Ph. D. Dissertation in Engineering

Research on Corporate Venture Capital Syndication

- Partner Selection, Distant Search, and Investee Performance -

기업벤처캐피탈의 신디케이션에 관한 연구
: 파트너 선택, 모기업의 원거리탐색 성과, 피투자회사의 성과

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Abstract

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The increasing importance of technology for creating and sustaining a competitive advantage, requires firms to continually innovate. Increasingly, firms have done so relying on knowledge and technologies beyond the boundaries set up by their internal R&D by employing a variety of external sourcing strategies. Among those, recently, corporate venture capital (or corporate venture capitalist; CVC), a sourcing mode seeking to identify opportunities from entrepreneurial firms has become an important strategic instrument. In certain high-tech industries, such as the biopharmaceutical and IT industries, where many innovations are introduced by entrepreneurial firms, corporations are increasingly adopting CVC into their innovation strategy. This trend is also spreading to more traditional industries such as energy and agriculture where CVC strategy is becoming more common and important. At the same time, the importance and status of

the CVCs in the venture ecosystem is increasing. Entrepreneurial firms are taking into account CVCs as an important source of funding, and traditional or independent venture capitalists (IVCs) are also strengthening their relationships with CVCs.

Academic research also sought to explain the growth of CVC. Studies on technological innovation have argued that CVCs represent a promising strategic tool for innovation, and have demonstrated the effects of CVC investments on innovation performance. Further, literature on venture capital and entrepreneurial firms have included CVCs in their analysis, and investigated CVCs' characteristics, influences, and relationships with other players in the venture ecosystem. However, studies that consider and combine the perspectives of different fields of research have not yet fully developed. Prior studies have independently examined CVC investments from the perspective of their own fields, and literature dealing with CVCs from the perspective of corporations and innovation have paid little attention to CVC's syndicate investments. Further, since in practice CVC investors syndicate the vast majority of their investments, the understanding of CVC's syndicate investments could provide impactful implications for the venture industry. In that sense, a research on CVCs' syndicate investments that integrates the perspectives of innovation literature and venture capital literature could provide an additional and comprehensive view of CVC investments. Considering the interests in the extant literature and the practical significance of key aspects and processes related to CVC investments, this dissertation includes three different studies on CVC investments,

namely, ‘syndicate partner selection’, ‘parent corporate’s distant search performance’, and ‘investee’s exit performance’. Each study deals with different aspects of CVC-related decision-making and performance. Collectively, this dissertation attempts to identify key characteristics related to CVCs and their syndicate investments. By analyzing the effects of these characteristics on syndicate formation with other VCs, the search performance of the parent corporate, and on the exit performance of the investee, this dissertation increases the academic understandings of CVC investments as well as provides implications for firms on how to appropriately manage CVC investments.

Specifically, Chapter 3 examines the determinants of CVCs’ partner selection in syndicate investments. As CVCs exhibit characteristics different to that of IVCs, it can be expected that they apply different criteria in their syndicate partner selection decisions. Using a sample of CVC-led syndicate investments, the empirical results verify that CVC lead investors are more likely to invite investors specialized in the investee’s industry into their syndicate. At the same time, due to concerns about the control over the management of the investee, CVC lead investors are less likely to syndicate with influential investors who possess a good reputation and status. These findings suggest that CVCs choose their syndicate partners based on the complementarity of the partners while also considering possible principal-principal conflicts with the partners.

Employing the resource-based view and organizational learning perspective, Chapter 4

investigates the relationship between the distant search using CVC investments and the resulting knowledge transfer. Moreover, as means to overcome the distance and facilitate the distant search, this study investigates the moderating effects of syndicate partners and organizational structure on the knowledge transfer through CVC investments. CVC investments allow firms to take cognizance of technological trends, access novel technologies held by entrepreneurial firms, and to overcome the constraints of contextually localized search. However, the results indicate that the inverted U-shape relationship between technological distance and knowledge transfer, which had been previously observed in other external knowledge sourcing contexts, also holds true for CVC investments. To overcome these constraints in distant search, CVCs could complement their absorptive capacity through their syndicate partners, or enhance their absorptive capacity by promoting communication between the CVC unit and the staff of the parent corporate. The results of the empirical study verify a positive moderating effects of an integrated CVC unit structure on the knowledge transfer from the investees. It is confirmed, however, that increasing the number of syndicate partners has a negative influence on the knowledge transfer in CVC investments. These findings suggest that syndicate investments have different characteristics in CVC investments, and CVC might face conflicts with their syndicate partners.

Compared to traditional VCs, CVCs have different characteristics in terms of their resources and capabilities, social capital, experiences, and motives and objectives of

investment. Hence, it can be expected that syndicate investments among different types of investors such as CVCs and IVCs may have varying outcomes depending on the relationship between the investors. Chapter 5 verifies how syndicate investment among different types of investors, such as CVCs and IVCs, affects the IPO performance of the investee firms. The empirical results indicate that CVCs and IVCs face increasing conflicts when they syndicate their investment with a balanced distribution of ownership. As a result, entrepreneurial firms backed by these syndicates can incur delays to their IPO exit. This result shows that syndicate investments among CVCs and IVCs are affected by conflicts originating from their different motives. Through a comprehensive approach, the study sheds light on the principal-principal conflicts among syndicate partners and contributes to the research on partner conflict and its consequences in the context of entrepreneurial finance.

Through the research outlined above, this dissertation provides three significant contributions: First, by examining CVC's syndicate investments, which, despite their increasing importance, were not prominently featured in prior literature, it complements the literature on CVCs and expands the understanding of CVC investments. Second, this dissertation reveals that the rationale behind the syndicate investments of CVCs relies more on agency theory, specifically principal-principal conflicts, rather than the resource-based view and resource complementarities. Through a comprehensive approach that integrates the CVC context with insights from diverse theories, including principal-

principal conflicts, the resource-based view, and relational theory, research on CVC syndicate investments will help provide a better understanding and insights on partner selection, knowledge transfer, and overall performance. Third, this dissertation confirms that syndicate investments do affect CVC activities and resulting outcomes, and suggests that, in utilizing syndications, CVCs need to be cautious about potential conflicts with their syndicate partners. Findings from this dissertation propose that firms need to take into account the syndication in their CVC investments, and utilize it appropriately.

Keywords: corporate venture capital, syndication, partner selection, distant search, IPO exit

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Chapter 1. Introduction

1.1 Backgrounds

Firms are continuously compelled to innovate and enhance their competitive advantage due to rapidly changing technological and business environments. Accordingly, firms have extended beyond the internal R&D to the external sourcing strategy to access and gain new ideas, novel technologies, and expertise (Fleming, 2001; Keil, 2004; Powerll et al., 1996). At the same time, entrepreneurial firms are increasingly recognized as a key source of innovation. Entrepreneurial firms have played an important role in promoting technological change, stimulating innovation, and wealth creation (Schumpeter, 1934; Tushman et al., 1986). In that sense, corporate venture capital (CVC) strategy that seeks to identify opportunities from these entrepreneurial firms has become an important strategic instrument. For example, Intel Capital, one of the technology industry's most experience CVCs, typically participates in 60-100 deals per year, and Novartis Venture Funds and SR One (GlaxoSmithKline's venture investment arm) who are the most active investors in healthcare industry typically invest in 10-20 entrepreneurial firms every year. As Figure 1-1 shows, firms have actively carried out CVC investments and expanded their investment in entrepreneurial firms.

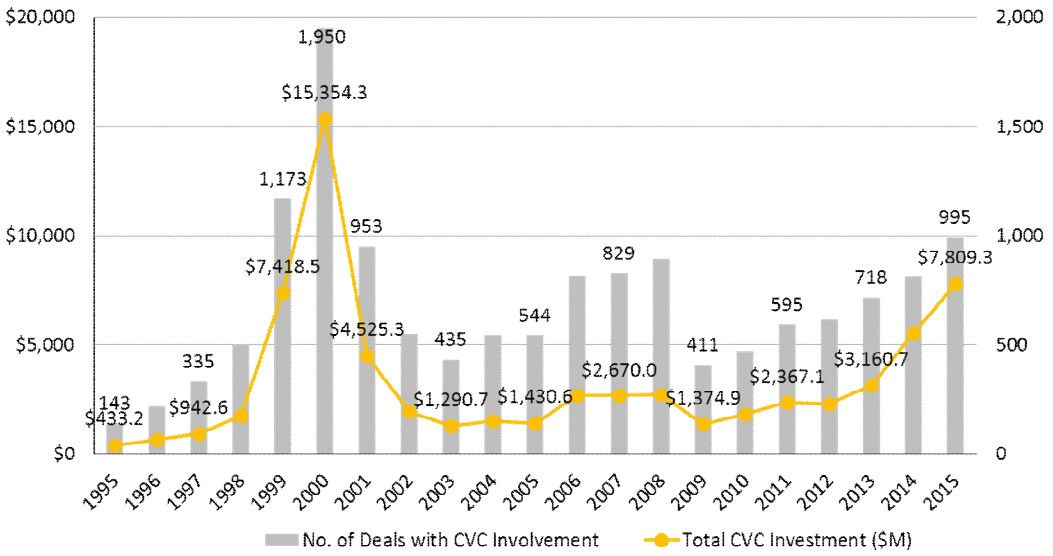


Figure 1-1 Corporate venture capital activity trends in the US
(Source: National Venture Capital Association, 2016)

In certain high-tech industries such as biopharmaceutical and IT industries, where many innovations are introduced by entrepreneurial firms, firms are increasingly adopting CVC into their innovation strategy. This trend is also spreading to more traditional industries such as energy and agriculture, where CVC is becoming common and important. It is widely recognized that firms utilize CVC investments as a window on technology that enables them to learn about and explore novel technologies and market opportunities. Prior studies have demonstrated that CVC investments result in CVC investor's diversified technological portfolios (Lee and Kang, 2015), explorative learning (Schildt et al., 2005), explorative knowledge creation (Wadhwa et al., 2010), and better innovation performance (Dushnitsky and Lenox, 2005).

However, these CVC investments are not determined solely by a firm's perspective.

Players such as entrepreneurial firms who will receive the investment, co-investing VC investors, and relevant service providers, which comprise the entrepreneurial ecosystem, affect each other and influence the decision on investment. Accordingly, growing importance of CVC investments is also recognized by other participants in the entrepreneurial ecosystem. As shown in Figure 1-2, CVC investments already account for certain portion of the total VC investments in the US market and are of growing importance to the VC industry. CVCs participated in 21.9% of the deals, and accounted for 13.0% of financings in 2015. Accordingly, entrepreneurial firms are taking into account CVCs as an important source of fund, and traditional or independent venture capitalists (IVCs) are also strengthening the relationship with CVCs.

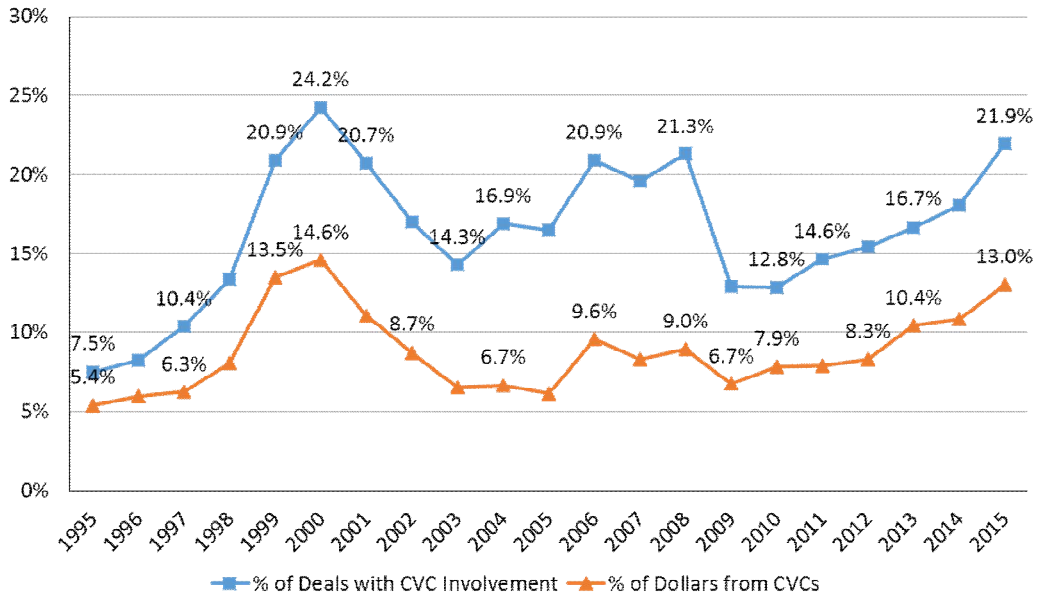


Figure 1-2 CVC share of all VC deals in the US
(Source: National Venture Capital Association, 2016)

Hence, prior studies on venture capital and entrepreneurial firms have included CVCs in their analysis, and investigated CVCs' characteristics, influences, and relationships with other players in the entrepreneurial ecosystem (Alvarez-Garrido and Dushnitsky, 2016; Ivanov and Xie, 2010; Maula et al., 2005). However, studies have independently examined the CVC investments from the perspective of their own fields, and few studies have included multiple perspectives on CVCs, ranging from corporates to IVCs and entrepreneurial firm. Despite CVCs adopt investment structure and practices similar to other VCs (Hill et al., 2009), they may exhibit different investment characteristics due to the differences in organizational structure and objectives. Thus, studies that include multiple perspectives and investigate the relationships between CVCs and other players within the entrepreneurial ecosystem could complement and extend the understandings on CVC investments.

