely to receive distant fundraising. Moreover, government involvement can mitigate the spatial proximity, as government can select promising companies and certify them to private venture capitalists (Guerini and Quas, 2016).

Please insert (Table 4 here)

Table 5 demonstrates the regression results on the natural logarithmic form of investment distance by stages at the pair and deal level, respectively. Panel A shows that the intangible ratio is statistically significant, with the negative sign in models 1 and 3. In models 2 and 4, we include the interaction of *Tech sector* and *ln (Intangibles/Tangibles)* to test further whether the sector can influence the effects of intangible ratio on distance. At the early stage, *Tech sector* is negatively significant at the 1% level, and the coefficient estimate of this interaction variable is negative and significant at the 5 % level (model 2 in Panel A and B). It reveals that the negative effects of intangible ratio on distance would sharpen for tech-sector investees. While the interaction variable is insignificant in model 4 where investees are in the late stage. The difference indicates, for investees in the technology sector, negative effects of intangible ratio on distance would be greater when investees are in the early stage. It can be explained by that early-stage investees suffer more severe information asymmetries.

Please insert (Table 5 here)

5.3 Economic Values of Intangible Assets

Table 6 presents the regression results of our analysis on the second and third hypotheses, with the investment distance as the dependent variable. In Panel A, with sample at the VC fund-investee-pair level, the results suggest the number of patent applications (*Patent*[17]) is significantly positively related to investment distance, at the 1% level. This supports our second hypothesis that patents that reflect the innovation abilities of startups attract more distant VCs. Moreover, no significant effect of *Trademark*[17] on distance is shown in Panel A, which supports our third hypothesis that trademarks are not useful signals in reducing information asymmetries for distant VCs. Panel B runs the regression on the syndication distance at the deal level. *Patent* keeps positively significant across three models. While *Trademark* is significantly negative with syndication distance in models 1 and 2, after fully controlling characteristics of deals (i.e., syndication number, deal sizes and other types of investors' involvement), the coefficient of *Trademark* turns to be insignificant. This is consistent with the results in Panel A and H3.

Please insert (Table 6 here)

Tables 7 divides samples into two subsamples based on sectors of investees, i.e., tech and non-tech sectors, and include the interaction of '*Patent_dummy'* and '*seed'*. This allows us to analyze the signal function of patents across sectors and stages. The coefficient estimates of '*Patent*' are positively significant across models. Whereas the interaction term is only positive and significant in model 2 of Panel A (Panel B), at the 10% (5%) level. This finding suggests that, for investees in the technology sector, patenting activities in the earliest stage rather than later stage stimulate a greater shift in investment distance. This is corroborate with the signal

[17] Our results remain robust when patent and trademark activities are measured by *ln (patent applications +1)* and *ln (registered trademarks +1)* respectively, at both the VC-fund-investee-pair level and the deal level.

function of patents being more influential when there are more severe information asymmetries in the earlier stages (e.g., Hsu and Ziedonis (2013); Hoenen et al. (2014)).

Please insert (Table 7 here)

Similarly, **Table 8** explores whether the maturation of investees can influence the effects of trademarks on distance, by including the interaction term of '*Trademark_dummy'* and '*Seed'*. *Seed* is adversely associated with distance (model 4) in both Panel A and B. Moreover, the coefficient of interaction is positive and highly significant when investees are in the non-tech sector (model 4). It reveals that although trademarks have no isolated effects on distance (Panel A and B), they can mitigate the spatial proximity caused by the untransparent information when non-tech investees are in the seed stage. This is similar to the finding of Block et al. (2014), which suggests that values of trademarks as signals decrease when startups progress into more advanced development stages. In conclusion, the effects of patents as a signaling device to attract distant investors are greater for tech startups in the seed stage rather than the later stage, whereas the trademark is significant to reduce spatial proximity of non-tech startups in the seed stage. This finding is also consistent with previous literature that the patent and trademark have complementary effects in different sectors. (e.g., Block et al. (2014); De Vries et al. (2017); Hoenen et al. (2014)).

Please insert (Table 8 here)

Tables 9 further investigates whether the effects of patents/trademarks differ with the VC fund's age. Although the coefficients of *VC age* are insignificant our analysis, our analysis presents the interaction item *Patent_dummy* VC age* is significantly negative with the distance (model 2 in panel A and B), suggesting that the signal function of the patents in reducing the spatial proximity is more influential for younger VCs. This is not surprising since younger VC

funds seem to have less experience and expertise in managing investees and therefore rely more on patents as signals to actively screen and select promising firms. These results are somewhat related to the earlier study by Chemmanur et al. (2011), who find that high-reputation VCs are better at improving total factor productivity (TFP) level by monitoring, while low-reputation VCs screen investees with higher levels of initial productivity.

Please insert (Table 9 here)

5.4 Alternative statistical approach: Ordered Logit Model

Before drawing conclusive inferences from our results, further analyses are conducted to validate the robustness of our study. We try to test results using the ordered Logit model at both the pair and deal levels. The dependent variable of ordered Logit models is the ordinal variable, which categorizes investment distance by quintiles, and higher values of the dependent variable suggest a longer distance from VCs to investees. We can see results, shown in **Table 10**, are robust where both *ln (Intangibles/Tangibles)* and *Patent* are statistically significant whereas *Trademark* is not. More specifically, for the decrease in *ln (Intangibles/Tangibles)* and increase in *Patent*, we expect increases in the odds of being in a higher level of investment distance, which support our hypotheses that higher accounting values of intangible assets aggravate the spatial proximity, patents are useful to attract more distant investors.

Please insert (Table 10 here)

6. Conclusion

Our results contribute to the literature on the relationship between spatial proximity of venture capital investments and the level of intangible assets of startups. In this study, we strive to

understand the characteristics of intangibles, i.e., low liquidation value and high potential of synergy, and how they can meet the nature of venture capital investments. Then we explore intangible assets from both accounting and economic values, drawing down our hypotheses based on information asymmetries and signal theories. Information gaps between VC investors and ventures tend to be aggravated when investees have a higher level of intangible assets, especially for tech and early startups, because classical valuation techniques are difficult to be applied and evaluations are mostly based on tacit information. In this regard, spatial proximity can alleviate these information asymmetries associated with intangible assets. On the other hand, considering the economic value of intangibles, patents and trademarks as signals reflect firms' potential innovation and commercialization abilities, reducing information asymmetries. After controlling deal year fixed effects and regions fixed effects, we find that venture capital funds have a preference for closer investment distance when investees have a lower level of liquidation value (i.e., higher intangible assets). We also find that negative effects of intangibles tend to be more prevalent in the tech sector, and tech-investees in the early stage suffer more than in the late stage. Furthermore, overall, patents rather than trademarks are useful to attract distant investors. But when we carry out deeper analysis by sectors and stages, we can find although trademarks have no significantly isolated effects on distance, it is still helpful to mitigate the spatial proximity of non-tech startups in the seed stage. Besides, for tech startups, the effects of possessing at least one patent application on attracting distant investors are more influential in the seed stage than in other later stages. These results are consistent with previous studies that signal function increase with information asymmetries between investors and investees (e.g., Hsu and Ziedonis (2013); Hoenen et al. (2014)). Additionally, our results corroborate the literature that patents and trademarks have complementary effects in different sectors (e.g., Block et al. (2014); De Vries et al. (2017)). Lastly, we find the effects of patents

are superior for younger VCs, which is related to studies that less experienced VCs rely more on screening while experienced ones are better at monitoring (Chemmanur et al., 2011).

Our study indicates avenues for extending future research. The uneven distribution of equity financing has attracted considerable attention from entrepreneurial finance studies. The UK is a heavily spatially centralized financial system with London being the geographic concentration of both venture capitalists and startups (e.g., Amini et al. (2012); Martin et al. (2005)). It would be useful to explore whether the investment distance varies between the financial core and peripheral regions. Similarly, venture capitalists tend to syndicate their investments with other VCs rather than to invest alone. There are good reasons to believe that the syndication relationship can enhance selecting high-quality investments and adding value to startups (e.g., Zhang (2019)). Consequently, it could be worthy for further studies to investigate how syndication networks of VCs can affect the location bias of investment activities.

