

Concentrating Too Hard? Foreign and Corporate Venture Capital Involvement in Syndicates

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We investigate the relationship between investment of corporate venture capital (CVC) and foreign venture capital (FVC), and the concentration of investors involved in a financing round. As forms of venture capital distinct from independent venture capital, CVC and FVC can offer different value to new ventures. However, having FVC or CVC investors in the syndicate can also pose additional risks to other investors. We find that a corporate venture capital or a foreign venture capital affiliation is related to lower concentration of investors. Our results suggest that the investors evaluate not only the venture but also their syndicate partners in determining their relative share of round investment.

Introduction

Venture capital (VC) firms are a major source of financing for start-up companies. Venture capitalists (VCs) serve as financial intermediaries and invest primarily in young companies in technology-based industries. Because VCs accept relatively high levels of risk and uncertainty attendant with investing in new ventures, VCs utilize various investment practices in the hopes of high potential return. VC investors are of various types, each with different configurations of motivations and associated risk tolerance. While the financial capital that different types of investors provide is fungible, investors differ in their ways of mitigating risk and may require different contract stipulations (Park and Steensma 2012).

Corporate venture capital (CVC) refers to the practice of using corporate funds to invest in entrepreneurial ventures by taking a minority stake (Gompers and Lerner 1998). Although independent venture capital (IVC), provided by firms specialized in the provision of equity or equity-linked investments, has been a major

source of capital for new ventures, entrepreneurs have been progressively considering CVC as a key source of funding (Dushnitsky 2006; Gaba and Meyer 2008; Katila, Rosenberger, and Eisenhardt 2008). Established corporations have been increasingly investing in new ventures for both financial and strategic reasons (Dushnitsky and Lenox 2006). CVC investments can facilitate investors' innovation efforts by providing access to new markets and technologies (Dushnitsky and Shapira 2010). As sources of external knowledge, CVC investments serve as a window on new technology and are related to higher innovation rates of the parent firm (Dushnitsky and Lenox 2005a). Previous studies have indicated the heterogeneous nature of VCs and explained that VCs may differ in terms of their value-added (Bertoni, Colombo, and Grilli 2013). Research also suggests that the value-added that independent VCs (IVCs) and corporate VCs (CVCs) offer may be complementary (Maula and Murray 2002a). As industry experts, CVCs could offer access to distribution channels and manufacturing facilities (Teece 1986) or

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industry contacts (Maula and Murray 2002b) to the funded new ventures. CVCs provide technological support and credibility for the new venture that is more suited for commerce building and IVCs can help raise capital and provide crucial support in early stages of the new venture establishment (Maula, Autio and Murray 2005). While CVCs provide financial capital and other value added resources, new ventures risk expropriation of their intellectual property by disclosing details of their technology to receive CVC funding. Once the new technology is revealed, a CVC investor may exploit the invention for its parent firm's own gain, underscoring the paradox of CVC (Dushnitsky and Shaver 2009). Moreover, in syndicated investments including both IVC and CVC, if the financial objective of the IVC is in conflict with the strategic objective of the CVC, strategically motivated CVCs might ignore the financial objective of the investee firm or other investors in the syndicate (Bertoni, Colombo, and Grilli 2013).

The VC industry is in the early stages of internationalizing (Manigart et al. 2007). Because many VCs do not have foreign presence, they have limited ability to directly communicate with or monitor the activities of ventures operating outside of their home country. Consequently, VCs generally exhibit a home bias towards investing in domestic ventures (Cumming and Dai 2010). At the same time, as domestic markets become saturated with investors, VCs are increasingly looking for investment opportunities abroad, leading to an increase in cross-border investment (Guler and Guillén 2010). In order to mitigate the risks associated with investing in a venture outside their home country, foreign VCs (FVCs), representing investors outside the investee venture's country, usually participate in investment syndicates (Guler and Guillén 2010) of two or more investors who share the risk (Dushnitsky and Shapira 2010), mitigating that of each partner.

In this paper, we investigate how the participation of different types of investors impact investor concentration in the syndicate. Specifically, we examine whether syndicates with CVC or FVC investors differ in investor concentration, measured by a Herfindahl index, from syndicates without CVC or FVC investors, using panel data of 1,137 financing rounds in technology ventures in the United States. The participation of CVC or FVC investors in a financing round may impact investor concentration by affecting how other round investors evaluate the risks

involved in investing in the new venture. Previous work shows that new ventures that receive CVCs take longer to exit (Guo, Lou, and Pérez-Castrillo 2015). Research also indicates that the exit strategy of the IVC and CVC investors may differ. For example, CVC investors may prefer to acquire the new venture depending on the fit of the new venture's technology. As IVCs are often driven by shorter term performance in an effort to grandstand (Bertoni, Colombo, and Grilli 2013) and have a preference for IPO over acquisition as an exit strategy (Bygrave and Timmons 1992), IVCs may be less inclined to syndicate in a round in which a CVC investor participates. In regards to the FVC investor participation, firms backed by at least one FVC investor are more likely to experience growth at a later stage than if when they receive investments from solely domestic VCs (Devigne et al. 2013). Moreover, when an investee venture underperforms, international syndicates are quicker to exit (Bertoni and Groh 2014). While FVCs may look to participate in syndicated investments in order to mitigate their local bias, prior research indicates that local investors are often reluctant to co-invest with an FVC investor due to its liabilities of foreignness (Dai and Nahata 2016). The participation of CVC or FVC investors in a financing round may impact investor concentration by affecting how other round investors evaluate the risks involved in investing in the new venture.