In practice, CVC investors syndicate the vast majority of their investments. Some studies suggest 88% to 98% of all CVC funds syndicate their investments (Basu et al., 2011; MacMillan et al., 2008). Hence, it can be expected that the relationship with other VC investors has an important influence on CVC investments, and it is needed to understand the view of both CVCs and other VCs. In that sense, a research on CVCs' syndicate investment that integrates the perspectives of innovation literature and venture capital literature could provide an additional and comprehensive view of CVC investments.

1.2 Research purpose

With an increasing significance of and need for innovation management, this dissertation is focused on CVC strategy and its syndicate investments. CVC investments are an important strategic tool for learning about novel technologies and market opportunities from entrepreneurial firms. Depending more on external knowledge and resources in fast-changing technological environments, firms are paying more attention to the entrepreneurial firms and CVC investments. Growing significance of CVC investments is also acknowledged from other participants in the entrepreneurial ecosystem. Studies on technological innovation, venture capital, and entrepreneurial firms have investigated and identified the characteristics of CVCs and the effects of CVCs on several dimensions of performance. As the CVC investments are the result of interaction of multiple participants in the entrepreneurial ecosystem, understandings that integrate perspectives from different fields of literature are needed. However, as the research on the syndicate investments of CVCs is relatively sparse, compared to the research on CVCs in general, many questions on the characteristics of CVCs' syndicate investment itself as well as on its effects remain unanswered.

The aim of this dissertation is to close some of the gaps in the current knowledge about CVCs' syndicate investments. Integrating approaches found in the extant literature and tasks relating to CVC investments, this dissertation investigates a number of CVC syndication-related characteristics. Three empirical studies analyze syndicate formation,

impact of syndicate size, and the impact of syndicate composition, respectively. Each study is analyzing different aspects of the CVC syndicate investment, and altogether this dissertation provides an overall picture of the CVC's syndicate investment characteristics. Specifically, each study's focus is as follows: The first, with its setting at the time of initiating investment, aims at increasing the understanding of the determinants of CVCs' syndicate partner selection by investigating how both complementarities and conflicts influence the decision on partner selection. The second study focuses on the post-investment period and aims at investigating the effects of syndicate partners on the knowledge transfer performance in distant search through CVC investments. The third study, focusing on the exit process, aims at demonstrating how syndicate investments among CVCs and IVCs affect the performance of the investee firms.

Altogether, this dissertation increases both the academic understanding of CVC investments as well as provides implications for firms to appropriately conduct CVC investments. First, by analyzing syndicate investments of CVC, this this dissertation addresses a gap in the research on CVC investments. Second, this dissertation reveals that the rationale behind the syndicate investments of CVCs is based on agency theory, specifically principal-principal conflicts, as well as the resource-based view and resource complementarities. Third, this dissertation suggests ways to utilize syndicate investment for companies that utilize CVC investment strategies. Fourth, this dissertation also provides implications for VCs who recognize CVCs as attractive syndicate partners.

1.3 Research outline

The dissertation consists of three key parts: the literature review, three different empirical studies on the determinants of syndicate partner selection, the effects of syndicate partners on knowledge transfer, and the effects of syndicate investment among CVCs and IVC on the investees' exit, as well as final chapter providing the conclusions of this research as well as limitations and some directions for future research.

Chapter 2 provides a literature review. Specifically, this chapter present the extant literature on CVCs from different fields, including innovation strategy, venture capital, and entrepreneurial firms. It highlights the importance of CVC investments as a tool for innovation, how are CVCs and IVCs different, and how CVCs influence their investees.

The three empirical studies are covered in Chapters 3, 4, and 5. Figure 1-3 provides an overview of the three key questions answered by these chapters and how they help to provide a comprehensive view of the CVCs' syndicate investments.

Chapter 3 investigates the determinants of CVCs' partner selection in syndicate investments. Prior research on syndicate partner selection has investigated, primarily focusing on IVCs, the complementarity and uncertainty of the potential partners. Though prior studies have regarded CVCs as passive investors, only recently has research begun to recognize that CVCs are more likely to take on a more active role in the syndicate and even lead or co-lead the investment. Since CVCs exhibit characteristics different to that of IVCs, it can be expected that they apply different criteria in their syndicate partner selection decisions. Using a sample of CVC-led syndicate investments, the empirical

results verify that CVC lead investors are more likely to invite investors specialized in the investee's industry into their syndicate. At the same time, due to the concerns about the control over the management of the investee, CVC lead investors are less likely to syndicate with influential investors who possess a good reputation and status. These findings suggest that CVCs choose their syndicate partners based on the complementarity of the partners while also considering the possible principal-principal conflicts with the partners.

Employing the resource-based view and organizational learning perspective, Chapter 4 investigates the relationship between the distant search using CVC investments and the resulting knowledge transfer. Moreover, as means to overcome the distance and facilitate the distant search, this study investigates the moderating effects of the syndicate partners and organizational structure on knowledge transfer through CVC investments. CVC investments allow firms to take cognizance of technological trends, access novel technologies held by entrepreneurial firms, and to overcome the constraints of contextually localized search. However, the results indicate that the inverted U-shape relationship between technological distance and knowledge transfer, which had been previously observed in other external knowledge sourcing modes, also holds true in CVC investments. To overcome these constraints in distant search, CVCs could complement their absorptive capacity through their syndicate partners, or enhance their absorptive capacity by promoting communication between the CVC unit and the staff of the parent corporate. The results of the empirical study verify a positive moderating effects of an integrated CVC unit structure on the knowledge transfer from their investees. It is

confirmed, however, that increasing the number of syndicate partners has a negative influence on the knowledge transfer in CVC investments. These findings suggest that syndicate investment have different characteristics in CVC investments, and CVC might face conflicts with their syndicate partners.

Compared to traditional VCs, CVCs have different characteristics in terms of their resources and capabilities, social capital, experiences, and motives and objectives of investment. Hence, it can be expected that syndicate investments among different types of investors such as CVCs and IVCs may have varying outcomes depending on the relationship between the investors. Chapter 5 verifies how syndicate investment among different types of investors, such as CVCs and IVCs, affects the IPO performance of the investee firms. The empirical results indicate that CVCs and IVCs face increasing conflicts when they syndicate their investment with a balanced distribution of ownership. As a result, investees backed by these syndicates can incur delays to their IPO exit. This result shows that the syndicate investments among CVCs and IVCs are affected by conflicts originating from their different motives. Through a comprehensive approach, the study sheds light on the principal-principal conflicts among syndicate partners and contributes to the research on partner conflict and its consequences in the context of entrepreneurial finance.

Concluding this dissertation, Chapter 6 provides a summary of the results and their implications. Moreover, this chapter provides a discussion of the limitations and directions for future research.

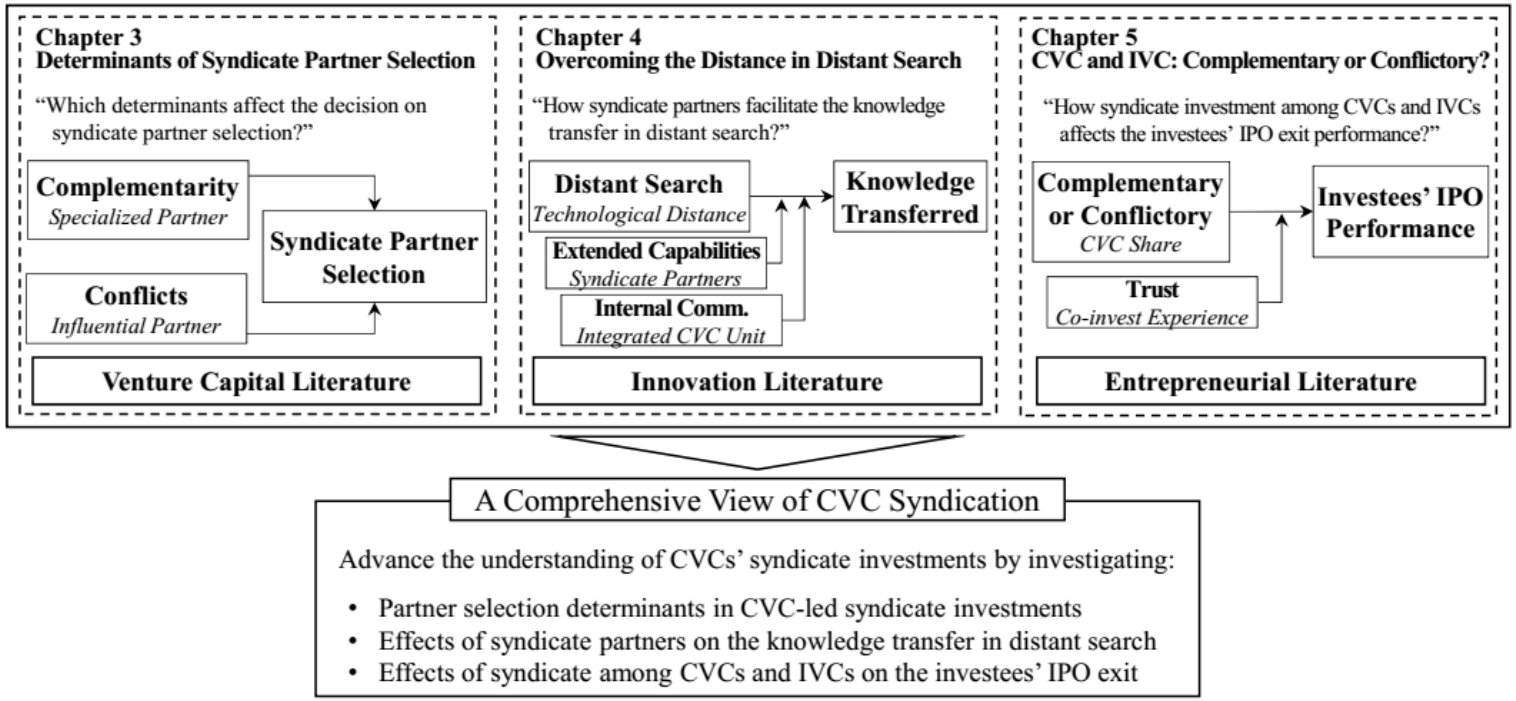


Figure 1-3 Overview of the dissertation

Chapter 2. Literature review

2.1 Venture capital syndicate investment

2.1.1 Venture capital

Entrepreneurial firms have played an important role in promoting technological change, stimulating innovation, and wealth creation (Schumpeter, 1934; Tushman et al., 1986). Though these entrepreneurial firms have positive characteristics such as entrepreneurship, flexibility, and rapid response, which stimulate innovation, they often face problems in raising capital for the growth and struggle with development, commercialization, innovation or even survival due to a lack of resources and capabilities (Baum et al., 2000). Thus, entrepreneurial firms often utilize external cooperative relationships to complement their internal deficiencies or attract venture capital investments to not only benefit from financial supports but also non-financial value-added contributions (Baum et al., 2000; Gorman and Sahlman, 1989).

Venture capital is defined as investments made by institutions, firms, and individuals in ventures that are not quoted on a stock market, and which have the potential to grow and become significant player on the international market (Landström, 2007). Prior research has acknowledged that venture capitalists provide financial and non-financial support to their investees (Large and Muegge, 2008), and play the role of a coach, giving advice about managerial decisions and growth strategies (Hellmann, 2000). Empirical

studies on venture capital also have confirmed the supportive influence of venture capitalists on the performance of entrepreneurial firms. In general, VC-backed entrepreneurial firms are more likely to bring their products to the market faster (Hellmann and Puri, 2000) and reach a successful exit (Chemmanur et al., 2011; Gompers and Lerner, 2000).

In short, entrepreneurial firms are important in society and economic growth, and venture capital is a momentous vehicle for promoting their growth. Venture capital positively affects many economic and managerial phenomena such as the foundation of public companies, technological innovations and economic growth (Kortum and Lerner, 2000). In a fast changing market and technology environment, the role of VCs in supporting high agility entrepreneurial firms is getting increasingly significant.

2.1.2 Syndicate investment

Syndicate in venture capital investment means that a venture capital firm co-invests with other venture capital firms on a deal. In practice, most of VC financing takes place in inter-organizational syndicates (Lerner, 1994b). Instead of investing in new entrepreneurial firms alone, VC firms form syndicates. Syndicates are a form of inter-organizational collaboration between firms (Wright and Lockett, 2003) which serve the purpose of financial intermediation, as well as the goals of each VC firm. Syndicates are made up with formal contractual structures that establish the terms of investment between

entrepreneurial firms and participating VC firms. At the same time, the decision to form and participate in a syndicate is determined by the needs and opportunities of both entrepreneurial firms and participating VC firms (Dimov and Milanov, 2010). Accordingly, the syndication of investments inherently includes multilevel aspects ranging from contraction, venture development, VC firm strategy, partnership formation, and inter-organizational networks (Jääskeläinen, 2012).