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Table 1 Descriptive statistics at the VC fund-investee-pair level

Variable	Obs	Mean	Std. Dev.	Min	Max
ln (Geodistance)	4,426	2.3777	2.3973	-6.9078	6.8742
ln (Intangibles/Tangibles)	3,713	-4.8336	6.1327	-20.1181	15.3409
Patent	4,455	0.5490	2.8117	0	63
Trademark	4,455	0.7540	2.0531	0	53
Tech/IP-based sector	4,455	0.7104	0.4536	0	1
Stage	4,455	0.3149	0.4645	0	1
Pct. of Dr. degree	4,383	0.0824	0.1905	0	1
Std age	4,057	8.0802	4.5042	0	34.1179
Average age	4,383	45.0944	8.1911	18.8700	69.6000
Tenure	4,383	2.5893	2.3132	0	22.1739
ln (multi-directorship)	4,383	1.2980	0.7578	0	5.1240
Pct. of foreign directors	4,381	0.2158	0.2849	0	1
PE/VC company as directors	4,383	0.0224	0.1479	0	1
Pct. of female	4,383	0.1014	0.1848	0	1
Trade debtors ratio	3,697	0.0610	0.1368	0	0.9407
Trade creditor ratio	3,697	0.0791	0.2577	0	6.3620
Audited	3,638	0.3887	0.4875	0	1
big4	3,600	0.1378	0.3447	0	1
N of investors	4,455	2.3235	1.6408	1	14
ln (Amount raised by deal)	4,130	14.4399	1.6013	8.2146	19.4680
Government Inv	4,455	0.1071	0.3092	0	1
University Inv	4,455	0.0207	0.1422	0	1
Business Angel Inv	4,455	0.1744	0.3795	0	1

Table 2 T-tests of subsamples at the VC fund-investee-pair level

	Panel A: Sectors of VC-backed firms					Panel B: Stages of VC-backed firms				
	Non-tech sector		Tech-sector			Early stage		Late stage		
Variables	N	Mean	N	Mean	Mean Diff	N	Mean	N	Mean	Mean Diff
ln (Geodistance)	1282	2.477	3144	2.337	0.140*	3028	2.262	1398	2.628	-0.366***
ln (Intangibles/Tangibles)	1052	-4.840	2661	-4.831	-0.009	2458	-4.443	1255	-5.598	1.154***
Patent	1290	0.125	3165	0.722	-0.597***	3052	0.339	1403	1.005	-0.666***
Trademark	1290	0.908	3165	0.691	0.216***	3052	0.567	1403	1.161	-0.594***
Pct. of Dr. degree	1268	0.018	3115	0.109	-0.090***	3009	0.100	1374	0.043	0.057***
Std age	1143	7.860	2914	8.166	-0.306*	2735	8.069	1322	8.104	-0.035
Average age	1268	44.825	3115	45.204	-0.378	3009	43.941	1374	47.621	-3.680***
Tenure	1268	2.937	3115	2.448	0.488***	3009	2.047	1374	3.777	-1.730***
ln (multi-directorship)	1268	1.459	3115	1.233	0.226***	3009	1.184	1374	1.547	-0.363***
Pct. of foreign directors	1266	0.153	3115	0.241	-0.089***	3007	0.225	1374	0.195	0.031***
PE/VC company as dir.	1268	0.006	3115	0.029	-0.023***	3009	0.024	1374	0.018	0.006
Pct. of female	1268	0.140	3115	0.086	0.054***	3009	0.105	1374	0.092	0.013**
Trade debtors ratio	1048	0.084	2649	0.052	0.032***	2446	0.034	1251	0.114	-0.080***
Trade creditor ratio	1048	0.103	2649	0.069	0.034***	2446	0.065	1251	0.107	-0.042***
Audited	1033	0.472	2605	0.355	0.117***	2403	0.208	1235	0.739	-0.531***
big4	1014	0.151	2586	0.133	0.018	2356	0.069	1244	0.268	-0.198***
N of investors	1290	1.770	3165	2.549	-0.779***	3052	2.281	1403	2.416	-0.134**
ln (Amount raised by deal)	1122	14.418	3008	14.448	-0.030	2887	13.953	1243	15.571	-1.618***
Government Inv	1290	0.054	3165	0.129	-0.074***	3052	0.132	1403	0.052	0.080***
University Inv	1290	0.001	3165	0.029	-0.028***	3052	0.027	1403	0.006	0.021***
Business Angel Inv	1290	0.135	3165	0.191	-0.056***	3052	0.217	1403	0.083	0.134***

Table 3 Effects of intangible ratio on investment distance

Panel A: Effects of intangible ratio on distance, at the VC fund-investee-pair level			
	[1]	[2]	[3]
ln (Intangibles/Tangibles)	-0.0104**	-0.0119**	-0.0179***
	(-2.45)	(-2.62)	(-3.83)
Pct. of Dr. degree	0.9486*	0.9489*	0.7936
	(1.93)	(1.98)	(1.69)
Std age	-0.0120**	-0.0161**	-0.0130
	(-2.30)	(-2.38)	(-1.68)
Average age	0.0591***	0.0589***	0.0578***
	(5.16)	(6.13)	(6.64)
Tenure	0.0857***	0.0864***	0.0910***
	(3.46)	(3.78)	(3.94)
ln (multi-directorship)	-0.2720***	-0.3019***	-0.3300***
	(-6.09)	(-6.91)	(-7.12)
Pct. of foreign directors	-0.9832***	-1.0482***	-0.9111***
	(-8.91)	(-11.66)	(-12.28)
PE/VC company as directors	0.2256	0.1701	0.1605
	(0.62)	(0.47)	(0.42)
Pct. of female	-0.1733	-0.0436	-0.1374
	(-1.74)	(-0.45)	(-1.36)
Trade debtors ratio		-0.6917***	-0.7045***
		(-3.41)	(-3.82)
Trade creditor ratio		-0.0944	-0.0702
		(-0.46)	(-0.34)
Audited		0.2011*	0.3401***
		(1.87)	(4.29)
Big4		-0.0485	0.1147
		(-0.48)	(0.89)
N of investors			-0.0045
			(-0.25)
ln (Amount raised by deal)			-0.1439***

			(-3.18)
Government Inv			0.2406
			(1.03)
University Inv			0.5666*
			(1.99)
Business Angel Inv			-0.2081**
			(-2.35)
_cons	0.2315	0.2664	2.3019*
	(0.36)	(0.43)	(2.11)
Deal year FE	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes
N	3485	3319	3106
Mean VIF	1.60	1.58	1.58

Table 3 (Continued)

Panel B: Effects of intangible ratio on syndication distance at the deal level			
	[1]	[2]	[3]
ln (Intangibles/Tangibles)	-0.0051	-0.0079	-0.0143**
	(-0.98)	(-1.38)	(-2.34)
Pct. of Dr. degree	0.8106	0.8408	0.7050
	(1.57)	(1.70)	(1.47)
Std age	-0.0116**	-0.0181**	-0.0156*
	(-2.59)	(-2.61)	(-1.80)
Average age	0.0590***	0.0608***	0.0613***
	(4.37)	(5.27)	(5.76)
Tenure	0.0956***	0.0967***	0.1008***
	(3.49)	(3.89)	(4.11)
ln (multi-directorship)	-0.2850***	-0.3098***	-0.3550***
	(-5.45)	(-6.77)	(-6.73)
Pct. of foreign directors	-1.0424***	-1.0884***	-0.8454***
	(-6.32)	(-7.73)	(-6.29)
PE/VC company as directors	0.0639	-0.0248	-0.0104
	(0.19)	(-0.08)	(-0.03)
Pct. of female	-0.1012	0.0233	-0.0955
	(-1.24)	(0.28)	(-1.03)
Trade debtors ratio		-0.5290*	-0.6304**
		(-2.05)	(-2.66)
Trade creditor ratio		-0.0858	-0.0871
		(-0.40)	(-0.40)
Audited		0.0867	0.2303**
		(0.74)	(2.86)
Big4		-0.0516	0.1481
		(-0.41)	(0.90)
N of investors			-0.0961***
			(-4.95)
ln (Amount raised by deal)			-0.1359**

			(-2.37)
Government Inv			0.1787
			(0.90)
University Inv			0.7011**
			(2.38)
Business Angel Inv			-0.2597**
			(-2.37)
_cons	0.1189	0.1048	2.1707
	(0.16)	(0.15)	(1.60)
Deal year FE	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes
N	2759	2615	2425
Mean VIF	1.60	1.58	1.58

Notes: the dependent variable of Table 3 is the natural logarithmic form of distance at the VC fund-investee-pair level in Panel A, and syndication distance at the deal level in Panel B. Models include deal year fixed effects and regions of VC-funds fixed effects, and standard errors are clustered by the regions of VC-funds. *ln (Intangibles/Tangibles)* is winsorized at 5th and 95th percentile. The t statistics is reported in parentheses * p < .10, ** p < .05, *** p < .01.