Our paper makes a number of contributions. First, we extend the entrepreneurship and VC literature that addresses VC affiliation and diversity (Andrieu and Groh 2012; Chahine et al. 2012; Hsu 2004; Maula and Murray 2002b). Previous studies have shown that different types of VCs vary in their value-added potential (Hsu 2004; Maula and Murray 2002b). For example, Andrieu and Groh (2012) have indicated that while IVCs provide better support, bank-affiliated VCs have greater capital reserve to continuously support the new venture in subsequent stages. We extend this literature by demonstrating that different types of syndicate partners such as CVCs or FVCs may bring not only distinctive value added but also additional risk. A CVC or FVC affiliation for new ventures can matter as syndicate partners may evaluate both the venture as well as their potential syndicate partners before making their investment decision. Previous work has shown that ownership concentration can impact venture performance (Bruton et al. 2010) and insights into how

CVCs or FVCs involvement may impact syndication concentration may inform our understanding of how entrepreneurs should consider the portfolio of investment that they may receive from different investors.

We also contribute to the literature on corporate venture capital (Dushnitsky and Shaver 2009; Maula and Murray 2002b; Park and Steensma 2012). Previous studies have shown the distinctive value added that the CVCs provide (Maula and Murray 2002b; Park and Steensma 2012) as well as the risks associated with CVCs (Dushnitsky and Shaver 2009). Prior work has largely focused on knowledge expropriation as a form of risk involved with CVC investment (Dushnitsky and Shaver 2009). Our paper links CVC investment to lower concentration of investors in the round, showing that the ramification of CVC participation goes beyond technology. CVC participation might change the VC syndicate concentration level, which has been associated with performance of new venture (Bruton et al. 2010; Chahine et al. 2012).

Lastly, we enrich the existing literature on FVCs. Prior studies on FVCs have focused on the benefits of having FVCs in the syndicate. International investors may not only provide international networks (Bertoni and Groh 2014), but also impact the level of investment (Mäkelä and Maula 2006), growth of the new venture (Devigne et al. 2013), exit performance (Cumming, Knill, and Syvrud 2016; Li, Vertinsky, and Li 2014), and risk and return (Espenlaub, Khurshed, and Mohamed 2014). However, as Dai and Nahata (2016, p. 140) point out, extant literature focuses on benefits of syndication and “syndicate formation itself has received much less attention.” Extending Dai and Nahata’s (2016) work, we address how the participation of a FVC may impact investor concentration in syndicated investments.

The paper is organized as follows. In the next section, we present our theory and hypotheses, followed by the section on data and methods. After presentation of results, we provide a discussion and the last section concludes.

Theory and Hypotheses

Ventures in high-technology industries traditionally utilize more than 70 percent of annual VC investments (Gompers and Lerner 1999). Technology-based ventures are highly dependent on VC, which accounts for approximately two-thirds of the external equity financing they

raise from private sources (Kortum and Lerner 2000). Many of these ventures are small, have yet to make a profit, and their initial resource endowments are often concentrated in the experience and network of their senior management team (Carpenter, Pollock, and Leary 2003). The high-technology base of such companies suggests a greater use of intangible assets, such as intellectual capital and tacit knowledge, as the venture’s main assets, making the company’s value largely dependent upon future growth opportunities. While the rewards of a successful VC investment are high, as evidenced by a return on investment of about four to five times for the top decile of VCs (Booth 2012), an estimated three-quarters of new ventures fail to return the investor’s capital (Gage 2012). In order to share and mitigate their investment risk, investors often syndicate (Manigart et al. 2006).

Syndication involves the participation of multiple investors in the financing round. Syndication of investments is common (Dimov and Milanov 2010; Wright and Lockett 2003) and is a way for VCs to mitigate their investment risk by enhancing selection, providing more varied value-added, and spreading financial risk, limiting the risk exposure of each investor (Brander, Amit, and Antweiler 2002). Furthermore, the inclusion of additional investors reduces asymmetries between investor and entrepreneur, and additional investors may increase value-added (Brander, Amit, and Antweiler 2002). Broader syndication also brings broadened networks, increasing access to knowledge and monitoring capabilities. Syndication can increase the amount of available information about the venture prior to investing and helps reduce uncertainty (Bygrave 1987).