VC firms syndicate their investments for various motives. The finance perspective provides motives such as risk sharing, portfolio diversification, capital constraints, and access to the future deal flow, which are related to the management of the VC firm's investment portfolio (Lerner, 1994b; Manigart et al., 2006). Another approach following the resource-based view provides motives for syndication related to the management of the individual investment, including improved venture selection, monitoring skills, value-added, and the sharing of knowledge (Brander et al., 2002; Manigart et al., 2006). Jääskeläinen (2012), who provides the most extensive and up-to-date review of the syndicate investments, further classified the motives on the basis of whether they are motivated by the performance and opportunities of the entrepreneurial firm or of the VC firm (Table 2-1). Regarding comparisons of motives, the research is inconclusive. Lockett and Wright (2001) concluded that the finance perspective provides a strong explanation of motives for syndication. However, they also found that the resource-based motives of syndicate investment, such as accessing multiple sources of expertise and reducing information asymmetries between investors and investees, provide more insights into the

early stage investments (Lockett and Wright, 2001). In study of Brander et al. (2002), authors concluded that value-added contributions is a more significant motive than selection. Bygrave (1987) argued that deal flow outweigh the risk sharing motives.

Table 2-1 Motives to syndicate on VC investments

Motivations	Prior studies
Firm-level motivations	
Leveraging existing/ compensating for lacking resources	Deal flow (Bygrave, 1987; Manigart et al., 2006; Fritsch and Schilder, 2008) Selection expertise and capabilities (Casamatta and Haritchabalet, 2007; Dimov and Milanov, 2010) Value-adding capabilities (Jääskeläinen et al., 2006; Manigart et al., 2006; Dimov et al., 2007; De Clercq et al., 2008; Dimov and Milanov, 2010; Deli and Santhanakrishnan, 2010, Verwaal et al., 2010; Dal-Pont Legrand and Pommet, 2010; Hopp, 2010a, 2010b; Hopp and Rieder, 2011) Market-specific knowledge (Mäkelä and Maula, 2008; Meuleman et al., 2009) Financial resources (Ferrary, 2010; Gottschalg and Gerasymenko, 2008)
Managing perceptions of the VC firm	Reputation-building (Lerner, 1994b) Structural positioning (Milanov and Shepherd, 2008)
Managing inter-organizational relationships	Entry deterrence (Hochberg et al., 2010) Networks (Castilla, 2003; Fund et al., 2008; Keil et al., 2010)
Managing portfolio	Reducing risk of underperforming peers (Lerner, 1994b; Lockett and Wright, 2001) Diversification (Lerner, 1994b; Lockett and Wright, 1999, 2001; Manigart et al., 2006; Kaiser and Lauterbach, 2007)
Deal-level motivations	
Venture-related factors	Selection (Brander et al., 2002; Cumming, 2006; Dimov and Milanov, 2010; Cestone et al., 2007) Value added (Brander et al., 2002; Manigart et al., 2006; Dimov and Milanov, 2010) Risk reduction (Manigart et al., 2006)
Necessity	Asymmetric information between VCs (Admati and Pfleiderer, 1994; Lerner, 1994b; Fluck et al., 2009) Asymmetric information between VCs and ventures (Hellmann, 2002; Huang and Xu, 2003; Schmidt, 2003; Bachmann et al., 2006; Fluck et al., 2009)

(Source: Jääskeläinen, 2012)

Table 2-2 Effects of syndication on performance and outcomes of ventures

Unit of analysis	Syndication measure	Performance measure	Effect	Study
Syndication, binary measure		IRR	+	Brander et al., 2002; Cumming et al., 2010
			–	Fleming, 2004
		Time to exit	–	Das et al., 2011
		Multiple	+	Das et al., 2011
		Exit type	+	Das et al., 2011; Tian, 2012
Syndicate size		IRR	+	Brander et al., 2002; Hege et al., 2009
		Time to exit	–	Giot & Schwienbacher, 2007
		Exit type	+	De Clercq & Dimov, 2008; Tian, 2012
		Size and likelihood of exit	+	Nahata, 2008
		Risk of IPO/acquisition	None	Guler, 2007
Syndicate composition	Prior exp. with partners	Exit type	+	De Clercq & Dimov, 2008
	Partner knowledge endowment	Exit type	+	De Clercq & Dimov, 2008
	Partner heterogeneity	IPO/acquisition exit	+	Du, 2009
	Lead with larger share	IPO/acquisition exit	+	Kotha, 2008
	Type of partner	IRR	None	Mason and Harrison, 2002
Network	Network centrality	Time to exit	+	Hochberg et al., 2007
		Survival of venture	+	Hochberg et al., 2007
	Network contacts	IPO	+	Walske et al. 2007
		Size and likelihood of exit	+	Nahata, 2008
		Risk of exit	+	Jääskeläinen & Maula, 2011

(Source: Jääskeläinen, 2012)

As the most of the motives for syndication aim to affect the value of the investees, it can be expected that syndicate investments are associated with enhanced performance on the investee-level. Prior research on performance effects of syndication proposes that syndication could affect the performance of the investees in the aspects of the post-investment management and the exit process (Jääskeläinen, 2012). Through syndication,

investors could improve the performance of individual investments as a result of the combining unique and complementary resources and the value-added contributions of the participating VC firms. Further, the existence of a prominent investor group provides endorsement and contributes to the perceptions of their investees. Empirical studies also have confirmed that syndication has mainly positive effects on the performance of their investees (Table 2-2).

Syndication also influences on the performance and outcome of the participating VC firms. By leveraging their syndicate partners' expertise and prior experiences, participating investors can reduce information asymmetry between themselves and the investee, and consequently better identify and evaluate the investee's technology and market opportunities (De Clercq and Dimov, 2008; Hopp, 2010). Further, through interacting with syndicate partners, participating investors can create an opportunity for organizational learning by gaining access to the partners' knowledge, experience, and expertise (Clarysse et al., 2013; Hopp, 2010; Meuleman and Wright, 2011). Syndicates function as forums for information exchange and knowledge flow among the participating partners (Anokhin et al., 2011). Thus, the opportunities for vicarious learning from the accumulated experiences and insights of the partners allow firms to extend their capabilities and overcome their deficiency in experiences (Grant and Baden-Fuller, 2004; Levitt and March, 1988).

2.1.3 Corporate venture capital

Corporate venture capital (CVC) is defined as a venture investment arm of established firm, or as equity investments in privately held entrepreneurial firms by established corporations. CVC is distinct from: (1) corporate venturing, which refers to internal entrepreneurship, the creation of entrepreneurial ventures within the firm; (2) investments by independent venture capital firms; (3) investments by financial corporations; and (4) equity investments in publicly held companies and in joint ventures (Kann, 2000). While this definition is from the perspective of corporations that views CVC as a mode of external corporate venturing (Dushnitsky and Lenox, 2005; Kann, 2000; Keil, 2000), there is also a perspective from entrepreneurial firms and venture capitalists that views CVC as an alternative source of funding (Gompers and Lerner, 2000; Maul et al., 2005). It depends on where we see it from. Focusing on the syndicate investments of CVC, this dissertation employs both of these perspectives. On the one hand, CVC is examined from the perspective of entrepreneurial firm and IVCs with the focus on influences of the nature of CVCs on the investment relationship and relationship outcome. On the other hand, CVC is also examined from the perspective of the corporation with a focus on the determinants of selection of syndicate partner and on the enhanced knowledge transfer in distant search through CVC investments.

Regarding the objectives of CVC investments, from the perspective of corporation, existing research suggests that corporations pursue multiple goals and strategies in their

CVC investments. Besides financial returns, CVCs invest in entrepreneurial firms with the goal of achieving certain strategic objectives. Strategic objectives of CVC programs can be further distinguished. Kann (2000) categorizes three classes of strategic objective: (1) external R&D, (2) accelerated market entry, and (3) demand enhancement. Alternatively, Maula (2001) identifies three main categories: (1) learning, (2) option building, and (3) leveraging internal existing resources and capabilities (Table 2-3). Several goals are usually pursued at the same time, and strategic and financial goals are often combined. Keil (2000) pointed out that while strategic objectives are often the motives for setting up CVC programs, investments are usually made in consonance with financial criteria. Prior survey studies also have confirmed that it is a combination of strategic and financial objectives, and firms assign different importance on their strategic objectives (Figure 2-1).

Corporate venture capital program models vary widely across corporates, ranging from CVC units housed in the corporate center to a formalized program established as a wholly-owned subsidiary. Since each model has distinct characteristics, corporates can combine the advantages and disadvantages of each model with a program's specific objectives to determine model selection (Table 2-4). In cases, multiple models are applied at the same time: while corporates invest in entrepreneurial firms through a wholly-owned CVC subsidiary, they also directly invest in entrepreneurial firms depending on their strategic circumstances.

Table 2-3 Objectives and potential benefits of CVC investments

Objectives			Examples
Financial objectives	**Financial gains**	Financial gains	Alter & Buchsbaum, 2000; Bannock Consulting, 1999; Keil, 2000, McKinsey & Co., 1998; McNally, 1997; Siegel et al., 1988; Silver, 1993
Strategic objectives	**Learning**	Market-level learning	Antenna-like identification of, monitoring of and exposure to new technologies, markets, and business models (Keil, 2000; McNally, 1997; Silver, 1993; Sykes, 1990; Winters & Murfin, 1988)
		Venture-specific learning	External R&D (Kann, 2000; McKinsey, 1998; McNally, 1997; Silver, 1993; Sykes, 1990) Improving manufacturing processes (McNally, 1997; Siegel et al., 1988)
		Indirect learning	Change corporate culture (McNally, 1997; Sykes, 1990) Train junior management (Silver, 1993) Learn about venture capital (McNally, 1997; Sykes, 1990) Improve internal venturing (Keil, 2000; Winters & Murfin, 1988) Complementary contacts (Winters & Murfin, 1988)
	Option building	Option to acquire companies	Identify and assess potential acquisition targets (Alter & Buchsbaum, 2000; McNally, 1997; Siegel et al., 1988; Silver, 1993; Sykes, 1990; Winters & Murfin, 1988)
		Option to enter new markets	Accelerated market entry (Kann, 2000) Option to expand (Chesbrough, 2000; Keil, 2000; Sykes, 1986)
	Leveraging	Leveraging own technologies and platforms	Increase demand for technology and products (Kann, 2000; Keil, 2000) Shape markets (Kann, 2000; Keil, 2000) Steer standard development (Kann, 2000; Keil, 2000) Support development of new applications for products (McKinsey & Co., 1998)
		Leveraging own complementary resources	Add new products to existing distribution channels (Alter & Buchsbaum, 2000; Siegel et al., 1988; Silver, 1993; Sykes, 1990; Winters & Murfin, 1998) Utilize excess plant space, time, and people (Silver, 1993)

(Source: Maula, 2001)

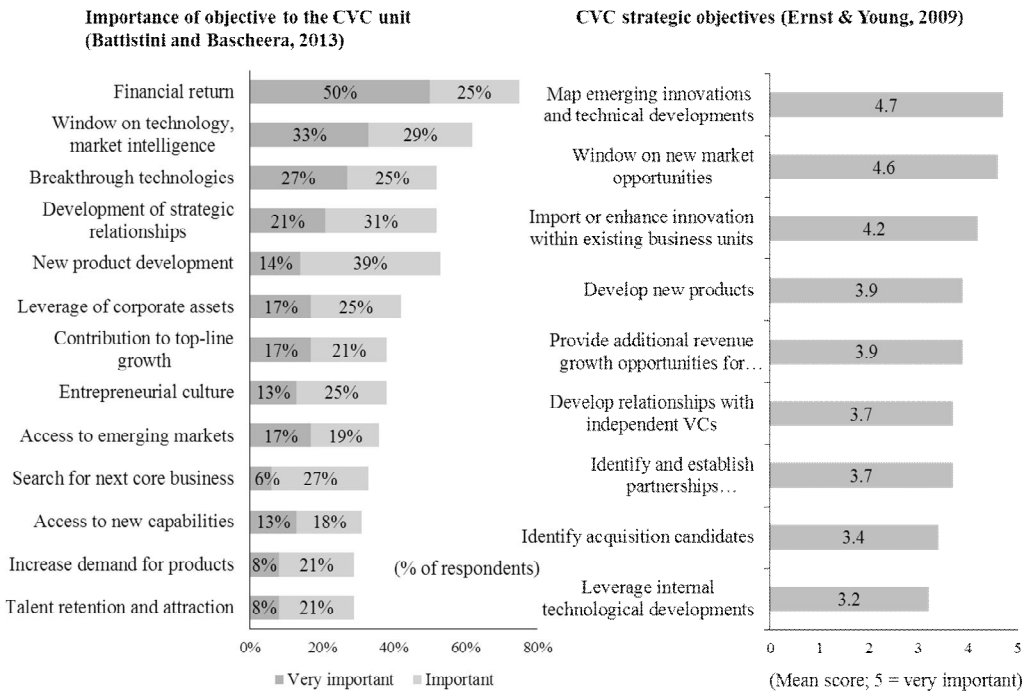
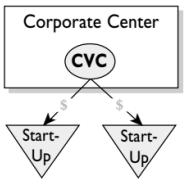
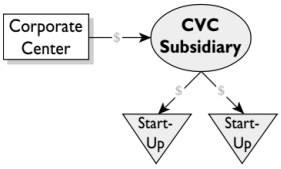
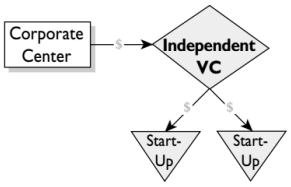