Table 4 Effects of intangible ratio on investment distance by sectors

Panel A: Effects of intangible ratio on distance by sectors, at the VC fund-investee-pair level						
	Tech sector			Non-tech sector		
	[1]	[2]	[3]	[4]	[5]	[6]
ln (Intangibles/Tangibles)	-0.0165**	-0.0173**	-0.0233***	0.0090	0.0070	0.0058
	(-2.49)	(-2.55)	(-3.69)	(0.61)	(0.43)	(0.33)
Stage	0.0008	-0.0892	0.0264	-0.0048	0.1406	0.2452*
	(0.01)	(-0.91)	(0.25)	(-0.05)	(1.20)	(2.03)
Pct. of Dr. degree	1.0663**	1.0244**	0.9217**	-0.8798	-0.8245	-1.0483
	(2.42)	(2.51)	(2.40)	(-0.46)	(-0.39)	(-0.47)
Std age	-0.0028	-0.0068	-0.0016	-0.0307**	-0.0365***	-0.0409***
	(-0.37)	(-0.75)	(-0.16)	(-2.37)	(-4.50)	(-7.03)
Average age	0.0636***	0.0615***	0.0595***	0.0409***	0.0470***	0.0450***
	(4.95)	(5.27)	(5.56)	(3.34)	(5.38)	(5.43)
Tenure	0.1112***	0.1211***	0.1183***	0.0620*	0.0579*	0.0614
	(7.21)	(8.16)	(7.02)	(1.99)	(1.83)	(1.76)
ln (multi-directorship)	-0.3207***	-0.3252***	-0.3346***	-0.1376*	-0.2142**	-0.2940***
	(-4.44)	(-4.98)	(-4.82)	(-1.96)	(-2.79)	(-3.72)
Pct. of foreign directors	-0.8125***	-0.8379***	-0.7296***	-1.1373***	-1.2726***	-0.9827***
	(-5.75)	(-7.18)	(-7.85)	(-9.71)	(-9.12)	(-9.20)
PE/VC company as dir.	0.0798	0.0326	0.0235	1.8113***	1.5752***	2.0475***
	(0.24)	(0.10)	(0.07)	(8.96)	(6.28)	(4.46)
Pct. of female	-0.2370	-0.1227	-0.0883	-0.1334	-0.0029	-0.3698
	(-0.63)	(-0.43)	(-0.30)	(-0.27)	(-0.01)	(-0.68)
Trade debtors ratio		-0.7291***	-0.7622***		-0.4908	-0.7089*
		(-3.15)	(-3.19)		(-0.97)	(-1.82)
Trade creditor ratio		-0.1001	-0.1480		-0.0272	0.3681
		(-0.35)	(-0.53)		(-0.09)	(1.06)
Audited		0.3409**	0.4410***		-0.1528	-0.0959
		(2.55)	(3.83)		(-0.99)	(-0.70)
Big4		-0.1823	-0.0350		0.0778	0.3092**
		(-1.77)	(-0.26)		(0.61)	(2.55)

N of investors			0.0004			-0.1109**
			(0.03)			(-3.10)
ln (Amount raised by deal)			-0.1358**			-0.1732***
			(-2.95)			(-3.87)
Government Inv			0.2625			0.6030*
			(0.87)			(2.15)
University Inv			0.5288*			-0.1781
			(1.88)			(-0.61)
Business Angel Inv			-0.1942**			-0.2091
			(-2.85)			(-1.00)
_cons	-0.0809	-0.0297	1.9178	1.0493	0.9401	3.5380**
	(-0.12)	(-0.05)	(1.74)	(1.35)	(1.21)	(3.06)
Deal year FE	Yes	Yes	Yes	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2511	2393	2290	974	926	816
Mean VIF	1.56	1.54	1.56	1.84	1.82	1.84

Table 4 (continued)

Panel B: Effects of intangible ratio on syndication distance by sectors, at the deal level						
	Tech sector			Non-tech sector		
	[1]	[2]	[3]	[4]	[5]	[6]
ln (Intangibles/Tangibles)	-0.0101	-0.0124	-0.0205**	0.0086	0.0066	0.0058
	(-1.17)	(-1.39)	(-2.71)	(0.50)	(0.34)	(0.27)
Stage	-0.0105	-0.0420	0.0996	-0.0148	0.1856	0.3028*
	(-0.16)	(-0.46)	(0.92)	(-0.12)	(1.24)	(1.97)
Pct. of Dr. degree	0.9609*	0.9765**	0.8547*	-1.0802	-0.9971	-1.0730
	(1.98)	(2.21)	(2.09)	(-0.56)	(-0.48)	(-0.49)
Std age	-0.0028	-0.0099	-0.0061	-0.0289*	-0.0349***	-0.0432***
	(-0.34)	(-0.97)	(-0.57)	(-1.94)	(-3.72)	(-6.90)
Average age	0.0671***	0.0674***	0.0672***	0.0379**	0.0441***	0.0430***
	(4.55)	(4.91)	(5.12)	(2.97)	(4.36)	(4.00)
Tenure	0.1276***	0.1347***	0.1311***	0.0652*	0.0603*	0.0685*
	(8.08)	(10.25)	(8.48)	(2.06)	(1.88)	(1.94)
ln (multi-directorship)	-0.3597***	-0.3581***	-0.3682***	-0.1305*	-0.2124**	-0.2900***
	(-3.56)	(-3.96)	(-3.80)	(-1.86)	(-2.73)	(-3.82)
Pct. of foreign directors	-0.8113***	-0.8176***	-0.6028***	-1.2320***	-1.3584***	-1.1262***
	(-3.68)	(-4.07)	(-3.24)	(-8.11)	(-8.36)	(-7.69)
PE/VC company as dir.	-0.2000	-0.2445	-0.2263	1.7888***	1.5644***	2.0357***
	(-0.77)	(-0.96)	(-0.88)	(9.40)	(6.10)	(4.20)
Pct. of female	-0.2898	-0.1786	-0.1179	-0.0041	0.1451	-0.2016
	(-0.73)	(-0.63)	(-0.39)	(-0.01)	(0.37)	(-0.42)
Trade debtors ratio		-0.5853*	-0.6844*		-0.3710	-0.6693
		(-1.91)	(-2.12)		(-0.67)	(-1.58)
Trade creditor ratio		-0.0545	-0.1519		-0.1024	0.3612
		(-0.21)	(-0.57)		(-0.27)	(0.86)
Audited		0.1964	0.3087**		-0.2565	-0.1717
		(1.37)	(2.46)		(-1.65)	(-1.20)
Big4		-0.1964	-0.0147		0.1273	0.3465**
		(-1.43)	(-0.08)		(0.84)	(2.62)
N of investors			-0.0951***			-0.1466**
			(-6.03)			(-3.09)

ln (Amount raised by deal)			-0.1255*			-0.1932***
			(-2.15)			(-4.26)
Government Inv			0.1394			0.8531**
			(0.61)			(2.84)
University Inv			0.6814**			-0.1093
			(2.34)			(-0.33)
Business Angel Inv			-0.2130**			-0.2981
			(-2.54)			(-1.05)
_cons	-0.3553	-0.3583	1.5836	1.1072	1.0205	3.9603**
	(-0.50)	(-0.52)	(1.19)	(1.47)	(1.28)	(3.12)
Deal year FE	Yes	Yes	Yes	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1926	1823	1733	833	791	691
Mean VIF	1.60	1.58	1.59	1.76	1.75	1.74

Notes: The dependent variable of Table 4 is the natural logarithmic form of distance at the VC fund-investee-pair level in Panel A, and syndication distance at the deal level in Panel B. Models include deal year fixed effects and regions of VC-funds fixed effects, and standard errors are clustered by the regions of VC-funds. The sample is divided into two subsamples, investees in technology/IP-based business (model 1-3) and non-technology/IP-based business (model 4-6). *ln (Intangibles/Tangibles)* is winsorized at 5th and 95th percentile. The t statistics is reported in parentheses * $p < .10$, ** $p < .05$, *** $p < .01$.