While larger syndication benefits investors by reducing risks, there are also more costs involved. Complicated relationships among investors may give rise to opportunistic behavior such as free riding on screening and due diligence efforts (Anand and Galetovic 2000) or withholding relevant venture-specific information from new syndicate partners (Admati and Pfleiderer 1994). Larger syndicates may also expose the entrepreneur and investors to increased risk of expropriation of the novel idea around which the venture is founded. Additionally, as syndicate size increases, so does communication complexity, requiring more focus by the lead investor to manage the syndicate, potentially at the expense of monitoring the

venture, which may impact performance (Jääskeläinen, Maula, and Seppä 2006).

Various investors with differing motivations and value-added may participate in syndicates. For CVC investors, a major reason for investing in ventures is strategic (Chesbrough 2002). Established firms often focus on catering to the needs of their existing customers and may fail to allocate sufficient resources to emerging new technologies (Christensen and Bower 1996). For these firms, one way to tap into emerging new technologies is through their CVC units, balancing management of current customer needs while preparing technological advances via investments in new ventures. Looking to benefit from new technologies, CVC investors are more likely to invest in a sector with greater technological opportunities and weak intellectual property regimes (Dushnitsky and Lenox 2005b). To reduce their risk of investing in emerging technologies, they often employ measures to mitigate such risk through syndication and low resource commitment (Petkova et al. 2014).

VCs usually prefer to invest domestically (Cumming and Dai 2010); this home bias can be explained by the higher cost involved with monitoring and foreign exit. Cross-border differences and geographic distances make monitoring more costly (Lerner 1995). As VCs seek profitable exits, initial public offerings (IPOs) in a foreign country are more costly and time consuming (Jeng and Wells 2000), reducing attractiveness for investors. Despite this home bias of VCs, there has been a rise in cross-border VC investing from the early 1990s as VCs increasingly turn their attention globally for their next investment opportunity (Guler and Guillén 2010). For example, outflow of FVC investment from Europe increased from \$1.3 billion in 1999 (Baygan and Freudenberg 2000) to €2.9 billion in 2013 (EVCA 2013) while cross-border investment within Europe increased from \$4.7 billion in 1999 (Baygan and Freudenberg 2000) to €9.3 in 2013 (EVCA 2013). As VCs are increasing their foreign investment, many countries are also facilitating FVC investment by reforming domestic policies and regulations (Guler and Guillén 2010). When VCs invest internationally, they try to mitigate the risk of investing outside their home country by investing within a syndicate and rarely as the majority investor (Guler and Guillén 2010). Syndication is used to mitigate disadvantages of investing in ventures that are distant (Fritsch and Schilder 2008).

Foreign Venture Capital

Since VCs seek to avoid problems of moral hazard and adverse selection, knowing the characteristics of the entrepreneur regarding abilities or risk propensity and building a relationship with the entrepreneur are key to VC investment. VCs exhibit local bias when they invest (Cumming and Dai 2010) and may be reluctant to invest in ventures outside their geographic region. Proximity to ventures helps VCs develop relationships with the entrepreneur, facilitates communication, and eases monitoring (Gorman and Sahlman 1989; Sorenson and Stuart 2001). Physical, cultural, and institutional distances between the investors and ventures can deter relationship development, communication, and monitoring. For foreign VCs, the greater distance between them and the venture makes monitoring more difficult. When it is more difficult or costly to verify a partner's behaviors, more potential for opportunistic behavior exists (Eisenhardt 1989). With greater uncertainty and heightened agency problems attendant with investing in ventures outside their nation, FVCs may limit the amount they invest in these ventures.

Previous research shows that FVC investors can add value for the portfolio company by providing expanded international networks and greater access to capital (Bertoni and Groh 2014). In terms of portfolio company exits, FVCs can help overcome negative local exit conditions when the macroeconomic conditions of the investee country are not favorable (Bertoni and Groh 2014). Recent research also suggests that having FVCs in the syndicate can increase the probability of IPO exit and IPO proceeds (Cumming, Knill, and Syrvud 2016). When the syndicate is composed of both domestic and foreign VCs, the new venture has a higher growth rate (Devigne et al. 2013) and better exit performance (Cumming, Knill, and Syrvud 2016; Dai, Jo, and Kassicieh 2012).