Figure 2-1 Survey results of CVC objectives

(Source: Battistini and Baschera, 2013; Ernst & Young, 2009)

Table 2-4 Variety of CVC program models

	Direct investment (Integrated CVC unit)	Wholly-owned subsidiary	Dedicated VC fund
			
Structure	Corporation assigns CVC investing responsibility to an entity within the corporate center	Corporation creates an independent subsidiary with autonomous decision-making authority through which to pursue CVC activity	Corporation hires a professional VC firm to make dedicated equity investments on its behalf
Advantages	· Participate in corporate and business-unit strategic planning sessions and product portfolio analysis · Enables identification of existing R&D gaps that strategically relevant equity investments can fill. · Maintains close proximity to the company's business units, raising their awareness of the potential value of equity investing as a business development tool · Decreases CVC managers' burden to convince them of the value of collaborating with strategically relevant entrepreneurial firms	· Autonomous funding decisions circumvents bureaucratic corporate approval processes, enabling the group to make rapid investment decisions alongside independent VC firms · Compensation schemes that commensurate with the VC community · Such incentives are easier to maintain in an autonomous subsidiary structure, which reduces corporate scrutiny on compensation equality across hierarchical levels of the company	· Extract strategic value from investments without expending significant resources other than capital outlays · Helps to assuage entrepreneurial firms' concerns regarding CVC's intentions or potential conflicts of interest
Disadvantages	· Early-stage investments are more difficult to pursue · Investment approval can be mired by business-unit skepticism and decision-making bureaucracy	· May lack sufficient oversight to anticipate and minimize the occurrence of strategically irrelevant deals	· Relinquish a substantial portion of financial returns to pay for the "carried interest" fee of the professional VC firm
Cases	Apple Strategic Group Hearst Interactive Media UPS Strategic Fund	Dell Ventures Primedia Ventures Senmed Ventures	Adobe Ventures Sequoia Seed Capital TI Ventures

(Source: Corporate Strategy Board, 2000; Dushnitsky, 2006)

As mentioned earlier, CVCs are recognized differently depending on the perspectives from taken. Hence, studies dealing with the CVC investments have diversified into distinctive, but complementary, approaches. First, extant research investigating from the perspective of corporate has examined the investor outcomes from CVC investments such as corporate innovation and knowledge transfer. Prior research has demonstrated that firms utilize CVC investments as a window on technology that enables them to learn about and explore novel technologies and market opportunities (Dushnitsky and Lenox, 2005; Lee et al., 2015; Schildt et al., 2005; Wadhwa and Kotha, 2006; Wadhwa et al., 2010). It has been proven that firms which participate in CVC investments more often or invest more capital to CVC activities are creating more knowledge and exhibit a better innovation performance (Dushnitsky and Lenox, 2005; Wadhwa and Kotha, 2006). Second, several studies have compared characteristics between CVCs and IVCs (Alvarez-Garrido and Dushnitsky, 2016; Ivanov and Xie, 2010; Keil et al., 2010; Maula et al., 2005). CVCs tend to be different from IVCs regarding a couple of key dimensions such as investment size, investment duration, and value-added contributions. Third, a few research has examined the relationship between CVC investments and performance outcomes of the investees from the perspective of entrepreneurial firms. Some studies have demonstrated that CVC-backed entrepreneurial firms are able to access resources and capabilities of CVC's parent corporate, thus, grow more rapidly, possess larger patent portfolio, and are likely result in an successful exit (Alvarez-Garrido and Dushnitsky, 2016; Gompers and Lerner, 2000; Park and Steensma, 2011). On the other hand, some

studies have raised concerns over the risks of engaging in transactions with CVC investors (Hallen et al., 2014; Katila et al., 2008). The remainder of the Literature review presents the detail of studies from each field of view.

2.2 CVC in venture capital literature

2.2.1 Different characteristics

Venture capital firms are heterogeneous in their source of fund, organizational structure, and investment objectives. Prior research has often classified VCs into financial investors, such as independent venture capitalists (IVCs), and strategic investors, such as corporate venture capitalists (CVCs). IVC, which is the dominant type of VC in the US, is structured as a management company managing several pools of capital provided by limited partners. CVC investor, on the other hand, is structured as an investment vehicle of non-financial companies, who is the only limited partner. Accordingly, CVCs have a quite distinct nature from IVCs (Table 2-5).

Most of all, CVCs and IVCs have different objectives in their investments. Financial returns are a fundamental objective of the investment and are used as an important performance index for IVCs. IVCs are seeking the grandstand such as faster growth of their investee firms and higher fund returns to demonstrate their ability to their potential limited partner investors (Gompers, 1996). On the other hand, besides financial returns,

CVCs put emphasis on strategic objectives (McNally, 1997). With their strategic objectives, CVCs may be less preoccupied with the investee firm's success, and even in some cases, CVCs put pressure on the investee firms to pursue a technology agenda that is favorable to the parent corporation but would result in suboptimal financial returns (Katila et al., 2008).

In terms of assets and resources that VC firms have, CVCs can access and utilize key resources held by their parent corporate, such as R&D personnel and facilities, distribution channels, knowledge and experiences, and social capital on related technologies and markets (Chemmanur et al., 2014; Maula et al., 2005). Further, CVCs could provide entrepreneurial firms with certification benefits, or even an opportunity to establish strategic relationships with parent corporate (Stuart et al., 1999). In terms of organizational structure, CVCs also shows different aspects. Since CVCs exist as a specific investment unit or a wholly-owned subsidiary, their compensation schemes are tied to the parent corporates (Chemmanur et al., 2014; Gompers and Lerner, 2000). Further, since fundraising activities may not be needed for CVCs, CVCs are unconstrained by the fixed lifetime of a fund (Guo et al., 2015). Finally, in terms of investment traits or performance, CVCs present somewhat different characteristics to IVCs. CVCs usually invest larger amount of capital to entrepreneurial firms than IVCs (Dushnitsky and Shapira, 2010). Further, CVCs' investees exhibit higher rates of innovation output (Alvarez-Garrido and Dushnitsky, 2016), and are more likely to achieve successful exit performance (Gompers and Lerner, 2000; Ivanov and Xie, 2010) than IVC only-backed investees.

Table 2-5 Comparison of corporate and independent venture capitalists

	Corporate VC	Independent VC
Definition	An established firm undertaking minority equity investment in entrepreneurial ventures	An investor dedicated to undertaking equity investment in entrepreneurial Ventures
Investor description	A corporation with one or more lines of business. Investment responsibilities lie with CVC program	A dedicated financial investor
Scope	Investment activity is not the main business of the investing firm. Annual investment amounts are a fraction of total revenues or assets of the investing firm	Investment activity is the sole business of the independent VC. Broadly speaking, IVC's assets (capital under management) are fully allocated toward investment in entrepreneurial ventures
Structure	Various legal and organizational structures. The CVC team is based within a business unit or headquarters. The parent corporation is the sole source of capital, and also provides support via access to R&D, business, and other corporate functions	Limited liability partnership (LLP). General partners (GP) raise funds from limited partners (LP) and then invest the capital in entrepreneurial ventures
Assets and resources	Professional investment team, capital provided by the corporation, access to corporate infrastructure including R&D as well as manufacturing facilities, dedicated units to manage national and international regulatory demands, and global sales force with deep ties to medical doctors, hospitals, and other drug buyers (e.g., HMOs)	Professional investment team, and financial capital committed by the LPs
Personnel size and backgrounds	Parent firm: Total number of CVC parent corporations ~60,000. These include thousands of highly specialized personnel in R&D, sales and marketing, as well as legal and regulatory areas CVC unit: Average number of personnel within the CVC unit is 4.3. Their background usually consists of corporate personnel, and may also involve former VC professionals, former entrepreneurs, or investment professionals	Average number of GP personnel is 4.7. Their background usually consists of investment professional, former entrepreneurs, sometimes with advanced Ph.D. background

(Source: Alvarez-Garrido and Dushnitksy, 2016)

Highlighting the differences in assets and resources profile, also as presented in Table 2-5, CVCs and IVCs exhibit quite different value-added contributions to the entrepreneurial firms. Maula et al. (2005) suggested that CVCs are more valuable in helping investees attract new business partners, attract new domestic customers, obtain new foreign customers, and in providing information on customer needs and trends, and new technologies than IVCs. While, IVCs are more valuable in helping investees organize for early growth, obtain additional financing, recruit new employees, and in providing information on competition than CVCs. In other words, IVC provides "enterprise nurturing" value-added which is needed during the early growth of a entrepreneurial firm, while CVC provides "commerce building" value-added which is needed for product development, manufacturing, and sales (Maula et al., 2005). CVC and IVC provide non-overlapping and "different but strongly complement" value-added contributions to investees (Maula et al., 2005).

2.2.2 Syndication between CVCs and IVCs

Likewise IVCs, most CVC investments take place in syndicates (MacMillan et al., 2008). As seen in subsection 1.1, most of CVCs syndicate their deals and CVCs participate in more than a fifth of all VC deals in the US. Since CVCs can utilize key resources held by their parent corporations, such as R&D facilities, distribution channels, and knowledge and experiences (Chemmanur et al., 2014; Maula et al., 2005), CVCs are

perceived by IVCs as attractive partners, and could take central positions in syndication networks (Keil et al., 2010). In prior research on syndicate investment, it was revealed that CVC participation in a syndicate has a positive effect on the performance of the investee firms as measured by its valuation at the time of IPO (Ivanov and Xie, 2010; Maula and Murray, 2002). Further, entrepreneurial firms backed by a syndicate that includes CVCs are more likely to reach the initial public offering (IPO) and exhibit a better innovation performance (Alvarez-Garrido and Dushnitsky, 2016; Gompers and Lerner, 2000). However, prior studies have usually considered CVCs as objects and alternative resources that complement the deficiencies of IVCs. Accordingly, most of prior research on syndicate investment among IVCs and CVCs have been approached from the point of view of the IVCs.

Further, prior literature has acknowledged that CVCs remain passive investors, generally not holding a board seat nor acting as the lead investor (Hellmann, 2002; Masulis and Nahata, 2009). Considering CVCs' weaker performance incentive structure and their preference for later stage investment, CVCs are not willing to be the first one to invest money into a company and are less involved in the management of the investee (Dushnitsky and Shapira, 2010; Ivanov and Xie 2010). Another explanation is that CVCs often become non-voting observers since their goal is to gather strategic information at relatively low cost (MacMillan et al., 2008).

While, as seen in subsections 2.1.1 and 2.2.1, previous studies have focused on the characteristics and different aspects of CVCs and IVCs, researchers have put less

attention on the syndicate investments among CVCs and IVCs, especially from the perspective of corporations. Only recent study has begun to acknowledge the syndicate investments among CVCs and IVCs, and examine the effects on the investees' productivity (Colombo and Murtinu, 2016).

2.2.3 Syndicate partner selection

Prior literature have acknowledged that interorganizational collaboration allows a firm to access partner's resources and capabilities and leads to new knowledge extensions and improved outcomes (Hamel, 1991; Powell et al., 1996; Stuart, 2000). In that sense, the results of the collaboration are influenced by the firm's own as well as its partner's quality and characteristics. After a firm makes the decision to form a partnership, its selection of an appropriate partner is a critical success factor (Geringer, 1991; Hitt et al., 1995; Shah and Swaminathan, 2008).

Prior studies on inter-organizational collaboration have distinguished broad categories of partner selection criteria. Geringer (1991) grouped partner selection criteria into task-related and partner-related criteria. More specifically, task-related criteria are associated with the operational skills and resources which a newly founded joint venture requires for its competitive success. Examples include patents, technical knowhow, financial resources, experienced managerial personnel, and access to marketing and distribution channels. In contrast, partner-related criteria are associated with the efficiency and

effectiveness of partners' cooperation. Examples include a partner's corporate culture, prior collaboration experience between the partners, compatibility of and trust between partners, and a partner's organizational size or structure. Further developing these prior categories, Cummings and Holmberg (2012) also suggested four sets of partner selection criteria, i.e., task-related, learning-related, partner-related, and risk-related categories. Shah and Swaminathan (2008) undertook an extensive review of the literature on strategic alliances, and identified four key factors that have been shown to influence partner selection: complementarity, value or financial payoff, trust, and commitment. Complementarity with the partners and the expected value payoff from the collaboration are explained as factors that influence the attractiveness of the partners which can improve the effectiveness and performance of the collaboration. Trust and commitment are suggested as factors that lower the opportunistic behavior and uncertainty in the collaboration. Comprehensively, the quality of and complementarity with the partner, together with concerns about the uncertainty and possible conflicts are regarded as key factors influencing partner attractiveness and selection.