Table 5 Effects of intangible ratio on distance by stages

Panel A: Effects of intangible ratio on distance by stages, at the VC fund-investee-pair level				
	Early-stage		Late-stage	
	[1]	[2]	[3]	[4]
ln (Intangibles/Tangibles)	-0.0177**	0.0172	-0.0131*	0.0013
	(-2.66)	(1.36)	(-2.09)	(0.07)
Tech sector	-0.1294	-0.3357***	0.0278	-0.0813
	(-1.30)	(-4.89)	(0.28)	(-0.45)
ln (Intangibles/Tangibles) * Tech sector		-0.0435**		-0.0218
		(-2.74)		(-0.98)
Pct. of Dr. degree	0.6315	0.6272	1.3891*	1.3779*
	(1.41)	(1.41)	(1.91)	(1.91)
Std age	-0.0099	-0.0100	-0.0209	-0.0227*
	(-1.08)	(-1.08)	(-1.57)	(-1.82)
Average age	0.0544***	0.0541***	0.0570***	0.0567***
	(4.23)	(4.21)	(6.10)	(6.18)
Tenure	0.1441**	0.1454**	0.0438	0.0439
	(2.95)	(2.94)	(1.78)	(1.76)
ln (multi-directorship)	-0.3172***	-0.3167***	-0.3701***	-0.3700***
	(-5.33)	(-5.33)	(-4.28)	(-4.20)
Pct. of foreign directors	-0.9245***	-0.9188***	-0.8970***	-0.8998***
	(-12.01)	(-12.17)	(-5.22)	(-5.14)
PE/VC company as directors	0.2246	0.2259	-0.1176	-0.1285
	(0.48)	(0.49)	(-0.31)	(-0.34)
Pct. of female	-0.1777	-0.1799	0.1784	0.1655
	(-1.36)	(-1.45)	(0.39)	(0.37)
Trade debtors ratio	-0.8302***	-0.8968***	-0.6388**	-0.6569**
	(-3.23)	(-3.46)	(-2.67)	(-2.71)
Trade creditor ratio	-0.1556	-0.1593	0.1242	0.1070
	(-0.58)	(-0.58)	(0.40)	(0.34)
Audited	0.3907***	0.3920***	0.1138	0.1132
	(3.31)	(3.35)	(0.98)	(0.98)
Big4	0.0453	0.0321	0.2360**	0.2322**

	(0.20)	(0.14)	(2.47)	(2.36)
N of investors	0.0131	0.0090	-0.0250	-0.0291
	(0.73)	(0.50)	(-1.41)	(-1.54)
ln (Amount raised by deal)	-0.1057**	-0.1057**	-0.2642***	-0.2643***
	(-2.36)	(-2.34)	(-6.83)	(-6.87)
Government Inv	0.1275	0.1301	0.4291***	0.4206***
	(0.47)	(0.48)	(3.93)	(3.79)
University Inv	0.7312**	0.7184**	-0.3163	-0.3062
	(3.03)	(3.01)	(-0.59)	(-0.56)
Business Angel Inv	-0.2380*	-0.2343*	-0.0557	-0.0445
	(-2.06)	(-1.96)	(-0.87)	(-0.67)
_cons	1.6089	1.8013	5.0267***	5.1386***
	(1.36)	(1.58)	(6.36)	(6.97)
Deal year FE	Yes	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes	Yes
N	2040	2040	1066	1066
Mean VIF	1.57	1.83	1.58	1.73

Table 5 (Continued)

Panel B: Effects of intangible ratio on syndication distance by stages, at the deal level				
	Early-stage		Late-stage	
	[1]	[2]	[3]	[4]
ln (Intangibles/Tangibles)	-0.0139	0.0213	-0.0083	0.0025
	(-1.72)	(1.49)	(-0.83)	(0.10)
Tech sector	-0.2280*	-0.4401***	-0.0104	-0.0930
	(-2.02)	(-5.78)	(-0.09)	(-0.46)
log (Intangibles/Tangibles) * Tech sector		-0.0447**		-0.0171
	Hao	(-2.33)		(-0.64)
Pct. of Dr. degree	0.6080	0.6025	1.4263*	1.4108*
	(1.18)	(1.17)	(2.19)	(2.16)
Std age	-0.0140	-0.0140	-0.0188	-0.0200
	(-1.50)	(-1.50)	(-1.16)	(-1.29)
Average age	0.0580***	0.0575***	0.0598***	0.0597***
	(4.03)	(4.02)	(5.66)	(5.71)
Tenure	0.1609***	0.1620***	0.0487*	0.0489*
	(3.15)	(3.15)	(1.88)	(1.87)
ln (multi-directorship)	-0.3711***	-0.3727***	-0.3437***	-0.3434***
	(-4.69)	(-4.74)	(-3.44)	(-3.38)
Pct. of foreign directors	-0.9032***	-0.8974***	-0.7093**	-0.7104**
	(-6.46)	(-6.61)	(-3.05)	(-3.04)
PE/VC company as directors	-0.0404	-0.0419	-0.0776	-0.0923
	(-0.14)	(-0.15)	(-0.21)	(-0.26)
Pct. of female	-0.1798	-0.1838	0.2981	0.2908
	(-1.12)	(-1.21)	(0.51)	(0.50)
Trade debtors ratio	-0.7380**	-0.8080**	-0.5814	-0.5984
	(-2.37)	(-2.58)	(-1.75)	(-1.78)
Trade creditor ratio	-0.1064	-0.1075	-0.0548	-0.0610
	(-0.37)	(-0.36)	(-0.16)	(-0.18)
Audited	0.2538*	0.2559*	0.0364	0.0353
	(1.90)	(1.94)	(0.29)	(0.28)
Big4	0.0880	0.0790	0.2417	0.2403

	(0.28)	(0.25)	(1.47)	(1.44)
N of investors	-0.0854**	-0.0904***	-0.1057***	-0.1084***
	(-3.01)	(-3.31)	(-3.93)	(-3.91)
ln (Amount raised by deal)	-0.1072*	-0.1060*	-0.2463***	-0.2469***
	(-2.15)	(-2.08)	(-3.64)	(-3.71)
Government Inv	0.0803	0.0848	0.3330*	0.3264*
	(0.34)	(0.36)	(1.94)	(1.86)
University Inv	0.9024***	0.8921***	-0.1717	-0.1656
	(3.33)	(3.32)	(-0.26)	(-0.25)
Business Angel Inv	-0.2799*	-0.2788*	-0.0502	-0.0443
	(-1.90)	(-1.85)	(-0.54)	(-0.48)
_cons	1.7513	1.9411	4.7242***	4.8075***
	(1.32)	(1.51)	(3.97)	(4.31)
Deal year FE	Yes	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes	Yes
N	1618	1618	807	807
Mean VIF	1.56	1.80	1.63	1.75

Notes: The dependent variable of Table 5 is the natural logarithmic form of distance at the VC fund-investee-pair level in Panel A, and syndication distance at the deal level in Panel B. Models include deal year fixed effects and regions of VC-funds fixed effects, and standard errors are clustered by the regions of VC-funds. The sample is divided into two subsamples, investees in the early stage (model 1-2) and the late stage (model 3-4). *ln (Intangibles/Tangibles)* is winsorized at 5th and 95th percentile. *ln (Intangibles/Tangibles) * Tech sector* is the interaction item of *ln (Intangibles/Tangibles)* and *Tech sector*. The t statistics is reported in parentheses * $p < .10$, ** $p < .05$, *** $p < .01$.

Table 6 Effects of patents/trademarks on distance

Panel A: Effects of patents/trademarks on distance, at the VC fund-investee-pair level			
	[1]	[2]	[3]
ln (Intangibles/Tangibles)	-0.0086*	-0.0101*	-0.0163***
	(-1.87)	(-2.06)	(-3.17)
Patent	0.0571***	0.0559***	0.0566***
	(4.72)	(4.51)	(4.39)
Trademark	-0.0281	-0.0269	-0.0230
	(-1.78)	(-1.70)	(-1.20)
Pct. of Dr. degree	0.9125*	0.9130*	0.7654
	(1.94)	(1.98)	(1.72)
Std age	-0.0121*	-0.0163**	-0.0131
	(-2.16)	(-2.35)	(-1.66)
Average age	0.0546***	0.0545***	0.0533***
	(5.05)	(6.00)	(6.57)
Tenure	0.0826***	0.0837***	0.0871***
	(3.65)	(4.04)	(4.47)
ln (multi-directorship)	-0.2517***	-0.2803***	-0.3094***
	(-5.70)	(-6.30)	(-6.49)
Pct. of foreign directors	-1.0040***	-1.0656***	-0.9181***
	(-9.79)	(-13.20)	(-13.71)
PE/VC company as directors	0.1507	0.1041	0.1120
	(0.49)	(0.34)	(0.33)
Pct. of female	-0.1391	-0.0134	-0.1027
	(-1.38)	(-0.14)	(-1.01)
Trade debtors ratio		-0.7015***	-0.7219***
		(-3.54)	(-4.12)
Trade creditor ratio		-0.0909	-0.0690
		(-0.46)	(-0.34)
Audited		0.1928*	0.3275***
		(1.89)	(4.42)
Big4		-0.0625	0.0973
		(-0.60)	(0.73)
N of investors			-0.0127