At the same time, there are also costs associated with having FVC investors in the syndicate. For example, FVCs can increase the costs involved in M&A exits (Cumming and Johan 2013). FVCs are also more likely to leave the operational activities to domestic VCs (Pruthi, Wright, and Lockett 2003). As compared to domestic VCs, FVCs are quicker to exit from underperforming companies (Bertoni and Groh 2014). As cultural and geographic distance increases, investors are more ready to curtail

commitment to ventures with low prospects (Mäkelä and Maula 2006). Moreover, cultural and institutional distance between investors and portfolio companies (PCs) can limit FVCs' access to investment possibilities and hinder the investors' effectiveness in deal selection (Li, Vertinsky, and Li 2014). FVCs face liabilities of foreignness in the PCs' home countries and, due to limited foreign contacts, unsolicited deals originating from their network are fewer than that of the domestic VCs (Bell, Filatotchev, and Rasheed 2012; Lu and Hwang 2010). Further, studies have found that FVCs are less stringent in rejecting prospective PCs (MacMillan, Siegel, and Narasimha 1985). From the perspective of FVCs, it is within their interest to partner with local investors as a way to reduce information asymmetries and increase performance outcomes (Dai, Jo, and Kassiech 2012). However, when FVCs were involved in culturally distant cross-border deals, local investors were less likely to participate in the syndicate (Dai and Nahata 2016). Local investors are reluctant to co-invest with an FVC due to risks and costs involved with FVC. As FVCs are less effective and less stringent than domestic VCs in selecting investments outside their home region, the participation of FVCs may increase uncertainty in terms of venture quality for other syndicate investors. Having an FVC investor in the syndicate may also increase communication complexity, and can negatively impact performance (Jääskeläinen, Maula, and Seppä 2006). Moreover, the geographical and cultural distance between the VCs and the venture located outside their home country can result in a reduced commitment from the FVCs (Mäkelä and Maula 2008). FVCs prefer day-to-day management to be handled by a local investor and, in the absence of the local investor, entrepreneurs feel pressure to carry a heavier workload (Mäkelä and Maula 2008). From the local investors' perspective, there is less sharing of the workload and monitoring when FVCs are involved. It is expected that the syndicate members "share the due diligence and later on the monitoring as well as support of the venture" (Lutz et al. 2013, p. 2,349). FVCs may also behave opportunistically by freeriding on screening and due diligence efforts (Anand and Galetovic 2000). Thus, other investors involved in the round may limit the amount of their investment. Since both FVCs and other investors look to control the amount of funding they disburse per round, we hypothesize:

H1: Other things being equal, a syndicate in which a foreign venture capital investor participates has lower concentration of investors in the round than a syndicate without foreign venture capital investors.

Corporate Venture Capital

Previous studies suggest that different types of investors may vary in what they signal to other investors (Bertoni, Colombo, and Grilli 2013). Most independent venture capitalists invest solely for financial return (Gompers and Lerner 1998), in contrast with CVC providers (MacMillan et al. 2008). The motivation of CVCs investing in new ventures may not be limited to financial returns, but may also be strategic (Chesbrough 2002). One of the major reasons firms establish CVC programs is to access new technologies and practices (Dushnitsky and Lenox 2006). By investing in new ventures, established companies may facilitate their own innovation activities and obtain value by acquiring newly developed technologies or by investing in new ventures with complementary offerings that may increase the demand for their own products and services (Dushnitsky and Lenox 2006). As the motivation of the CVC investors is largely strategic, relinquishing a large equity stake to the CVC investor could be risky for the entrepreneur. Often the goal of a CVC investor is to access the venture's novel knowledge and technology. Compared to IVC fund managers who often lack the experience in the industry in which they invest, CVC fund managers are often industry experts who offer value added services and technical expertise (Gompers and Lerner 1998). While CVCs could offer access to distribution channels and manufacturing facilities (Teece 1986) or social and professional network contacts in the industry (Maula and Murray 2002b), they also pose a risk for the entrepreneur. The paradox of disclosure of innovations is most relevant in the CVC context (Arrow 1962; Dushnitsky and Shaver 2009), since CVCs are most equipped with the knowledge to understand and appropriate such information. New ventures fear the risk of expropriation of the novel idea by established companies (Dushnitsky and Lenox 2006). As the amount of funding CVCs provide increases, CVCs are likely to expect more in return such as greater share of control rights or disclosure of sensitive technology, which could expose the entrepreneur to a greater risk of

misappropriation. Thus, while the deep pockets of CVC parents may be attractive to the new venture, the entrepreneur might be reluctant to relinquish a large stake to the CVC investor. At the same time, independent VC investors in the syndication may want to limit their individual investment out of concern about expropriation of intellectual property by CVC investors. Moreover, since different types of VC investors vary in their motivation and objectives, the impact of these investors on venture performance differs. Bertoni, Colombo, and Grilli (2013) explain that CVC investors may have “scarce interest” in venture performance while independent VC investors may look to “grandstand” and show that their ventures’ short-term sales, an early indicator of venture success, outpaced CVC-backed ventures’ short-term sales. Therefore, the participation of a CVC in the syndicate may signal more risk.