Complementarities between the partners have been suggested as an important determinant of partner selection (Geringer, 1991; Hitt et al., 2000; Rothaermel and Boeker, 2008; Teece, 1986). Drawing on the resource-based view and organizational learning perspectives, Hitt et al. (2000) pointed out that firms can leverage resources that are complementary to create synergy, or learn skills and capabilities from their partners to improve their own competencies. Rothaermel and Boeker (2008) also argued that

complementarities between partners allow them to compensate each other's weaknesses while leveraging each other's comparative strengths, and found evidence of the importance of complementarities in alliance partner selection. Another stream of research, mainly based on the agency theory, has demonstrated that the risk and uncertainty associated with the partner influence the decision to collaborate. In an analysis of international collaborations of firms, Hitt et al. (1995) found that several of partnerships have not been successful because of their partner's management style, motivations, or commitment conflict with their own (Hitt et al., 1995, p.14). Further, partners will behave opportunistically in a volatile and uncertain environment (Luo, 2007). In R&D alliances, participants could be placed at risk of leakage of their valuable technological assets (Beckman et al., 2004; Li et al., 2008).

Much of VC financing takes place in inter-organizational syndicates (Lerner, 1994b; Manigart et al., 2006), which are considered as a kind of collaboration between firms (Wright and Lockett, 2003) As syndicate partners can combine and share their accumulated resources and expertise, participating partners can take advantage of an improved selection and better quality of contributions to the investee firms (Hopp, 2010; Verwaal et al., 2010). Accordingly, the lead investor, who initiates the deal and actively manages the investee and syndicate, may invite non-lead investors depending on their resources and capabilities (Verwaal et al., 2010). Previous studies have acknowledged the quality of the partner investors, judged by their investment experience, knowledge, and network position, as important determinants of partner selection (Hochberg et al., 2007;

Hopp and Lukas, 2014). Meanwhile, syndicate investments also incur costs due to the uncertainty about partners' experience and expertise, mutual monitoring among syndicate partners, information leakage, and principal-principal conflicts from misaligned goals (Casamatta and Haritchabalet, 2007; Hopp, 2008; Meuleman et al., 2010). Prior studies on partner selection have suggested that the relational embeddedness or the reputation of the partner can mitigate the risk of the selection (Meuleman et al., 2010; Wright and Lockett, 2003). Considering that syndicate partners could provide both gains and pains (Wright and Lockett, 2003), VC firms need to use syndication as a part of their overall strategy.

Likewise IVCs, most CVCs syndicate their deals with other VC investors. However, prior studies have addressed CVCs as passive investors, generally not acting as the lead investor (Masulis and Nahata, 2009). It was only recently that CVC-focused research recognized that CVCs have been moving away from a passive role, and nowadays are more likely to take on a more active role in the syndicate and even lead or co-lead the investment (MacMillan et al., 2008; Von Krogh et al., 2012). In an interview on CVC, Reinhard Ambros, the executive director of Novartis Venture Funds, said: "Ten years ago, we would never have dared to lead a deal, but today we are accepted as a real partner. Now, any deal we do, we are either leading or co-leading." Similarly, Stephen Lee, former principal of Samsung America Ventures, also mentioned that "We frequently work with the financial venture community and are flexible about whether we lead the investment or join as part of a larger syndicate" (Ernst & Young, 2010). Moreover, a

recent report of the U.S. National Venture Capital Association (NVCA Yearbook, 2015) points out that "All signs suggest that corporate venture groups are becoming more involved alongside traditional venture firms in deals. In addition, they are initiating corporate venture group syndicates to do deals in lieu of, or in advance of, investment rounds by traditional venture firms". For example, Intel Capital, one of the technology industry's most experienced CVCs, is well known for its role as the lead investor in the majority of the deals it undertook. In this changing face of CVC investments, the strategic aspects of partner selection decisions in CVC-led syndicates have significance for CVCs and their parent corporates.

2.3 CVC in innovation literature

2.3.1 CVC: A tool for external search

Corporate venture capitals (CVCs), as venture investment arms of established firms, put emphasis on strategic objectives besides financial returns. Extant literature on CVCs have demonstrated that firms utilize CVC investments as a window on technology that enables them to learn about and explore novel technologies and market opportunities (Dushnitsky and Lenox, 2005; Lee et al., 2015; Schildt et al., 2005; Wadhwa and Kotha, 2006; Wadhwa et al., 2010). Through CVC investments, firms search novel technologies and learn and transfer knowledge from their investee firms and co-investing partners.

Corporate investors search and gain information about the novel technologies and market opportunities of the entrepreneurial firms, even beyond organizational boundaries, through various ways, such as evaluating business plans, working with investee firms within their investment portfolios, and interacting with co-investing VC partners (Benson and Ziedonis, 2009). After making an investment in a firm, corporate investors are able to access and transfer knowledge from the investee firm (Dushnitsky and Lenox, 2005; Lee et al., 2015). CVCs often involve personnel from relevant business units or the R&D team of the investor firm in the due diligence process to gauge a target firm's technological feasibility and market potential. Accordingly, the CVC parent firm's R&D team and business units become aware of the technologies and markets they review. Corporate investors gain further insight and acquire knowledge of investee firm's activities and technologies through board membership following the investments. Through these learning channels, corporate investors are able to access and understand novel and distant knowledge, and expand their knowledge base beyond their current domain of expertise.

Further, establishing relationships with internal and external partners is important to improving strategic returns (Wadhwa and Kotha, 2006). CVC units are able to leverage internal innovation capabilities as well as selected external innovation. While CVC units provide value-added contributions to their investees using internal resources and capabilities, they can also identify and assimilate potential innovations with R&D and

business units. Especially, they can actively contribute to enhancing corporates' innovation process by enhancing and complementing internal R&D capabilities (Table 2-6).

Table 2-6 Internal R&D-related strategic returns from CVC investments

Corporate innovation process	How corporate venturing adds value
Technology and business monitoring	· Window on emerging technologies/market intelligence · Leverage CVC unit's network to "connect and develop"
Corporate R&D	· Buy and "option" to a new technology rather than pay the full R&D costs · Use external resources to develop new materials/technology
Production, scale-up, and market development	· Use new production technology and capacity · Leverage existing distribution channels · Extend potential of current portfolio
Selling and buying firms	· Option for direct investment · Option for acquisition · Option for financial return via IPO or trade sale

(Source: Battistini and Baschera, 2013)

Accordingly, it has been found that firms which more frequently participate in CVC investments or allocate more capital to CVC activities are creating more knowledge and exhibit a better innovation performance (Dushnitsky and Lenox, 2005; Wadhwa and Kotha, 2006). By having the chance, through CVC investments, to access and learn about novel technologies held by the investees, firms can recognize and seize innovation opportunities that are difficult to find on their own. Previous literature has demonstrated that CVC investments result in a diversification of the CVC investors' technological portfolios (Lee and Kang, 2015), explorative learning (Schildt et al., 2005), and

explorative knowledge creation (Wadhwa et al., 2010). A recent study of Lee et al. (2015) further demonstrated that the number of CVC investments has a curvilinear relationship with the knowledge transferred from the investee firms.

2.4 CVC in entrepreneurial literature

As noted earlier, limited research has examined the relationship between CVC investments and the investees' performance and outcomes from the perspective of entrepreneurial firms (Zahra and Allen, 2007). While some studies suggest positive effects of CVC investors on entrepreneurial firms (Alvarez-Garrido and Dushnitsky, 2016; Gompers and Lerner, 2000; Maula and Murray, 2002; Park and Steensma, 2011), other studies raise concerns about the opportunism by established firms (Diestre and Rajagopalan, 2012; Hallen et al., 2014; Hellmann, 2002; Katila et al., 2008).

2.4.1 Benefits from CVCs

Prior studies have suggested that CVC-backing may increase an investee's success rate. An established firm, through CVC program, could contribute to entrepreneurial firms on a number of dimensions (Table 2-7). First, CVCs could provide significant non-financial value-added contributions. For example, CVCs can utilize and leverage key resources and capabilities that held by their parent corporates. Through CVCs, entrepreneurial firms can access corporation laboratories, marketing and distribution channels, accumulated knowledge and expertise, and they can leverage a firm's networks

of customers and suppliers (Chemmanur et al., 2014; Maula and Murray, 2002; Maula et al., 2005). Second, the fact that an entrepreneurial firm is backed by a prominent incumbent provides certification benefits, which can provide an endorsement effect to the investee and decrease the liability if newness (Stuart et al., 1999). Further, CVC-backed entrepreneurial firms can employ the corporate as a readily available beta site, or even establish strategic relationships with the corporate, such as buyer-supplier relationship and strategic alliances (Stuart et al., 1999; Van de Vrande and Vanhaverbeke, 2013).

Table 2-7 Potential benefits to entrepreneurial firms from CVC-backing

Activity	Benefits
Financing	· Access financial resources-equity, royalties, R&D funding, etc. · Reduce costs
R&D / New product development	· Utilize market intelligence · Access to extensive publications library · Obtain technological insights · Access complementary technologies · Access to labs and test facilities
Manufacturing	· Receive manufacturing knowledge and capabilities · Capitalize on component purchasing power · Access quality assurance capabilities
Marketing / Distribution	· Improve market access (distribution channels, global networks) · Access and established and loyal customer base · Acquire market research and personal insights · Reduce cycle time · Increase credibility · Ties to a partner capable of driving industry standards
Legal / Regulatory	· Advice on regulatory or patent approvals
Service / Support	· Establish warranty, service and customer support procedures
Reputation	· Exploit “halo effect” that comes from large company’s endorsement

(Source: Dushnitsky, 2006; Kelly et al., 2000)

Accordingly, prior studies suggest that CVC-backed ventures experience favorable performance. Gompers and Lerner (2000) found that CVC-backed firms are more likely

to reach the IPO and have higher valuation at the IPO. Maula and Murray (2002) also found the evidence that companies financed by single or multiple CVC investors have higher IPO valuations than those funded only by IVCs. Further, Alvarez-Garrido and Dushnitsky (2016) confirmed that CVC's investees exhibit higher rates of innovation output, compared to IVC-backed firms.

2.4.2 Risks associated with CVCs

In general, VCs participate in the board, and engage in management of their investee firms. In that sense, when strategically motivated CVCs invest in entrepreneurial firms, they can face a conflict of interest with the entrepreneurs. Because CVCs align its focus with their parent corporates than their investees, CVCs may want to influence the investee firms to pursue a technology agenda that is favorable to the parent corporates, which may not maximize the investees' value. A CVC could against the investee' s product or service development in areas that overlap with the CVC's parent corporate. Or, they may support development of less promising technologies that complement the parent's technologies and products (Masulis and Nahata, 2009). Even, a CVC parent can use and appropriate its knowledge about an investee's ideas, technologies, and products to develop its own products. Katila et al. (2008) addressed one particularly challenging situation in which a potential partner is both particularly attractive and particularly dangerous, and termed these tension between attractive resources and high misappropriation risks as the "shark dilemma". Taking an entrepreneurial perspective,

Katila et al. (2008) examined the tie formation in CVC investments, and found that entrepreneurial firms take the risk when they need specific resources and when they have defense mechanisms.

From the perspective of entrepreneurial firms, Block and MacMillan (1993) acknowledged that entrepreneurial firms would distrust CVCs because "they will control their ventures to satisfy corporate objectives at the expense of the ventures' well-being". Accordingly, VCs or entrepreneurial firms often question CVC's intentions, and are concerned about possible leakage of key intellectual properties and a loss of competitiveness. In that sense, CVCs could face both principal-agent conflicts with entrepreneurial firms and principal-principal conflicts with other syndicating VC investors (Dalziel et al., 2010; Eisenhardt, 1989; Hoskisson et al., 2002).

Chapter 3. Strategic determinant of partner selection in CVC-led syndicates

3.1 Introduction

Research on partner selection have been conducted in various fields of research, such as international business, R&D alliance, and network research (Beckman et al., 2004; Diestre and Rajagopalan, 2012; Hitt et al., 2000). After a firm makes the decision to form a partnership, its selection of an appropriate partner is a critical factor for success. Hence, the determinants that affect partner selection have received much attention and have been empirically tested across various contexts. One set of studies, mainly based on the resource-based view (Penrose, 1959; Wernerfelt, 1984), explains that firms are more likely to partner with firms that have resources and capabilities that increase the chances of success (Rothaermel and Boeker, 2008; Teece, 1986). Another set of studies, stands on the agency theory (Eisenhardt, 1989; Jensen and Meckling, 1976), reveals that firms are reluctant to engage in partnership when there is a high risk of partner uncertainty problems, value appropriation problems, or principal-principal conflicts (Beckman et al., 2004; Katila et al., 2008). Further, in the case of collaborations involving multiple partners, not only the dyadic relationship but also the relationship and combinations with other partners can influence partner selection decisions. Previous studies on multi-party

collaborations have addressed that collaborating partners' diversity or relationships affect the resulting performance (García-Canal et al., 2003; Gong et al., 2007; Kim, 2014). So far, previous partner selection studies have focused predominantly on dyadic and static partner selection analysis (Hopp and Lukas, 2014; Meuleman et al., 2010; Rothaermel and Boeker, 2008; Shah and Swaminathan, 2008; Sorenson and Stuart, 2008). Nevertheless, identifying the determinants of partner selection from the dyadic perspective could provide a basis for determining partner selection decisions also from a portfolio perspective.