			(-0.75)
ln (Amount raised by deal)			-0.1381**
			(-3.04)
Government Inv			0.2532
			(1.10)
University Inv			0.5531*
			(1.88)
Business Angel Inv			-0.2028**
			(-2.44)
_cons	0.3962	0.4282	2.4053**
	(0.64)	(0.72)	(2.25)
Deal year FE	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes
N	3485	3319	3106
Mean VIF	1.57	1.56	1.56

Table 6 (Continued)

Panel B: Effects of patents/trademarks on syndication distance, at the deal level			
	[1]	[2]	[3]
ln (Intangibles/Tangibles)	-0.0043	-0.0071	-0.0135*
	(-0.78)	(-1.17)	(-2.08)
Patent	0.0511***	0.0501***	0.0532***
	(3.23)	(3.21)	(3.39)
Trademark	-0.0514**	-0.0447**	-0.0382
	(-2.48)	(-2.21)	(-1.49)
Pct. of Dr. degree	0.7686	0.7994	0.6690
	(1.56)	(1.70)	(1.48)
Std age	-0.0118**	-0.0184**	-0.0158*
	(-2.43)	(-2.61)	(-1.84)
Average age	0.0555***	0.0574***	0.0576***
	(4.30)	(5.13)	(5.58)
Tenure	0.0955***	0.0959***	0.0991***
	(3.82)	(4.25)	(4.81)
ln (multi-directorship)	-0.2709***	-0.2954***	-0.3417***
	(-5.25)	(-6.44)	(-6.45)
Pct. of foreign directors	-1.0625***	-1.1072***	-0.8561***
	(-6.64)	(-8.28)	(-6.83)
PE/VC company as directors	-0.0108	-0.0917	-0.0583
	(-0.04)	(-0.37)	(-0.22)
Pct. of female	-0.0811	0.0416	-0.0722
	(-0.97)	(0.50)	(-0.77)
Trade debtors ratio		-0.5361*	-0.6388**
		(-2.03)	(-2.65)
Trade creditor ratio		-0.0671	-0.0727
		(-0.34)	(-0.36)
Audited		0.0819	0.2193**
		(0.75)	(2.83)
Big4		-0.0588	0.1321
		(-0.45)	(0.78)
N of investors			-0.1048***

			(-5.41)
ln (Amount raised by deal)			-0.1300**
			(-2.30)
Government Inv			0.1881
			(0.97)
University Inv			0.6933**
			(2.21)
Business Angel Inv			-0.2493**
			(-2.37)
_cons	0.2592	0.2449	2.2526
	(0.37)	(0.36)	(1.70)
Deal year FE	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes
N	2759	2615	2425
Mean VIF	1.59	1.57	1.57

Notes: The dependent variable of Table 6 is the natural logarithmic form of distance at the VC fund-investee-pair level in Panel A, and syndication distance at the deal level in Panel B. Models include deal year fixed effects and regions of VC-funds fixed effects, and standard errors are clustered by the regions of VC-funds. *ln (Intangibles/Tangibles)* is winsorized at 5th and 95th percentile. *Trademark* is winsorized at 1st and 99th percentile. The t statistics is reported in parentheses * p < .10, ** p < .05, *** p < .01.

Table 7 Effects of patents on distance by sectors

Panel A: Effects of patents on distance by sectors, at the VC fund-investee-pair level				
	Tech-sector		Non-tech sector	
	[1]	[2]	[3]	[4]
Patent	0.0484***	0.0472***	0.3046***	0.2534**
	(3.85)	(3.75)	(3.28)	(2.54)
Seed	-0.0725	-0.1447	-0.0646	-0.1144
	(-0.56)	(-1.07)	(-0.29)	(-0.51)
Patent_dummy* seed		0.6068*		1.4078
		(1.91)		(1.41)
Trademark	-0.0125	-0.0123	-0.0653	-0.0622
	(-0.36)	(-0.36)	(-1.37)	(-1.31)
ln (Intangibles/Tangibles)	-0.0215**	-0.0210**	0.0031	0.0024
	(-2.56)	(-2.50)	(0.23)	(0.18)
Pct. of Dr. degree	0.9266***	0.9095***	-1.1566	-1.2439
	(3.83)	(3.76)	(-1.19)	(-1.28)
Std age	-0.0019	-0.0025	-0.0387**	-0.0393**
	(-0.18)	(-0.24)	(-2.37)	(-2.40)
Average age	0.0551***	0.0547***	0.0407***	0.0403***
	(7.09)	(7.03)	(3.20)	(3.17)
Tenure	0.1069***	0.1063***	0.0691**	0.0663**
	(3.82)	(3.80)	(2.46)	(2.36)
ln (multi-directorship)	-0.3168***	-0.3147***	-0.2803**	-0.2842**
	(-4.20)	(-4.17)	(-2.51)	(-2.54)
Pct. of foreign directors	-0.7341***	-0.7331***	-0.9754***	-0.9685***
	(-3.89)	(-3.89)	(-2.94)	(-2.92)
PE/VC company as dir.	-0.0180	-0.0288	2.1191**	2.1191**
	(-0.07)	(-0.11)	(2.14)	(2.15)
Pct. of female	-0.0486	-0.0432	-0.3245	-0.2994
	(-0.16)	(-0.14)	(-0.91)	(-0.84)
Trade creditor ratio	-0.1667	-0.1548	0.4386	0.4008
	(-0.70)	(-0.65)	(1.18)	(1.08)
Trade debtors ratio	-0.7889**	-0.7789*	-0.6287	-0.5862
	(-1.98)	(-1.95)	(-1.28)	(-1.19)

Audited	0.4327***	0.4416***	-0.0619	-0.0626
	(3.62)	(3.69)	(-0.32)	(-0.32)
Big4	-0.0554	-0.0540	0.3913*	0.3871*
	(-0.38)	(-0.37)	(1.75)	(1.73)
N of investors	-0.0046	-0.0047	-0.1154*	-0.1147*
	(-0.15)	(-0.15)	(-1.80)	(-1.79)
ln (Amount raised by deal)	-0.1394***	-0.1448***	-0.1477**	-0.1468**
	(-3.12)	(-3.23)	(-2.35)	(-2.34)
Government Inv	0.2724*	0.2611*	0.5839*	0.5984**
	(1.80)	(1.72)	(1.94)	(1.98)
University Inv	0.5210*	0.5212*	-1.6578	-1.4056
	(1.93)	(1.93)	(-0.80)	(-0.67)
Business Angel Inv	-0.1880	-0.1769	-0.2370	-0.2335
	(-1.60)	(-1.50)	(-1.12)	(-1.10)
_cons	2.0736***	2.1831***	3.2003***	3.2078***
	(2.95)	(3.10)	(3.19)	(3.20)
Deal year FE	Yes	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes	Yes
N	2290	2290	816	816
Mean VIF	1.54	1.53	1.80	1.80

Table 7 (Continued)

Panel B: Effects of patents on syndication distance by sectors, at the deal level				
	Tech-sector		Non-tech sector	
	[1]	[2]	[3]	[4]
Patent	0.0419***	0.0401**	0.3231***	0.2708**
	(2.69)	(2.57)	(3.30)	(2.58)
seed	-0.0866	-0.1770	-0.2037	-0.2598
	(-0.56)	(-1.10)	(-0.83)	(-1.04)
Patent_dummy * seed		0.7553**		1.4399
		(2.08)		(1.37)
Trademark	-0.0318	-0.0315	-0.0668	-0.0632
	(-0.74)	(-0.73)	(-1.26)	(-1.19)
ln (Intangibles/Tangibles)	-0.0193*	-0.0186*	0.0043	0.0034
	(-1.89)	(-1.82)	(0.28)	(0.22)
Pct. of Dr. degree	0.8404***	0.8264***	-1.1680	-1.2573
	(2.90)	(2.85)	(-1.14)	(-1.23)
Std age	-0.0066	-0.0077	-0.0416**	-0.0420**
	(-0.52)	(-0.60)	(-2.29)	(-2.31)
Average age	0.0640***	0.0630***	0.0371***	0.0365***
	(6.73)	(6.63)	(2.65)	(2.61)
Tenure	0.1251***	0.1254***	0.0762**	0.0732**
	(3.82)	(3.83)	(2.53)	(2.43)
ln (multi-directorship)	-0.3597***	-0.3579***	-0.2774**	-0.2806**
	(-3.92)	(-3.91)	(-2.26)	(-2.29)
Pct. of foreign directors	-0.6057***	-0.6057***	-1.1227***	-1.1151***
	(-2.63)	(-2.63)	(-2.96)	(-2.94)
PE/VC company as dir.	-0.2722	-0.2718	2.1069**	2.1076**
	(-0.77)	(-0.77)	(2.03)	(2.04)
Pct. of female	-0.0932	-0.0882	-0.1683	-0.1370
	(-0.26)	(-0.25)	(-0.43)	(-0.35)
Trade creditor ratio	-0.1531	-0.1371	0.4294	0.3805
	(-0.56)	(-0.50)	(0.97)	(0.86)
Trade debtors ratio	-0.6745	-0.6691	-0.5524	-0.5040
	(-1.38)	(-1.37)	(-1.03)	(-0.93)