Additionally, entrepreneurs have concerns about investors not adhering to nondisclosure agreements (Cable and Shane 1997). When a CVC investor is involved in the syndicate, new ventures may be less willing to provide key information to IVC investors in the syndicate (Kollmann and Kuckertz 2010), as syndicate partners often share information with each other. This may exacerbate information asymmetries for both CVC and IVC investors participating in the syndicate. When it is more difficult to verify the behavior of the entrepreneurs in new ventures due to less information sharing, the potential for entrepreneurs’ opportunistic behavior increases (Eisenhardt 1989). Thus, VCs participating in the round may want to limit the amount that they invest in the new venture. The level of resource commitment by a VC investor is a way to manage its risks (Petkova et al. 2014). At the same time, CVCs participating in the round have an incentive to check large investments made by IVCs. Independent VCs who make large investments in the new venture are likely to have more control rights, making it more difficult for the CVCs to influence the decisions made by the new venture, as CVCs look to benefit strategically by investing in new ventures. Also, CVC investors are less likely to occupy a board seat and are often exempt from the fiduciary responsibilities relating to board activity that would require CVCs to act on behalf of the new venture (Hallen, Katila, and Rosenberger 2014). This situation will exacerbate the misalignment of goals and tension between the IVC and CVC investors. Consequently, IVCs

could perceive the CVC investment as increasing the risk of expropriation of IP without sharing the fiduciary responsibilities of the investors.

Furthermore, potential syndicate partners understand that CVCs apply different evaluation criteria when they consider investing in a new venture. Since one of the main investment goals of CVC is strategic, CVCs may choose to invest in the new venture, even if the financial return is uncertain, if the venture’s technology is complementary or necessary to the CVCs’ parent company. Moreover, IVCs’ and CVCs’ exit plans are often misaligned. While IVCs often have a planned exit, CVCs often have unplanned exit routes and may be interested in acquiring the venture (De Clercq et al. 2006). Ownership power source match between VC firms is associated with higher exit rates (Ma, Rhee, and Yang 2013). Thus, one way to align the exit strategy between independent VCs and CVCs is to decrease the power mismatch between the VCs by balancing the ownership differences between the VCs. Conversely, CVC participation increases the number of members in a syndicate (Dushnitsky and Shapira 2010). Thus, lower concentration of investors may be a way to align the exit strategy of the IVC and CVC. Additionally, as the participation of CVC in the syndicate can create more uncertainty and risks to the investment, each syndicate partner may choose not to be a dominant partner in the round, thereby lowering the concentration of investment. Therefore, we hypothesize:

H2: Other things being equal, a syndicate in which a corporate venture capital investor participates has lower concentration of investors in the round than a syndicate without corporate venture capital investors.

Method

Sample and Data Collection

We test our hypotheses using a data set drawn from CorpTech and VentureXpert/SDC Platinum (SDC). CorpTech maintains data on companies that research, develop, manufacture, and provide services in high technology industries in the United States. CorpTech data, which has been used extensively in management research (Freear and Wetzel 1990; Knight and Kim 2009; Knight and Cavusgil 2004; Sine, Mitsuhashi, and Kirsch 2006; Soh 2003), provided data on the venture characteristics. The SDC

data, also used widely in VC research (Dushnitsky 2006; Gompers 1995; Gompers and Lerner 1999), provided data on the ventures, investors, and financing.

We focus on U.S.-based ventures in high-technology industries that received venture capital. Our sample of companies founded between 1997 and 2003, obtained from CorpTech, excludes publicly owned or nontechnology technology (e.g., holding) companies. We study companies that are six years or younger, consistent with the literature on new ventures (Brush 1995; Brush and Vanderwerf 1992; Zahra, Ireland, and Hitt 2000), by focusing on a six-year window around the internet bubble in 2000. Many companies received VC funding around the internet bubble burst, we are able to collect a large sample of data by focusing on companies during this period. Studying ventures in this period also allows us to eliminate other additional period effects that different time frames may contribute. Moreover, the time frame of this sample is also a time in which CVC reached its peak as a percentage of total U.S. venture investment (Lerner 2013), making it ideal period to study. We also eliminate management buyouts, spin-offs, or divestitures since VCs may differentially regard ventures with prior history, which may influence their pattern of capital provision. We match this set of companies from CorpTech with a list of all companies that received VC between 1997 and 2003 obtained from SDC. Our final sample consists of 1,137 investing rounds for 354 companies. We track these 354 companies in a panel data methodology.

Dependent Variables

Our dependent variable is *Investor concentration*. We measure *Investor concentration* using the Herfindahl index:

$$H = \sum_{i=1}^N S_i^2$$

where S_i is the percentage of funding provided by investor i in the round, and N is the number of investors in the round.

Independent Variables

The independent variable, *CVC participation*, represents whether the focal venture received corporate venture capital. *CVC participation* is

assigned a value of 1 if the round involves a corporate investor and 0 otherwise. *FVC Participation* is a dichotomous variable that takes a value of 1 if the round involves a foreign investor and 0 otherwise.