Venture capital investment syndicate, which is defined as a co-investment on a deal, also provides a suitable context for the analysis of partner selection decisions. Much of VC financing takes place in inter-organizational syndicates (Lerner, 1994b; Manigart et al., 2006). As syndicate partners can recombine their resources and capabilities to obtain advantages (Lerner, 1994b), the lead investor, who initiate the deal and invite other investors, may try to choose adequate syndicate partners based on their characteristics.

Further, corporate venture capitals (CVCs), who are venture capital arms of established firms and aside from the financial returns, pursue strategic objectives, such as opening up windows on new technologies or markets (Chesbrough, 2002; Dushnitsky and Lenox, 2005), may exhibit strategic behavior when they act as a lead investor and invite syndicate partners. Hence, a study on syndicate partner selection in CVC context could provide room for extending perspective on partner selection and novel insight to the literature. So far, only a limited number of studies has examined the characteristics and

determinants of CVC syndicate investment while taking their strategic context into account. Anokhin et al. (2011) elucidated the information exchange paradox in syndicate investments and provided strategies for CVC managers. However, the strategic determinants of partner selection and coordination in CVC-led syndicates have not yet been fully explored. To address this gap in the literature, the present study investigates CVC's syndicate partner selection criteria.

Since CVCs participating in syndicate could get both gains and pains from their syndicate investment (Wright and Lockett, 2003), selecting appropriate partners is crucial for the performance of the syndicate. By forming a syndicate, partners can combine and share their accumulated resources and knowledge to obtain advantages (Brander et al., 2002; Lockett and Wright, 2001; Manigart et al., 2006). Meanwhile, syndicate investments incur costs due to the uncertainty about partners' expertise and principal-principal conflicts from misaligned goals (Cassamatta and Haritchabalet, 2007; Hopp 2008; Meuleman et al., 2010). Thus, I expect that CVC lead investors are more likely to form syndicates with investors who can provide complementary resources and capabilities, while exerting less control over the management of the investee. Specifically, I suggest that CVC lead investors are likely to invite partner investors who is specialized in the investees' industry, because these partner investors can provide complementary value-added to the investee and knowledge related to the industry to the CVC lead investor. I also propose that CVC lead investors, On the other hand, are less likely to form a syndicate with influential investors, i.e., investors with a good reputation or status, to

secure the control over the management of the investee.

I believe that this study would contribute to the literature by extending perspective on partner selection further by identifying the importance of conflicts and power dynamics among partners. Further, this study would suggest managerial implications for CVCs that help to define and clarify partner selection criteria as pursuing both financial and strategic objectives.

3.2 Research hypotheses

3.2.1 Profiting from specialized partners

Through CVC investments, parent corporates can gain insight into new technologies and market opportunities. Moreover, as the investees grow up, CVC parent firms have the opportunity to develop strategic relations, such as R&D alliances and customer-supplier relationships, with their investees. Hence, CVC lead investors would be willing to invite syndicate partners who can contribute to achieving these strategic objectives. In this respect, partners' experiences and expertise in the investee's industry contribute not only to the success of the investee and strategic benefits from the investee, but also to the CVC and parent's organizational learning from their partners in the syndicate.

Accumulating knowledge over time and from several deals through subsequent investments in a specific industry enables the investors to profit from a learning curve

effect (Gupta and Sapienza, 1992; Norton and Tenebaum, 1993). Repeated investments allow the investors to have a better understanding of technology, markets, and industry, and to develop a network with suppliers, customers, and the recruiting pool of the industry. Hence, investors whose previous investment experience is in the industry of the investee can improve the quality of the investment by, e.g., providing an improved screening of investments, appropriate advising on the investee, and an effective monitoring and control over the management of the investee (De Clercq and Dimov, 2008). Prior studies have shown that VCs who follow the portfolio specialization strategy achieve better performance than those who follow the diversification strategy (Bygrave, 1987; Norton and Tenebaum, 1993).

Inviting a VC which possesses relevant experience to become a syndicate partner will complement the resources and capabilities of the CVC lead investor and have a positive influence on the performance of the investment. Since the success of the investee entails a positive externality (Arping and Falconieri, 2010), CVC lead investors could gain a strategic benefit from the influence of the specialized syndicate partners on the success of the investee. Further, as the investees grow up with the additional and complementary support of the specialized syndicate partners, the CVC lead investors and their parent corporate can benefit from indirect strategic returns, such as the opportunity to create demand for corporate products or services and further develop strategic relationships with the investee (Chesbrough, 2002; Dushnitsky, 2006).

Meanwhile, the organizational learning perspective explains another strategic return to

the CVC lead investors when they bring specialized VCs into the syndicate (Dyer and Singh, 1998; Levitt and March, 1988). Inter-organizational collaborations provide opportunities to rapidly learn and acquire the accumulated knowledge and skills from the collaboration partners (Mowery et al., 1996). Similar to strategic alliances, VC syndications also facilitate the transfer and acquisition of the partners' knowledge and experiences (Casamatta and Harichbalet, 2007; De Clercq and Dimov, 2008). Through this process, CVC lead investors can acquire accumulated knowledge, experiences, and social capital from their syndicate partners, and in turn improve their understanding of markets, industry trends, and novel technologies. Even though the CVC parent corporates and their CVC investees belong to the same industry, through the syndicate partner investors, CVC lead investors get a new perspective on the changes in the industry and can better exploit their resources and capabilities. Theses learning aspects coincide with the primary strategic objective of the CVC investments: creating new windows on technologies and markets (Chesbrough, 2002; Ernst & Young, 2009; Dushnitsky, 2006). Accordingly, CVC lead investors can enhance their strategic returns through syndication with specialized investors in the investee's industry. Consequently, CVC lead investors would exhibit a preference towards inviting such specialized investors into the syndicate. This leads to the following hypothesis:

Hypothesis 3-1*: CVC lead investors are more likely to syndicate with VCs specialized in the investees' industry.*

3.2.2 Securing control over the management of the investee

"Joint ventures have been characterized as mixed motive games between their sponsors who simultaneously cooperate and compete" (Yan and Gray, 2001, p.395). Collaborating partners have different mix of common and private benefits within relationships (Khanna et al., 1998; Lavie, 2007). Similarly, CVC lead investors also need to consider possible conflicts between their strategic objectives and those of their syndicate partners. Through principal-principal conflicts, such as heterogeneous interests and time horizon on the investment (Filatotchev et al., 2006; Young et al., 2008), CVC lead investors can be constrained in appropriating the value and strategic returns from the investments (Hallen et al., 2014; Katila et al., 2008; Khanna et al., 1998). To mitigate such conflicts, CVC lead investors may seek to secure dominant ownership and control rights in the syndication and exercise higher decision-making power over the management of the investee (Dalziel et al., 2010; Wright and Lockett, 2003; Yan and Gray, 2001). However, prior studies on syndicate partner selection only considered the partner uncertainty problems in the pre-investment stage (Hopp, 2008; Meuleman et al., 2010). Moreover, prior research dealing with the value appropriation problems and principal-principal conflicts in VC investments much focused at the time of exit (Bruton et al., 2010; Dalziel et al., 2010; Filatotchev et al., 2005), but less focused on partner selection issue.

In the post-investment stage, depending on the contract and equity ownerships, investors are allocated control rights over the management of the investee and VCs usually take board positions and become involved in the management of the investee. Typically, lead investors take a larger equity stake than non-lead investors for seeking control over the investee and in return for their greater effort in coordinating the syndicate (Wright and Lockett, 2003). However, overall control and decision-making power over the investee are not solely achieved through equity ownership and formal contracts but also through the perceived influence of the investor (Drover et al., 2014). The investee's perception of control is affected by the relative resource input from the investors, the relatedness of strategic resources (Mjoen and Tallman, 1997; Yan and Gray, 2001), and non-legal rather than legal sanctions (Wright and Lockett, 2003). In this respect, influential investors who have good reputation or status in the industry can achieve control over the management of the investee even though they hold lower equity ownership than the lead investor. This can result in conflicts between influential non-lead investors and the lead investor over the control of the investee, decreasing the strategic benefits derived from the investment (Geringer and Hebert, 1989; Yan and Gray, 2001). Prior research on VCs, which only considered financial returns, has acknowledged that influential partners who have good reputation and status have a positive impact on the investment performance (Dimov et al., 2007; Hochberg et al., 2007; Lerner, 1994), but showed little consideration for conflicts between the lead investor and influential non-

lead investors. More recent research proposed that partner uncertainty related to value appropriation is shaped by power dynamics inside a syndicate, thus influences the chance to bring in an additional partner to syndicate (Zhang and Guler, 2015).

While VCs who are aiming for purely financial returns are willing to invite influential VCs as syndicate partners (Dimov and Milanov, 2010; Meulemen et al., 2010; Verwaal et al., 2010), influential investors may not be welcomed by CVC lead investors. An influential syndicate partner could arouse concerns about increased principal costs of the syndication for the CVC lead investor (Dalziel et al., 2011), resulting in increased coordination costs and a weakened control over the investee. When the CVC lead investor is able to exert a sufficient and effective control over the investee, it can coordinate its activities to efficiently utilize its resources and effectively implement its strategy (Geringer and Hebert, 1989). Moreover, concentrated ownership and control lead to a reduction of coordination cost (Bruton et al., 2010). Hence, considering their strategic objectives, CVC lead investors may try to retain overall control, including the equity ownership and perceived control, over the investee. Therefore, I can draw the following hypothesis:

Hypothesis 3-2*: CVC lead investors are less likely to syndicate with influential VCs, i.e., investors which have a good reputation or status.*

3.2.3 Type of partner venture capital

VCs are classified into IVCs and CVCs, who each have different characteristics and objectives in their investments (Chesbrough, 2002; McNally, 1997). Hence, from the lead investor's perspective, depending on their type, potential partner investors provide different resource complementarities and incur different levels of principal-principal agency costs. The different cost-benefit expectations on syndication with IVCs and CVCs affect the CVC lead investors' willingness to syndicate with each type of potential partner.

IVCs and CVCs possess different resources and capabilities, social capital, and experiences, which results in differences in pre-investment screening and post-investment value-adding activities (Alvarez-Garrido and Dushnitsky, 2016; Ivanov and Xie, 2010; Maula et al., 2005). Specifically, relating to the value-added provided to the entrepreneurial firms, IVCs have an advantage in providing 'enterprise nurturing' support such as helping raise additional finance, recruiting key employees, and professionalizing the organization, while CVCs have an advantage in providing 'commerce building' support like building commercial credibility and capacity, and providing technological support. IVCs and CVCs provide 'different but complementary' resources and capabilities (Maula et al., 2005). Hence, from the perspective of the CVC lead investors, IVCs can be suitable syndicate partners providing complementary resources and capabilities (Brander et al., 2002; Teece, 1986). Although syndicate partners bring about uncertainty in post-investment value-adding activities (Casamatta and Hartchabalet, 2007; Meuleman et al., 2010), benefits outweigh costs for inviting IVCs as syndicate partners.

Meanwhile, as potential partners, CVC investors can complement the value-adding activity of the CVC lead investor with their industry-specific knowledge and expertise. Especially when the parent corporate of the CVC partner investor and the investee are involved in the same industry, CVC partner investors can effectively provide industry-specific and accumulated knowledge, experts, and social capital with suppliers and customers to the investee (Maula et al., 2005). However, hidden intent of the CVC partner investors can lead to increased principal-principal conflicts with the CVC lead investor (Hopp, 2008; Meuleman et al., 2010). Due to similar strategic objectives, the CVC lead investor and the CVC partner investors have a higher chance for conflicts of interests, such as in the control over the management of the investee and competition in appropriating the investee's technology. Further, in a broader perspective, corporates competing in the product market could be more competitive than collaborative in their syndicate investments (Kim et al., 2016). Although the level of conflict depends on the level of industrial overlap between the parent corporates of the CVC lead investor and CVC partner investor, the conflicts and coordination cost in the syndication can be high enough to diminish the value of the investment. If the parent corporate of the CVC lead investor and the parent corporate of the CVC partner investor are operating in the same industry, one can expect a severe competition in appropriating the value from technologies and markets of the investee. If the investee and the parent corporate of the CVC partner investor are involved in the same industry, different from the parent corporate of the CVC lead investor, the CVC partner investor can appropriate value from the syndicate investment through their higher absorptive capacity (Gompers and Lerner,

2000; Lane and Lubatkin, 1998). Conflicts would be reduced in case the investee, as well as the parent corporates of the CVC lead investor and the parent corporate of the CVC partner investor are all operating in different industries. However, in this case, the lack of expertise in the industry of the investee would make it more difficult for the CVC lead investor to profit from synergy effects from the syndicate investment. Thus, in the case of inviting CVCs to become partners in the syndicate investment, costs outweigh the benefits for the CVC lead investor. This leads to the following hypothesis:

Hypothesis 3-3: *CVC lead investors are more likely to syndicate with IVCs rather than CVCs.*

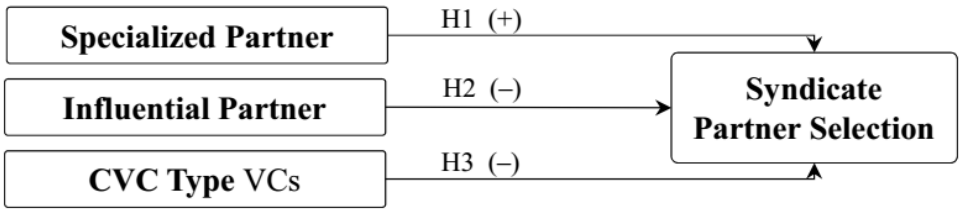


Figure 3-1 Conceptual model for Chapter 3

3.3 Methods

3.3.1 Data sample and analysis

The data on investors, deals and investees used in this study was collected from the PE/VC module of the Thomson Reuters Thomson One database. The database provides investment-level data including information on investment size, investment round,

investment stage, syndicate partners, and other details of the investment. Investor-level data collected from the database includes details of the investors, such as their investment history, type, and the industrial classifications of the CVC parent corporates. Using this data, I constructed a sample of CVC-led syndicate investments from 2001 to 2009 in the U.S. market. This sample period starts with the end of the dot-com bubble, when the VC industry shrunk back to about half of its peak. This was done as investments made during the late-1990s have raised questions about the rationality of the participating investors (Valliere and Peterson, 2004).