Audited	0.3208**	0.3349**	-0.1472	-0.1492
	(2.21)	(2.31)	(-0.68)	(-0.69)
Big4	-0.0302	-0.0355	0.4442*	0.4395*
	(-0.16)	(-0.19)	(1.68)	(1.67)
N of investors	-0.1014**	-0.1009**	-0.1571*	-0.1544*
	(-2.31)	(-2.30)	(-1.82)	(-1.79)
ln (Amount raised by deal)	-0.1232**	-0.1285**	-0.1786***	-0.1771***
	(-2.33)	(-2.43)	(-2.61)	(-2.58)
Government Inv	0.1426	0.1273	0.8289**	0.8452**
	(0.76)	(0.68)	(2.32)	(2.36)
University Inv	0.6670**	0.6658**	-1.7398	-1.4832
	(2.06)	(2.06)	(-0.80)	(-0.68)
Business Angel Inv	-0.2063	-0.1942	-0.3261	-0.3242
	(-1.40)	(-1.31)	(-1.24)	(-1.23)
_cons	1.6194*	1.7514**	3.9123***	3.9127***
	(1.95)	(2.11)	(3.52)	(3.52)
Deal year FE	Yes	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes	Yes
N	1734	1734	691	691
Mean VIF	1.57	1.56	1.71	1.71

Notes: The dependent variable of Table 7 is the natural logarithmic form of distance at the VC fund-investee-pair level in Panel A, and syndication distance at the deal level in Panel B. Models include deal year fixed effects and regions of VC-funds fixed effects. *Patent_dummy* is the dummy variable, equal to 1 if the investee has at least one patent application before VC investments and zero otherwise. *Seed* is the dummy variable, taking the value of 1 if investees are in the seed stage (the earliest stage) and zero otherwise. *Patent_dummy* seed* is the interaction item of *Patent_dummy* and *seed. ln (Intangibles/Tangibles)* is winsorized at 5th and 95th percentile. *Trademark* is winsorized at 1st and 99th percentile. The t statistics is reported in parentheses * p < .10, ** p < .05, *** p < .01.

Table 8 Effects of trademarks on distance by sectors

Panel A: Effects of trademarks on distance by sectors, at the VC fund-investee-pair level				
	Tech sector		Non-tech sector	
	[1]	[2]	[3]	[4]
Trademark_dummy	-0.0362	-0.0810	-0.0178	-0.2188
	(-0.38)	(-0.79)	(-0.12)	(-1.36)
seed	-0.0757	-0.1418	-0.0510	-0.4419*
	(-0.58)	(-1.00)	(-0.23)	(-1.72)
Trademark_dummy*seed		0.3364		1.1695***
		(1.20)		(3.01)
Patent	0.0483***	0.0488***	0.2873***	0.3060***
	(3.85)	(3.89)	(3.11)	(3.32)
ln (Intangibles/Tangibles)	-0.0216**	-0.0219***	0.0035	0.0020
	(-2.57)	(-2.61)	(0.26)	(0.15)
Pct. of Dr. degree	0.9231***	0.9194***	-1.1286	-1.0591
	(3.82)	(3.80)	(-1.16)	(-1.10)
Std age	-0.0019	-0.0022	-0.0404**	-0.0404**
	(-0.18)	(-0.21)	(-2.47)	(-2.48)
Average age	0.0551***	0.0552***	0.0417***	0.0417***
	(7.09)	(7.10)	(3.27)	(3.28)
Tenure	0.1067***	0.1077***	0.0644**	0.0643**
	(3.82)	(3.86)	(2.30)	(2.31)
ln (multi-directorship)	-0.3181***	-0.3189***	-0.2799**	-0.2871**
	(-4.21)	(-4.22)	(-2.50)	(-2.58)
Pct. of foreign directors	-0.7365***	-0.7249***	-0.9689***	-0.9523***
	(-3.90)	(-3.83)	(-2.91)	(-2.88)
PE/VC company as directors	-0.0179	-0.0048	2.1396**	2.1282**
	(-0.07)	(-0.02)	(2.16)	(2.16)
Pct. of female	-0.0526	-0.0863	-0.3251	-0.2388
	(-0.17)	(-0.28)	(-0.91)	(-0.67)
Trade creditor ratio	-0.1661	-0.1742	0.3764	0.4674
	(-0.69)	(-0.73)	(1.00)	(1.25)
Trade debtors ratio	-0.7884**	-0.7870**	-0.5736	-0.5769
	(-1.98)	(-1.97)	(-1.16)	(-1.18)

Audited	0.4334***	0.4310***	-0.0550	-0.1012
	(3.62)	(3.60)	(-0.28)	(-0.52)
Big4	-0.0583	-0.0558	0.3400	0.4203*
	(-0.40)	(-0.38)	(1.53)	(1.89)
N of investors	-0.0043	-0.0051	-0.1131*	-0.1120*
	(-0.14)	(-0.16)	(-1.76)	(-1.75)
ln (Amount raised by deal)	-0.1401***	-0.1398***	-0.1513**	-0.1573**
	(-3.14)	(-3.13)	(-2.41)	(-2.51)
Government Inv	0.2721*	0.2716*	0.5962**	0.5619*
	(1.80)	(1.79)	(1.97)	(1.87)
University Inv	0.5197*	0.5335**	-1.8587	-1.7685
	(1.92)	(1.97)	(-0.89)	(-0.86)
Business Angel Inv	-0.1866	-0.1845	-0.2193	-0.2114
	(-1.59)	(-1.57)	(-1.03)	(-1.00)
_cons	2.0897***	2.1048***	3.1931***	3.3970***
	(2.97)	(3.00)	(3.18)	(3.39)
Deal year FE	Yes	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes	Yes
N	2290	2290	816	816
Mean VIF	1.54	1.55	1.80	1.82

Table 8 (Continued)

Panel B: Effects of trademarks on syndication distance by sectors, at the deal level				
	Tech sector		Non-tech sector	
	[1]	[2]	[3]	[4]
Trademark_dummy	-0.0508	-0.1035	0.0405	-0.1284
	(-0.43)	(-0.81)	(0.24)	(-0.70)
Seed	-0.0859	-0.1565	-0.1775	-0.4884*
	(-0.55)	(-0.92)	(-0.72)	(-1.72)
Trademark_dummy*seed		0.3400		0.9880**
		(1.06)		(2.25)
Patent	0.0411***	0.0417***	0.3031***	0.3180***
	(2.65)	(2.68)	(3.13)	(3.28)
ln (Intangibles/Tangibles)	-0.0194*	-0.0196*	0.0044	0.0029
	(-1.90)	(-1.92)	(0.29)	(0.19)
Pct. of Dr. degree	0.8366***	0.8329***	-1.1226	-1.0752
	(2.88)	(2.87)	(-1.09)	(-1.05)
Std age	-0.0067	-0.0069	-0.0440**	-0.0443**
	(-0.52)	(-0.54)	(-2.42)	(-2.44)
Average age	0.0640***	0.0642***	0.0389***	0.0393***
	(6.73)	(6.75)	(2.76)	(2.80)
Tenure	0.1238***	0.1247***	0.0701**	0.0694**
	(3.78)	(3.81)	(2.34)	(2.33)
ln (multi-directorship)	-0.3613***	-0.3625***	-0.2736**	-0.2787**
	(-3.94)	(-3.95)	(-2.22)	(-2.27)
Pct. of foreign directors	-0.6078***	-0.5965***	-1.1189***	-1.0867***
	(-2.64)	(-2.58)	(-2.95)	(-2.87)
PE/VC company as directors	-0.2723	-0.2586	2.1286**	2.1243**
	(-0.77)	(-0.73)	(2.05)	(2.06)
Pct. of female	-0.0976	-0.1327	-0.1600	-0.1062
	(-0.27)	(-0.37)	(-0.41)	(-0.27)
Trade creditor ratio	-0.1552	-0.1616	0.3385	0.4031
	(-0.57)	(-0.59)	(0.76)	(0.91)
Trade debtors ratio	-0.6732	-0.6739	-0.4755	-0.4815
	(-1.38)	(-1.38)	(-0.88)	(-0.89)