Control Variables

We include several control variables to account for factors that may also affect investor concentration. The variable *Round age* is the number of months between the focal venture's round date and the founding date. Older ventures at the round have a longer performance track record which can mitigate uncertainty and information asymmetry problems for the investors. Venture capitalists may also perceive more mature ventures as less risky, thus willing to invest larger amounts in older ventures. *Cumulative funds* is the natural log of the total capital that a focal venture received from investors prior to the current round. The sum of investments disbursed by investors signifies VCs' commitment to the venture and their perception of risk.

The variable *Mid-late stage* controls for the focal venture's stage in which the round is invested. Ventures typically expand during the middle or late stage of VC financing (Gompers 1995) and investors seek to control the financial risk of expansion (De Clerq and Dimov 2004) by increasing syndication during these stages. Moreover, VCs retain additional control rights such as board representation in the venture in later rounds (Broughman 2010) to address agency issues and uncertainty (Kaplan and Strömberg 2004). In addition, we include the variable *First round age*, which measures the age (in months) at which the venture received its first round. If ventures are more mature when they receive their initial investment, their performance record can reduce investors' uncertainty.

The variable *VC reputation* is constructed using Krishnan and Masulis's (2012) VC Reputation Dataset based on VC IPO market share. By matching the focal venture's VCs in each round syndicate with the VCs in the VC Reputation Dataset, we take the natural log of the highest value of the reputation measure of a syndicate member from the year prior to each respective round. Previous studies indicate a significant relationship between the VC IPO market share and the long-term venture performance (Krishnan and Masulis 2012). The participation of reputable VCs has a signaling effect and helps

other investors in the syndicate reduce their investment uncertainty and alleviate perceived risk (Fernhaber and McDougall-Covin 2009). Reputable VCs are better at venture selection (Krishnan et al. 2011). The variable *Prior investment* is the number of investments (in ten thousand) that the VCs have made before the focal round, as larger portfolios of prior investments may be related to smaller share of investment at the round. Prior studies have found that the portfolio size of different types of VCs vary (Cumming 2006). The variable *Legal quality* (source: World Bank) controls for the difference in legal quality between the United States where the portfolio company is located and the country the international investor is coming from. Prior studies indicate that host country's legal right protection of investor's rights is associated with rate of entry into foreign market by the VCs (Guler and Guillén 2010) and stronger legal rights are associated with a lower chance of over evaluation (Cumming and Walz 2010).

A dummy variable, *Founding year*, representing the year the focal venture was established, controls for unique cohort-specific conditions that may influence ventures established around the same time (Gompers 1995). We also include the variable *IPO*, which measures the number of IPOs (in hundreds) that took place in the United States during the same year as the investment round. This measure has been used in previous work that studied VC investments to control for the liquidity of exit markets (Cumming, Fleming and Schwienbacher 2005), which relates to investors' willingness to invest. We collected this variable from Jay Ritter's website on IPOs (Ritter 2015).

Dummy variables for 14 major industries are used to control for variations among different industries, as performance variation among industries (McGahan and Porter 1997) may influence perceptions of risk. We assign a value of 1 if the focal round operates in the respective industry, and 0 otherwise.

Statistical Analysis

We analyze the relationship between *CVC* or *FVC participation* and *Investor concentration* using a panel generalized least square (GLS) regression analysis with random-effects. We conducted the Hausman specification test, which indicated a random-effects model was more appropriate for our analysis than a fixed-effects model.

Results

Table 1 provides pairwise correlations and descriptive statistics for each of our variables in the analyses. The correlations are generally low. The variance inflation factors were below 10.0 benchmark, so there was not a concern for multicollinearity.

Table 2 presents estimates of panel GLS regressions exploring the relationship between *FVC* or *CVC participation* and the *Investor concentration* of the studied ventures. Model 1 provides a baseline analysis, only including the control variables. In Model 2, we add the variable *FVC participation* testing H1. In Model 3, we add the variable *CVC participation* testing H2. All models are significant at the .01 level. The coefficient estimate for the variable *FVC participation* in Model 2 is negative and significant, indicating support for H1, which posited that a syndicate in which a foreign venture capital investor participates has lower concentration of investors in the round. The results indicate that the participation of FVCs in the round decreases the Herfindahl index by 0.208, which is a significant drop in the index that ranges from 0 to 1.

The coefficient estimate for the variable *CVC participation* in Model 3 is also negative and significant, indicating support for H2, which posited that a syndicate in which a corporate venture capital investor participates has lower concentration of investors in the round. The results indicate that the participation of CVCs in the round decreases the Herfindahl index by 0.180, also a considerable drop.