To arrive at the final dataset of CVC-led syndicate investments, I performed the following steps: First, I excluded transactions in which at least one investor is labeled as an "undisclosed firm" for lack of investor-level information. As the focus of this study is placed on CVC-led syndicates, investor types such as University Program, Government Affiliated Program, Angel, SBIC, Endowment Foundation or Pension Fund, Incubator/Development Program, Service Provider, and Others were not considered in the analysis for their different nature and structure of investments (Sorenson and Stuart, 2008). Due to the focus on syndicates and investees, only transactions belonging to the Startup/Seed and Early stages with two or more investors in a round were considered.

Although in practice, every round has a lead investors, it is difficult to identify the lead investors from the available investment data. Hence, following prior literature, I used a quantitative approach in identifying the lead investors. While Hochberg et al. (2007) and Megginson and Weiss (1991) define the lead investor as the investor who invested the

largest amount in the investee, Hopp and Lukas (2014) define the lead investor as the investor who fulfils two criteria: 'the maximum number of rounds and the involvement in the initial financing round'. Masulis and Nahata (2009) suggest a definition of the lead investor based on 'the involvement in the initial financing round and the maximum amount of investment'. This study follows the definition of Masulis and Nahata (2009): the involvement in the initial financing round and the overall maximum amount of investment. The underlying assumption is that the lead investor usually initiates the deal and has the largest amount of investment. Using this method I identified the lead investors in the sample and excluded non-CVC lead investors. Finally, I identified 48 CVC-led syndicate investments and 86 realized syndicate ties, i.e., ties between a lead investor and its co-investors.

This study modeled the probability that two organizations would meet in a triad in which two nodes represent two VCs participating in a syndicate and the third node represents the investee (Sorenson and Stuart, 2008). Thus, the investee-CVC lead investor-potential syndicate partner triads are used as the unit of analysis and I analyzed the probability that the CVC lead investor invites a specific investor to the syndicate investment on a given investee. Since this approach requires both realized syndicate ties and unrealized syndicate ties together, I constructed the unrealized syndicate ties sample from the set of all VC investors that invested in the first round and in a syndicate with CVCs to finance a different target investee in the same year (Meuleman et al., 2010; Sorenson and Stuart, 2008). These VCs exhibit a propensity to invest at a particular time,

particular round, and in a syndicate, thus they have a similar risk set for syndicate formation. CVCs type account for 14% of the total VCs, which is similar to reported levels (NVCA Yearbook, 2015) and supports the representativeness of the sample. In total, the sample includes 26,533 observations, of which 86 are actual cases and 26,447 are controls. I estimated the logistic regression with residuals clustered by investees. For each matched group, the investee-CVC lead investor side of the triad is fixed and the third node, i.e., the syndicate partner investor, includes all realized ties sample and unrealized ties sample.

The lead investor may first choose whether to invest in a syndicate or not before selecting syndicate partners. Hence, concerns about selection bias can be raised when analyzing only investors who have already decided to invest in a syndicate. However, since 88% to 98% of all CVC funds syndicate their investments (Basu et al., 2011; MacMillan et al., 2008), the selection bias for syndicated investments can be considered to be adequately controlled.

3.3.2 Dependent variable

The dependent variable used in this study is the dummy variable of forming a syndicate between the CVC lead investor and a potential partner. This variable indicates whether the CVC lead investor and a potential partner form a syndicate for a given investee. The variables take the value of 1 if a potential partner is invited to the CVC-led syndicate, and 0 otherwise.

3.3.3 Independent variables

This study investigates how the characteristics of the potential partners affect the formation of the syndicate with the CVC lead investors. These characteristics include the extent of specialization in the investees' industry, the degree of investors' influence, and the VC types.

The extent of specialization in the investees' industry was operationalized as the number of investments in the investees' industry divided by number of overall investments, a potential partner engaged in (*PP specialized*). The investee companies rather than the round as the unit of analysis, I computed the investment experiences in the focal investees' industry at the same 3-digit SIC level during the last five years.[1] A higher value indicates a higher possibility of expertise and learning opportunity from the potential partner investor to the CVC lead investor (Hopp, 2010; Sorenson and Stuart, 2001).

I captured the investors' influence using two different approaches, the reputation and the status of the potential partners (Jensen and Roy, 2008). The two terms, reputation and status, have been often used interchangeably to proxy the perceived quality of the firm, but developed in different fields and connote different aspects. Dimov and Milanov

[1] Although the choice of any window length would be arbitrary, the use of a five-year window is common in the inter-organizational network and venture capital literature (Gulati, 1995; Hochberg et al., 2007; Sorenson and Stuart, 2008). Moreover, a Venture Economics study (1988) find that the average holding period of a portfolio company was 4.2 years in VC investments. Thus, a five-year window prior the investment was considered appropriate to capture potential partners' experience and expertise.

(2010) distinguished the two concepts as follow: "While reputation is an economic concept that is closely coupled with the firm's past actions and track record, status is a sociological concept that captures a firm's social rank based on its external affiliations". Following and modifying the method used in Dimov and Milanov (2010), I measured the syndicate partners' reputation and status. I measured the *PP reputation* relevant for its activity in year (t) as a composite of the syndicate partner's age in year (t), the total number of investments involved in during the last five years (t-5 to t-1), and the total number of companies exit through IPO which were backed by the syndicate partner during the last five years (t-5 to t-1). The composite reputation scores were based on the standardized values for each components for each year, and I normalized the scores for each year across VC firms so that the lowest value in each year has the normalized value of zero and the highest one has the normalized value of one. To measure *PP status*, I constructed a matrix of relationships between all VC firms in the Thomson One database for each year. For a matrix constructed for year (t), each element (Rij) represented the number of times firms (i) and (j) had co-invested in the same company over the last five years (t-5 to t-1). Using Bonacich's (1987) centrality measure, I measured a VC firm's network status in year (t), and calculated a centrality score for each VC firm and each year and normalized the score (Dimov and Milanov, 2010; Podolny, 2001; Sorenson and Stuart, 2001).

The third independent variable, *PP firm type*, is a dummy variable that categorizes investors into CVCs and IVCs. The variable takes the value of 1 if a potential partner is a

strategic investor, i.e., CVC, and 0 otherwise. The data used in this study provides information on each investors' type. Among Bank Affiliated, Private Equity Firm, Corporate PE/Venture, Investment Management Firm, and Insurance Firm Affiliated investor types, I classified only the Corporate PE/Venture type as CVCs and the remaining types as IVCs (Arping and Falconieri, 2010; Hellmann, 2002). Depending on the literature, the Bank Affiliated type also has been classified as CVCs or Captive VCs together with the Corporate PE/Venture type. However, considering CVCs' strategic objectives, I classified the Bank Affiliated type as IVCs (Andrieu and Groh, 2012).

3.3.4 Control variables

I included several control variables to account for potential partner's characteristics, CVC lead investor's characteristics, and dyadic level characteristics previously shown to affect syndicate formation. The variable *PP investment size* measures the logarithm of the total amount of investments by a potential partner during the last five years. Since financial considerations are important drivers of syndication, I expect that potential partners with large investment size, which can be used as a proxy for the fund size, will more likely invest (Bygrave and Timmons, 1992; Humphery-Jenner, 2011). Since more active investors are more likely to be invited to join a syndicate, I included a measure of the activity level of a potential partner (*PP activity level*) by counting the number of investee companies in which a potential partner invested in the year in which the deal

takes place (Meuleman et al., 2010). I also controlled for potential partner's preference for investment stage (*PP stage preference*) by dichotomizing each VC firm's preferred investment stages into a relatively more risky stage (seed and early stages) and a relatively less risky stage (extension, later, and balanced stages) (Anokhin et al., 2011). Further, I included a measure of geographic distance between an investee company and a potential partner (*Distance company-PP*). Since geographic proximity enables a rich exchange of information and reduces the time costs in transit, organizations are more likely to collaborate with partners in proximate (Sorenson and Stuart, 2001, 2008). I used the logged distance in kilometers to measure the geographic distance between an investee company and a potential partner. After assigning latitudes and longitudes for each firms, I calculated the distance in kilometers using spherical geometry.

To partial out the effects of CVC lead investor's characteristics on partner selection, I controlled for the CVC lead investor's reputation (*LC reputation*). Dimov and Milanov (2010) proposed that syndicate formation is a function of need and opportunity of the lead investor, thus the lead investor's ability to signal its quality to potential partners influences the likelihood of syndication. The CVC lead investor's status variable could not be included in this study because of its high correlation with the CVC lead investor's reputation variable.

For dyadic level controls, I included measures of each CVC lead investor-potential partner dyad's characteristics, such as prior co-investment experience, status similarity, and geographic distance. To investigate the relational characteristics among syndicate

partners, I controlled for prior co-investment experience between a CVC lead investor and a potential partner (Gulati, 1995; Meuleman et al., 2010). I defined the *co-investment experience* variable of each dyad as the total number of deals the two VC firms co-invested in the same company in the same year during the last five years. Further, organizations with similar status are more likely to engage in transactions with each other (Chung et al., 2000; Podolny, 1994). Thus, I included the *status similarity* as control variable. I compute the similarity by dividing the status of the lower status venture capital firm by that of the higher status venture capital firm (Chung et al., 2000; Mueleman et al., 2010). I also controlled for the geographical distance between a CVC lead investor and a potential partner (*Distance LC-PP*), using the same methodology used to calculate the geographic distance between an investee and a potential partner (Sorenson and Stuart, 2008). Finally, I include year dummy variables in each regression.

3.4 Results

Table 3-2 shows the descriptive statistics and correlation matrix of the variables analyzed in this study. The correlation table shows that the independent variables relevant to reputation and status are highly correlated. To check for the presence of any multicollinearity problem, I carried out a Variance Inflation Factor (VIF) test. The results of this VIF test are shown in Table 3-3. The results confirmed that multicollinearity does not pose a problem for the analysis.

Table 3-1 Variables description

Variables	Definition
Syndicate formation	1, if a potential partner was selected as one of the partners in the CVC-led syndicate; 0, otherwise.
PP specialized	Number of investments in the investees' industry divided by the number of overall investments, the potential partner was involved in during the last five years
PP reputation	Composite measure of (1) the potential partner's age, (2) the number of overall investments a potential partner was involved in during the last five years, and (3) the number of companies exit through IPO which were backed by the potential partner during the last five years
PP status	A potential partner's network status using Bonacich's (1987) centrality measure
PP firm type	1, if a potential partner is a strategic investor, i.e., corporate venture capital; 0, if otherwise.
PP last 5Y investment size	Total amount of investments conducted by the potential partner in the last five years, log transformed, thousands USD
PP focal year activity level	Number of investee companies the potential partner invested in during the year in which the deal takes place
PP stage preference dummy	1, if the potential partner prefers to invest in seed and early stages; 0, if otherwise.
LC reputation	Similar to PP Reputation
Last 5Y co-investment experience	Number of co-investments of the lead CVC investor and the potential partner in the same company in the same year during the last five years
Status similarity	Status of the lower status venture capital firm divided by that of the higher status venture capital firm
Distance company-PP	Geographic distance between the investee company and the potential partner, log transformed
Distance LC-PP	Geographic distance between the lead CVC investor and the potential partner, log transformed
Year dummies	Year dummies from 2001 to 2010

Table 3-2 Descriptive statistics and correlation table

#	Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1	PP specialized	.181	.250											
2	PP reputation	.117	.128	.037										
3	PP status	.131	.147	.068	.860									
4	PP firm type	.141	.348	.001	-.034	-.106								
5	PP last 5Y investment size	10.766	2.771	.144	.505	.598	-.150							
6	PP focal year activity level	8.290	9.646	.059	.695	.771	-.156	.494						
7	PP stage preference dummy	.478	.500	.037	-.074	.003	-.113	.079	.055					
8	LC reputation	.254	.271	.240	.001	.013	-.001	.000	.024	.007				
9	Last 5Y co-investment experience	.471	1.537	.165	.329	.383	-.014	.219	.293	.033	.363			
10	Status similarity	.255	.266	.026	.080	.112	-.039	.189	.082	.040	-.223	.124		
11	Distance company-PP	6.829	1.914	-.057	-.054	-.102	.001	-.054	-.094	-.057	-.041	-.060	-.007	
12	Distance LC-PP	6.896	1.817	-.100	-.063	-.114	.001	-.057	-.104	-.092	-.068	-.146	-.004	.394

N=26,533 potential CVC investment transactions

Table 3-3 VIF of variables

Variables	VIF	1/VIF
PP Status	5.72	.175
PP Reputation	4.07	.246
PP Focal Year Activity Level	2.56	.391
PP Last 5Y Investment Size	1.66	.603
Last 5Y Co-investment Experience	1.46	.686
LC Reputation	1.34	.746
Distance LC-PP	1.22	.819
Distance Company-PP	1.19	.838
Status Similarity	1.14	.875
PP specialized	1.10	.908
PP Firm Type	1.06	.942
PP Stage Preference Dummy	1.06	.946
Mean VIF	1.96	

Table 3-4 shows the results from the logistic regression. I estimated robust standard errors with residuals clustered by investees. Model 1 is the baseline model which only includes the control variables of this study. Among these control variables, potential partners' focal year activity level has a significant and positive effect on the probability of being invited into the syndicate. This result is consistent with prior research which demonstrated that more active investors are more likely to be invited to the syndicate (Hochberg et al., 2007; Meuleman et al., 2010). The coefficient for *PP last 5Y investment size* variable is significant and negative. This shows that investors have larger fund or investment size are less likely to be selected as members of a CVC-led syndicate. The coefficient for *Distance company-pp* variable is significant and negative, which is consistent with prior literature (Sorenson and Stuart, 2008).