Audited	0.3191**	0.3177**	-0.1296	-0.1575
	(2.20)	(2.19)	(-0.60)	(-0.73)
Big4	-0.0357	-0.0336	0.3874	0.4446*
	(-0.19)	(-0.18)	(1.48)	(1.70)
N of investors	-0.1004**	-0.1005**	-0.1532*	-0.1544*
	(-2.29)	(-2.29)	(-1.78)	(-1.80)
ln (Amount raised by deal)	-0.1253**	-0.1254**	-0.1830***	-0.1881***
	(-2.37)	(-2.37)	(-2.67)	(-2.75)
Government Inv	0.1427	0.1387	0.8387**	0.8022**
	(0.76)	(0.74)	(2.34)	(2.24)
University Inv	0.6689**	0.6836**	-1.9719	-1.9144
	(2.06)	(2.11)	(-0.90)	(-0.88)
Business Angel Inv	-0.2061	-0.2047	-0.3072	-0.2807
	(-1.39)	(-1.38)	(-1.17)	(-1.07)
_cons	1.6506**	1.6684**	3.8567***	3.9989***
	(1.99)	(2.01)	(3.45)	(3.59)
Deal year FE	Yes	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes	Yes
N	1734	1734	691	691
Mean VIF	1.57	1.58	1.70	1.72

Notes: The dependent variable of Table 8 is the natural logarithmic form of distance at the VC fund-investee-pair level in Panel A, and syndication distance at the deal level in Panel B. Models include deal year fixed effects and regions of VC-funds fixed effects. *Trademark_dummy* is the dummy variable, equal to 1 if the investee has at least one registered trademark before VC investments and zero otherwise. *Seed* is the dummy variable, taking the value of 1 if investees are in the seed stage (the earliest stage) and zero otherwise. *Trademark_dummy * seed* is the interaction item of *Trademark_dummy* and *seed. ln (Intangibles/Tangibles)* is winsorized at 5th and 95th percentile. The t statistics is reported in parentheses * p < .10, ** p < .05, *** p < .01.

Table 9 Effects of patents/trademarks on distance varying with VC-fund age

Panel A: Effects of patents/trademarks on distance varying with VC-fund age, at the VC fund-investee pair level				
	Effects of patents		Effects of trademarks	
	[1]	[2]	[3]	[4]
VC age	-0.0054	0.0058	-0.0047	0.0026
	(-0.51)	(0.52)	(-0.45)	(0.19)
Trademark	-0.0299	-0.0308		
	(-1.07)	(-1.11)		
Patent_dummy	0.4857***	0.8969***		
	(4.32)	(4.80)		
Patent_dummy* VC age		-0.0768***		
		(-2.75)		
Patent			0.0558***	0.0558***
			(4.62)	(4.61)
Trademark_dummy			-0.0136	0.0790
			(-0.17)	(0.60)
Trademark_dummy * VC age				-0.0176
				(-0.88)
ln (Intangibles/Tangibles)	-0.0178**	-0.0177**	-0.0165**	-0.0164**
	(-2.52)	(-2.51)	(-2.34)	(-2.32)
Pct. of Dr. degree	0.7242***	0.7093***	0.7673***	0.7653***
	(3.22)	(3.16)	(3.42)	(3.41)
Std age	-0.0133	-0.0132	-0.0133	-0.0134
	(-1.50)	(-1.48)	(-1.50)	(-1.50)
Average age	0.0529***	0.0534***	0.0534***	0.0534***
	(8.03)	(8.10)	(8.13)	(8.12)
Tenure	0.0851***	0.0853***	0.0856***	0.0855***
	(4.37)	(4.38)	(4.42)	(4.41)
ln (multi-directorship)	-0.3030***	-0.3088***	-0.3107***	-0.3108***
	(-4.85)	(-4.95)	(-4.99)	(-4.99)
Pct. of foreign directors	-0.9114***	-0.9094***	-0.9132***	-0.9136***
	(-5.66)	(-5.66)	(-5.67)	(-5.67)
PE/VC company as directors	0.1046	0.1281	0.1165	0.1134

	(0.43)	(0.53)	(0.48)	(0.47)
Pct. of female	-0.1348	-0.1457	-0.1145	-0.1105
	(-0.59)	(-0.63)	(-0.50)	(-0.48)
Trade debtors ratio	-0.6739**	-0.6605**	-0.7465**	-0.7473**
	(-2.25)	(-2.21)	(-2.49)	(-2.50)
Audited	0.3379***	0.3387***	0.3238***	0.3222***
	(3.35)	(3.37)	(3.22)	(3.20)
Big4	0.1040	0.1042	0.0848	0.0857
	(0.85)	(0.85)	(0.69)	(0.70)
N of investors	-0.0132	-0.0115	-0.0112	-0.0113
	(-0.48)	(-0.42)	(-0.41)	(-0.41)
ln (Amount raised by deal)	-0.1406***	-0.1454***	-0.1380***	-0.1386***
	(-4.11)	(-4.25)	(-4.04)	(-4.06)
Government Inv	0.2279*	0.2423*	0.2553*	0.2555*
	(1.74)	(1.85)	(1.95)	(1.95)
University Inv	0.4943*	0.4910*	0.5549**	0.5592**
	(1.88)	(1.86)	(2.11)	(2.12)
Business Angel Inv	-0.2012**	-0.2063**	-0.2016**	-0.2003*
	(-1.97)	(-2.02)	(-1.97)	(-1.96)
_cons	2.3040***	2.2943***	2.2753***	2.2507***
	(4.38)	(4.37)	(4.34)	(4.29)
Deal year FE	Yes	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes	Yes
N	3106	3106	3106	3106
Mean VIF	1.58	1.68	1.58	1.69

Table 9 (Continued)

Panel B: Effects of patents/trademarks on syndication distance varying with VC-fund age, at the deal level				
	Effects of patents		Effects of trademarks	
	[1]	[2]	[3]	[4]
VC age	0.0048	0.0184	0.0055	0.0099
	(0.37)	(1.34)	(0.43)	(0.61)
Trademark	-0.0447	-0.0463		
	(-1.33)	(-1.38)		
Patent_dummy	0.4699***	0.9803***		
	(3.45)	(4.33)		
Patent_dummy*VC age		-0.0983***		
		(-2.82)		
Patent			0.0516***	0.0514***
			(3.48)	(3.47)
Trademark_dummy			-0.0016	0.0551
			(-0.02)	(0.35)
Trademark_dummy*VC age				-0.0110
				(-0.44)
ln (Intangibles/Tangibles)	-0.0141*	-0.0136	-0.0133	-0.0132
	(-1.67)	(-1.62)	(-1.57)	(-1.56)
Pct. of Dr. degree	0.6258**	0.6024**	0.6682**	0.6686**
	(2.35)	(2.26)	(2.51)	(2.51)
Std age	-0.0164	-0.0162	-0.0165	-0.0165
	(-1.56)	(-1.55)	(-1.58)	(-1.57)
Average age	0.0567***	0.0571***	0.0578***	0.0578***
	(7.23)	(7.29)	(7.41)	(7.41)
Tenure	0.0974***	0.0965***	0.0955***	0.0954***
	(4.44)	(4.40)	(4.37)	(4.37)
ln (multi-directorship)	-0.3325***	-0.3384***	-0.3419***	-0.3419***
	(-4.53)	(-4.61)	(-4.67)	(-4.67)
Pct. of foreign directors	-0.8588***	-0.8508***	-0.8519***	-0.8504***
	(-4.44)	(-4.40)	(-4.39)	(-4.38)
PE/VC company as directors	-0.0699	-0.0455	-0.0537	-0.0564