As a robustness check, we conducted additional analysis by separating our sample for syndicated and nonsyndicated rounds. The results did not differ significantly from those reported on Table 2. We also conducted propensity score matching analysis (e.g., Cumming, Knill, and Syvrud 2016) in order to address the potential for endogeneity bias. Propensity score matching analysis has been used in prior VC studies to address nonrandom selection of FVCs (Cumming, Knill, and Syvrud 2016) and CVCs (Chemmanur, Loutskina, and Tian 2014). Using the nearest neighbor matching method (Chemmanur, Loutskina, and Tian 2014; Rosenbaum and Rubin 1983), portfolio companies with FVCs or CVCs were matched with portfolio companies without FVCs or CVCs using variables such as industry and year. We find that even after we control for firm characteristics, a syndicate in

Table 1
Descriptive Statistics and Pairwise Correlations

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1. Investor concentration	0.51	0.30	1.00										
2. FVC participation	0.14	0.35	-0.27	1.00									
3. CVC participation	0.25	0.43	-0.38	0.31	1.00								
4. Round age	26.74	18.14	-0.09	0.06	0.04	1.00							
5. Cumulative funds	6.32	4.41	-0.21	0.13	0.11	0.56	1.00						
6. Mid-late stage	0.68	0.47	-0.06	0.09	0.11	0.47	0.56	1.00					
7. First round age	11.23	11.29	0.03	-0.02	0.03	0.50	-0.15	0.05	1.00				
8. VC reputation	-0.42	0.33	-0.41	0.05	0.19	0.02	0.21	0.07	-0.17	1.00			
9. Prior investment	0.30	0.45	0.11	-0.15	-0.18	-0.10	-0.18	-0.13	0.01	-0.14	1.00		
10. IPO	2.26	1.71	0.07	-0.04	0.06	-0.54	-0.46	-0.26	-0.10	-0.07	0.09	1.00	
11. Legal quality	0.07	0.30	-0.17	0.55	0.21	0.02	0.08	0.04	-0.02	0.02	-0.12	-0.05	1.00

which CVC or FVC participates still have lower concentration of investors.

Discussion

In this study, we investigated how the participation of CVC or FVC in an investment round relates to syndication concentration. We found that the participation of either CVCs or FVCs is negatively related to the concentration of investors in the round. VCs take measures such as the use of syndication or limited resource commitment in order to mitigate the uncertainties and risks investing in a new venture (Petkova et al. 2014). Dimov and Milanov (2010) show that when VCs evaluate the risks involved in their investment, not only do they look at the characteristics of the new venture, but also consider composition of the investors participating in the round. Dimov and Milanov (2010) suggest that the reputation and the status of VCs can impact the opportunity for syndication by signaling the investment quality to other investors. In this study, we investigated how the participation of CVCs and FVCs relates to the investment practices of the syndicate. We demonstrated that relational uncertainty does not only reside between the VC-venture dyad at a heterogeneous level, but also between the VCs of the syndicate.

This paper contributes to the VC literature by addressing VC heterogeneity and its relationship to investment patterns, and enriches the understanding of the investments provided by different types of venture capitalists and their impact on syndicate partners. Potential syndicate partners may consider the additional risk that CVC partners bring, due to the possibility of expropriation of intellectual property, and may adjust their investment practices accordingly which, in turn, may alter the concentration of the syndicate. Even though a detailed contract stipulating both the investor's and entrepreneur's rights and responsibilities helps both transaction partners alleviate potential problems by aligning interests and incentives (Kaplan and Strömberg 2003), these contracts are inevitably incomplete (Grossman and Hart 1986). We demonstrate that VC firms in the syndicate evaluate not only the risks of a new venture, but their potential partners before making their investment decision.

We also contribute to the entrepreneurship literature by demonstrating the consequences of CVC or FVC affiliation for new ventures.

Table 2
Results of Panel GLS Regression Analysis of Investor Concentration

Variable	Model 1		Model 2		Model 3	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	0.454	0.130***	0.551	0.128***	0.561	0.122***
Round age	-0.001	0.001	-0.001	0.001	-0.001	0.001
Cumulative funds	-0.014	0.003***	-0.014	0.003***	-0.012	0.003***
Mid-late stage	0.025	0.021	0.027	0.021	0.035	0.020*
First round age	-0.003	0.001**	-0.003	0.001***	-0.002	0.001**
VC reputation	-0.354	0.027***	-0.348	0.026***	-0.307	0.025***
Prior investment	0.001	0.018	-0.011	0.017	-0.032	0.017*
IPO	-0.024	0.008***	-0.025	0.008***	-0.021	0.007***
Legal quality	-0.130	0.027***	-0.002	0.031	0.015	0.030
FVC participation			-0.208	0.028***	-0.152	0.027***
CVC participation					-0.180	0.019***
Observations		1137		1137		1137
R ²		0.2377		0.2738		0.3330
Wald chi-square		311.25***		384.04***		508.65***

*, **, and *** denote significance at 10, 5, and 1 percent levels, respectively. Not shown are the industry and year dummies that were included.

Previous research has emphasized the importance of VC affiliation and explained that “From whom you raise capital is often more important than the terms” (Sahlman 1997, p. 107). Prior work shows that VCs offer different value-added and entrepreneurs must pay a premium for value-added that highly reputable VCs bring, since a venture’s affiliation with highly reputable VCs can have performance benefits (Hsu 2004). In regards to a new venture’s CVC affiliation, while CVCs can offer extra value-added such as detailed market knowledge (Dushnitsky and Lenox 2006) and access to distribution channels and manufacturing facilities (Teece 1986), a new venture’s CVC affiliation is also associated with lower investor concentration. Similarly, while FVC investors provide foreign market knowledge and foreign expansion opportunities, a new venture’s FVC affiliation is also associated with lower concentration of investment. CVC or FVC participation in the round constrains the rise of dominant investors in terms of their investment amount. From the perspective of the entrepreneur, this may mean that the entrepreneur can retain more control in the new venture, but at the higher cost of communicating with and managing potentially more and

different types of VCs. Therefore, our study suggests that entrepreneurs, who seek to benefit from the CVC or FVC investors, must also consider the costs and risks involved.

While our study yielded interesting results, there are some sample limitations. As noted, the timeframe from which the sample was drawn was particularly intense in VC investing, demonstrating record investment of venture capital. There was also an intensification in the application of FVC during this period, and cross-border investing was growing (Baygan and Freudenberg 2000; Maula 2010). However, broadening the timeframe of the sample (e.g., Cumming, Grilli, and Murtinu 2017; Li, Vertinsky, and Li 2014) would provide further insights into FVC and CVC syndication through multiple economic cycles. Our sample only examines single country (U.S.-based) new ventures; a multicountry study (e.g., Li, Vertinsky, and Li 2014; Cumming, Grilli, and Murtinu 2017) would provide for more generalizable results.

Our paper offers a number of future research avenues. Ma, Rhee, and Yang (2013) demonstrated that familiarity coming from prior investment experience together can mitigate potential problems and facilitate interaction between VC

firms involved in the round. Partners involved in repeated amicable interactions develop trust (Gulati 1995) and psychological safety (Edmondson 1999). Future studies can investigate how the prior interaction between VCs and familiarity can impact the negative relationship between CVCs and investor concentration.

Another avenue of future research is to explore if there is a different VC investing behavior for new ventures that internationalize early in their life cycle (LiPuma and Park 2014). While FVCs suffer from liabilities of foreignness (Bell, Filatotchev, and Rasheed 2012) and rely more on domestic investors for support in daily operations (Mäkelä and Maula 2008), FVCs may be able to add value to new ventures that internationalize, especially if the new venture is internationalizing to the same country where the FVC is based. FVCs can offer relevant knowledge to the new venture and provide more strategic support. They can aid the internationalization of new ventures by reducing the liability of foreignness and increase legitimacy (Mäkelä and Maula 2005). FVCs can also offer foreign exit options (Jääskeläinen and Maula 2005). Thus, it would be interesting to see if the participation of FVCs in the round will influence the investing behaviors of other VCs when the new venture is internationalizing.

Lastly, future research may investigate the impact of government VC (GVC) participation on syndication. Previous research shows that GVC involvement is associated with lower productivity of portfolio companies, as GVC is much less stringent than private VCs, which have clearly defined exit strategies (Alperovych, Hübner, and Lobet 2015). There are also heightened agency problems associated with inefficient GVC covenants and compensation terms, as compared to those of IVCs (Cumming, Grilli, and Murtniu 2017). GVC-backed firms usually underperform compared to private VC-backed firms in terms of growth (Grilli and Murtniu 2011), innovative output (Bertoni and Tykvová 2012), and exit performance (Cumming, Grilli, and Murtniu 2017). Given these risks associated with GVCs, GVC participation may alter the investment decision of other investors involved in the syndicate. The role of government may have an even broader impact on the VCs' investment behavior. For example, Johan, Schweizer, and Zhan (2014) show that as government tax policy changes, investment behavior of VCs may change accordingly, for instance, moving away from investing in private new ventures to

investing more in publicly-listed companies. Government policy also impacts disclosure standards in a country, a policy that is closely linked to entrepreneurial spawning or number of VC-backed IPOs (Cumming and Knill 2012).

Conclusion

CVC and FVC investments are becoming increasingly common, as existing companies look for new ways to conduct R&D and FVCs seek new investment opportunities. This paper demonstrated the impact of the participation of CVC or FVC investors on the overall concentration of investors involved in a round's syndication. As CVCs and FVCs bring different value added, and potential liabilities, to the new venture, a closer look at the impact of the CVC and FVC involvement on the syndicate can be helpful to investors and entrepreneurs. The relational uncertainties in the venture impact partner selection of a VC syndicate (Dimov and Milanov 2010) and the VC's decision to invest in a new venture is dependent not only on the cost and benefits of the new venture alone but also on the risks reflected in the VC syndicate partners. By demonstrating different VCs' investment behavior when FVC or CVC is involved, we provide a more comprehensive picture of venture capitalists' behavior. Entrepreneurs should consider the potential impact of a FVC or CVC on syndicate partners' investment behavior when they receive funding.

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