	(-0.21)	(-0.14)	(-0.16)	(-0.17)
Pct. of female	-0.0768	-0.0944	-0.0681	-0.0666
	(-0.29)	(-0.36)	(-0.26)	(-0.25)
Trade debtors ratio	-0.6037*	-0.5900*	-0.6585*	-0.6581*
	(-1.72)	(-1.68)	(-1.88)	(-1.88)
Audited	0.2237*	0.2228*	0.2091*	0.2080*
	(1.88)	(1.87)	(1.75)	(1.74)
Big4	0.1490	0.1479	0.1233	0.1234
	(0.97)	(0.97)	(0.81)	(0.81)
N of investors	-0.1062***	-0.1036***	-0.1045***	-0.1044***
	(-2.78)	(-2.72)	(-2.74)	(-2.74)
ln (Amount raised by deal)	-0.1333***	-0.1386***	-0.1354***	-0.1358***
	(-3.37)	(-3.50)	(-3.42)	(-3.43)
Government Inv	0.1593	0.1753	0.1879	0.1875
	(1.00)	(1.10)	(1.18)	(1.17)
University Inv	0.6491**	0.6434**	0.7065**	0.7107**
	(2.08)	(2.06)	(2.26)	(2.27)
Business Angel Inv	-0.2518**	-0.2609**	-0.2548**	-0.2531**
	(-1.97)	(-2.04)	(-1.99)	(-1.98)
_cons	2.1488***	2.1435***	2.1489***	2.1338***
	(3.54)	(3.54)	(3.55)	(3.52)
Deal year FE	Yes	Yes	Yes	Yes
Regions of VC-funds FE	Yes	Yes	Yes	Yes
N	2425	2425	2425	2425
Mean VIF	1.57	1.67	1.56	1.68

Notes: The dependent variable of Table 9 is the natural logarithmic form of distance at the VC fund-investee-pair level in Panel A, and syndication distance at the deal level in Panel B. Models include deal year fixed effects and regions of VC-funds fixed effects. Models 1-2 (3-4) analyzes whether the VC-funds' age influence the effects of patents (trademarks) on distance. *Patent_dummy* is the dummy variable, equal to 1 if the investee has at least one patent application before VC investments and zero otherwise. *Trademark_dummy* is the dummy variable, equal to 1 if the investee has at least one registered trademark before VC investments and zero otherwise. *Patent_dummy* VC-fund age* is the interaction item of *Patent_dummy* and *VC-fund age. Trademark_dummy * VC-fund age* is the interaction item of *Trademark_dummy* and *VC-fund age. ln (Intangibles/Tangibles)* is winsorized at 5th and 95th percentile. *Trademark* is winsorized at 1st and 99th. The t statistics is reported in parentheses * p < .10, ** p < .05, *** p < .01.

Table 10 Robustness tests by ordered logit models

	Panel A Sample at the VC fund-investee-pair level	Panel B Sample at the deal level
ln (Intangibles/Tangibles)	-0.0122**	-0.0104*
	(-2.18)	(-1.68)
Patent	0.0944***	0.0763***
	(5.05)	(3.96)
Trademark	-0.0478	-0.0615
	(-1.38)	(-1.60)
Pct. of Dr. degree	0.9687***	0.8300***
	(4.40)	(3.40)
Std age	-0.0094	-0.0116
	(-1.23)	(-1.38)
Average age	0.0506***	0.0546***
	(8.29)	(7.95)
Tenure	0.0795***	0.0827***
	(4.62)	(4.58)
ln(multi-directorship)	-0.2860***	-0.3073***
	(-4.89)	(-4.62)
Pct. of foreign directors	-0.6909***	-0.7220***
	(-5.16)	(-4.61)
PE/VC company as directors	-0.0743	-0.2585
	(-0.34)	(-1.05)
Pct. of female	-0.1027	-0.0778
	(-0.48)	(-0.33)
Trade debtors ratio	-1.0109***	-0.9220***
	(-3.82)	(-3.29)
Trade creditor ratio	0.0270	-0.0010
	(0.17)	(-0.01)
Audited	0.3248***	0.2499***
	(3.67)	(2.58)
Big4	0.1055	0.1587
	(1.04)	(1.34)

N of investors	-0.0413*	-0.1383***
	(-1.83)	(-4.66)
ln (Amount raised by deal)	-0.1693***	-0.1628***
	(-5.33)	(-4.77)
Government Inv	0.2508*	0.2414*
	(1.85)	(1.65)
University Inv	0.3001	0.4415*
	(1.28)	(1.72)
Business Angel Inv	-0.1488*	-0.1682*
	(-1.87)	(-1.77)
Deal year FE	Yes	Yes
Regions of VC-funds FE	Yes	Yes
N	3106	2425

Notes: The dependent variable of this table is the ordinal variable of investment distance, categorizing investment distance by quintiles at the VC fund-investee-pair level in Panel A. In panel B, the dependent variable categorizes syndication distance by quintiles at the deal level. Models include deal year fixed effects and regions of VC-funds fixed effects with robust standard errors. *ln (Intangibles/Tangibles)* is winsorized at 1st and 99th. *Trademark* is winsorized at 5th and 95th. The t statistics is reported in parentheses * p < .10, ** p < .05, *** p < .01.

Appendix

Appendix Table A1 Variable definitions

Variables	Definition	Database
ln (Geodistance)	Dependent variable, Natural logarithm form of the shortest transit distance from the VC-fund office to the investee office at the VC fund-investee-pair level; Syndication distance is natural logarithm form of the shortest distance from the investee to the closest VC-fund syndication member at the deal level.	
ln (Intangibles/Tangibles)	Natural logarithm form of intangible assets (t-1) to tangible assets (t-1)	Beauhurst
Patent	Number of patent applications from firms' foundation year to one year before VC investment year (t-1)	UKIPO
Patent_dummy	Dummy variable, with a value of 1 if there is at least one patent application before investment year (t-1) and zero otherwise	UKIPO
Trademark	Number of registered and not expired trademarks from firms' foundation year to one year before VC investment year (t-1)	UKIPO
Trademark _dummy	Dummy variable, with a value of 1 if there is at least one registered and not expired trademark before investment year (t-1) and zero otherwise	UKIPO
Characteristics of investees		
Stage	There are four stages i.e., seed, venture, growth and established. Dummy variable, taking the value of 1 if investees are in the late stage (growth or established).	Beauhurst
Seed	Dummy variable, taking the value of 1 if investees are in the seed (earliest) stage and zero otherwise	Beauhurst
Technology/IP-based businesses sector	Dummy variable, taking value of 1 if investees in Technology/IP-based businesses sector and zero otherwise	Beauhurst
Average age	Average age of individual directors on the board when the investment is made, at year level	CreditSafe
Std age	Standard variation of individual directors 'age when the investment is made	CreditSafe
Pct. of doctoral degree	Number of directors with doctorate degree to number of individual directors	CreditSafe
Tenure	Average tenure of individual directors when investment made, at year level	CreditSafe
ln (multi-directorship)	Natural logarithm form of one plus average No. of other companies where individual directors also have directorships when the investment is made.	CreditSafe
Pct. of foreign directors	Non-UK (nationality) directors to number directors with nationality information	CreditSafe
Pct. of female directors	Number of female directors to number of individual directors	
PE/VC company as directors	Dummy variable, taking value of 1 if the investee has PE/VC director when the investment is made and zero otherwise	CreditSafe
Trade creditor ratio	Trade creditor (t-1) to total assets (t-1)	Beauhurst
Trade debtors ratio	Trade debtors (t-1) to total assets (t-1)	Beauhurst
Audited	Dummy variable, taking value of 1 if the last account before the investment (t-1) is audited and zero otherwise.	Beauhurst & CreditSafe
Big 4	Dummy variable, taking value of 1 if the auditor of last account before the investment (t-1) is from big 4 accounting company and zero otherwise.	Beauhurst & CreditSafe

Characteristics of deals		
Number of investors	Total number of investors involved in the deal (including all types of investors)	Beauhurst
Government Involvement	Dummy variable, taking value of 1 if there is government involvement in the deal and zero otherwise	Beauhurst
University Involvement	Dummy variable, taking value of 1 if there is university involvement in the deal and zero otherwise	Beauhurst
Business Angel Involvement	Dummy variable, taking value of 1 if there is business angel involvement and zero otherwise	Beauhurst
ln (Amount raised)	Natural logarithm form of total amount (GBP) raised by one deal	Beauhurst
Deal year	Factor variable, the year of fundraising	Beauhurst
Characteristics of VC funds		Beauhurst
VC age	The age of VC funds, measured by the deal date minus the first deal date, at the year level.	
Regions of VCs	Factor variables based on NUTS statistical regions, with 12 regions in the UK and the reference category is London	Beauhurst