Table 3-4 Logistic regression results

Variables	Model 1	Model 2	Model 3	Model 4
PP specialized		1.235***	1.105***	1.010***
		(.337)	(.345)	(.323)
PP reputation			-5.004**	
			(2.532)	
PP status				-6.741***
				(2.097)
PP firm type				
PP last 5Y investment size	-.156***	-.179***	-.144***	-.111***
	(.029)	(.030)	(.035)	(.039)
PP focal year activity level	.030***	.033***	.063***	.082***
	(.009)	(.009)	(.015)	(.014)
PP stage preference dummy	.610**	.610**	.470*	.509**
	(.258)	(.256)	(.252)	(.255)
LC reputation	.183	-.058	-.247	-.350
	(.400)	(.440)	(.447)	(.440)
Last 5Y co-investment experience	-.018	-.027	.029	.077
	(.068)	(.068)	(.080)	(.077)
Status similarity	-.602	-.600	-.744	-.774
	(.542)	(.541)	(.543)	(.549)
Distance company-PP	-.388***	-.386***	-.386***	-.395***
	(.075)	(.073)	(.073)	(.074)
Distance LC-PP	-.070	-.059	-.061	-.070
	(.075)	(.075)	(.075)	(.074)
Constant	-2.291***	-2.330***	-2.321***	-2.508***
	(.541)	(.577)	(.575)	(.588)
Year dummies	Included	Included	Included	Included
Log likelihood	-515.673	-511.136	-506.254	-501.521
Pseudo-R^2	.109	.117	.125	.134

N=26,533 potential CVC investment transactions

*, **, *** denotes significance at the 10 percent, 5 percent or 1 percent level, respectively.

Table 3-4 (continued)

Variables	Model 5	Model 6	Model 7
PP specialized	1.103***	1.011***	1.011***
	(.341)	(.320)	(.321)
PP reputation	-5.020**		.140
	(2.501)		(2.678)
PP status		-6.738***	-6.836**
		(2.090)	(2.713)
PP firm type	.038	-.018	-.020
	(.325)	(.332)	(.324)
PP last 5Y investment size	-.143***	-.112***	-.112***
	(.035)	(.038)	(.038)
PP focal year activity level	.064***	.082***	.082***
	(.015)	(.014)	(.014)
PP stage preference dummy	.472*	.507**	.510**
	(.249)	(.250)	(.255)
LC reputation	-.248	-.350	-.349
	(.446)	(.439)	(.441)
Last 5Y co-investment experience	.028	.077	.077
	(.081)	(.077)	(.077)
Status similarity	-.744	-.773	-.772
	(.543)	(.550)	(.545)
Distance company-PP	-.386***	-.395***	-.395***
	(.074)	(.075)	(.075)
Distance LC-PP	-.061	-.070	-.070
	(.075)	(.074)	(.075)
Constant	-2.334***	-2.501***	-2.503***
	(.612)	(.625)	(.624)
Year dummies	Included	Included	Included
Log likelihood	-506.247	-501.520	-501.518
Pseudo-R^2	.125	.134	.134

Model 2 examines Hypothesis 3-1. As seen in the results, the specialized experience in the investee's industry has a significant and positive relationship with the probability of becoming a partner in the syndicate (β=1.235, p-value<0.01). That is, the more the potential partners specialized in the investee's industry, the more likely is the CVC lead investor to select them as partners for the syndicate. The estimate implies that a one percent increase in the potential partner's industrial specialization increases the odds that a potential partner will be selected by a factor of 3.4. Hence, the result supports Hypothesis 3-1.

Models 3 and 4 test Hypothesis 3-2, which predicted that a potential partners' influence will decrease the probability of the syndicate formation between the CVC lead investor and the potential partner. As seen in Model 3, the coefficient of the *PP reputation* variable is significant and negative (β=-5.004, p-value<0.05). This result shows that potential partners who have good reputation are less likely to be invited to the CVC-led syndicate. In economic terms, a one percent increase in the potential partner's reputation increases the odds that a potential partner will be selected by a factor of 0.007. Although the coefficient is insignificant in the full model, the result partially supports Hypothesis 3-2. Similarly, in Model 4, potential partner's status has a significant and negative relationship with the probability that the CVC lead investor will syndicate with the potential partner (β=-6.741, p-value<0.01). That is, the higher status a potential partner have, the less likely it is that the CVC lead investor selects the potential partner as a member of the syndicate. The result is also economically significant. The potential

partner's status decreases the odds that a potential partner will be selected by a factor of 0.001. Overall, the results support Hypothesis 3-2.

Models 5 and 6 verify Hypothesis 3-3, which stated that the CVC lead investors will prefer IVCs to CVCs. In Models 5 and 6, potential partner type shows a positive but insignificant relationship with the probability that the CVC lead investor will syndicate with the potential partner. This results show that, contrary to the expectations, CVC lead investors are insensitive to their potential partners' type. Thus Hypothesis 3-3 is not supported. Finally, the full model provides consistent results in which Hypotheses 3-1 and 3-2 are supported but Hypothesis 3-3 is not.

For robustness check, I performed various additional analyses including the rare-events logistic regression and the conditional logistic regression. First, I estimated the rare-events logistic regression to reduce the bias seen in rare events (King and Zeng, 2001). Table 3-5 shows the results from the rare-events logistic regression, and the results are sufficiently consistent to those in Table 3-4. In addition, I also estimated the conditional logistic regression grouped on the investee-CVC lead investor side of the triad. Grouping cases and controls effectively reduces the likelihood that the data violates the independence assumption of the logistic regression models. I matched the realized syndicated ties of the sample with the unrealized potential ties sample using a 1:10 ratio.[2] In the conditional logit regression models, I tested the hypotheses by adding interaction terms that are created by multiplying *LC reputation* variable with each of the independent

[2] No hard rule governs the optimal ratio of cases to controls. As in Sorenson and Stuart (2008) and Meuleman et al. (2010), I tested ratios of 1:5, 1:7, and 1:10 and found that all produced fairly consistent results.

variables. The models exclude the main effects of the variable that I used to assess the quality of CVC lead investors; because this term does not vary within matched groups of cases and controls, the main effect automatically drops out of the estimation. The results in Table 3-6 are also coherent with those from the logistic regression presented in Table 3-4.

3.5 Discussion

This paper identifies strategic factors affecting partner selection in CVC-led syndicate investments and investigates their impact on syndicate formation. While CVCs are adopting VC practices and structures (Hill et al., 2009), the distinct strategic objectives of their investments need to be considered when they lead syndicate investments with other VC investors. This empirical study identified the following characteristics of CVC lead investors' syndicate partner selection:

First, CVC lead investors are more likely to invite investors specialized in the industry of the investee to their syndicate. Potential investors who are experienced and specialized in the investee's industry can support the investee with their accumulated knowledge, information, and related networks. This complements the support given by the CVC lead investor and increases the quality of the investment. Moreover, through experienced partner investors, CVC lead investors can shorten the learning curve in acquiring knowledge on new technologies and markets of the investee. Thus, by forming a syndicate with more experienced VCs, a CVC lead investor can improve both its financial and strategic returns. The results are consistent with prior literature on syndicate partner selection (De Clercq and Dimov, 2008; Hopp, 2010).

Table 3-5 Rare-event logistic regression results

Variables	Model 1	Model 2	Model 3	Model 4
PP specialized		1.247***	1.119***	1.021***
		(.337)	(.344)	(.323)
PP reputation			-4.776*	
			(2.531)	
PP status				-6.575***
				(2.095)
PP firm type				
PP last 5Y investment size	-.159***	-.183***	-.149***	-.116***
	(.029)	(.030)	(.035)	(.038)
PP focal year activity level	.031***	.034***	.064***	.082***
	(.009)	(.009)	(.015)	(.014)
PP stage preference dummy	.599**	.600**	.461*	.496*
	(.258)	(.256)	(.252)	(.255)
LC reputation	.166	-.0733	-.258	-.363
	(.400)	(.439)	(.447)	(.440)
Last 5Y co-investment experience	-.003	-.011	.041	.090
	(.068)	(.068)	(.080)	(.077)
Status similarity	-.562	-.558	-.702	-.734
	(.541)	(.540)	(.543)	(.549)
Distance company-PP	-.386***	-.385***	-.385***	-.393***
	(.075)	(.073)	(.073)	(.074)
Distance LC-PP	-.071	-.059	-.061	-.070
	(.075)	(.075)	(.075)	(.074)
Constant	-2.182***	-2.217***	-2.205***	-2.386***
	(.540)	(.576)	(.575)	(.588)
Year dummies	Included	Included	Included	Included

N=26,533 potential CVC investment transactions

*, **, *** denotes significance at the 10 percent, 5 percent or 1 percent level, respectively.

Table 3-5 (continued)

Variables	Model 5	Model 6	Model 7
PP specialized	1.116***	1.021***	1.024***
	(.340)	(.320)	(.320)
PP reputation	-4.794*		.482
	(2.499)		(2.676)
PP status		-6.572***	-6.860**
		(2.088)	(2.710)
PP firm type	.072	.018	.015
	(.325)	(.332)	(.324)
PP last 5Y investment size	-.148***	-.116***	-.116***
	(.035)	(.038)	(.038)
PP focal year activity level	.064***	.082***	.082***
	(.015)	(.014)	(.014)
PP stage preference dummy	.464*	.495**	.499**
	(.249)	(.250)	(.255)
LC reputation	-.259	-.362	-.360
	(.446)	(.439)	(.440)
Last 5Y co-investment experience	.041	.090	.089
	(.081)	(.077)	(.077)
Status similarity	-.702	-.734	-.730
	(.543)	(.549)	(.544)
Distance company-PP	-.385***	-.393***	-.393***
	(.074)	(.075)	(.075)
Distance LC-PP	-.061	-.070	-.070
	(.075)	(.074)	(.075)
Constant	-2.219***	-2.379***	-2.384***
	(.612)	(.625)	(.623)
Year dummies	Included	Included	Included

Table 3-6 Conditional logistic regression results

Variables	Model 1	Model 2	Model 3	Model 4
PP specialized		1.573***	1.418*	1.308*
		(.741)	(.733)	(.728)
PP reputation			-4.577**	
			(1.866)	
PP status				-5.496***
				(1.727)
PP firm type				
PP last 5Y investment size	-.151***	-.187***	-.153***	-.128***
	(.031)	(.033)	(.036)	(.038)
PP focal year activity level	.031***	.036***	.063***	.081***
	(.010)	(.010)	(.013)	(.014)
PP stage preference dummy	.604***	.605***	.470**	.511**
	(.231)	(.231)	(.234)	(.232)
Last 5Y co-investment experience	-.025	-.044	.001	.102
	(.082)	(.084)	(.103)	(.102)
Status similarity	-.858	-.772	-.902	-.702
	(.557)	(.543)	(.576)	(.566)
Distance company-PP	-.449***	-.444***	-.443***	-.444***
	(.055)	(.055)	(.055)	(.054)
Distance LC-PP	-.141**	-.132*	-.129*	-.132*
	(.070)	(.070)	(.070)	(.070)
(PP specialized) X (LC reputation)		1.475	1.552	1.395
		(1.648)	(1.664)	(1.623)
(PP reputation) X (LC reputation)			.423	
			(4.465)	
(PP status) X (LC reputation)				-3.583
				(3.887)
(PP firm type) X (LC reputation)				
Log likelihood	-444.961	-435.835	-431.718	-427.623
Pseudo-R^2	.127	.145	.153	.161

N=26,533 potential CVC investment transactions

*, **, *** denotes significance at the 10 percent, 5 percent or 1 percent level, respectively.

Table 3-6 (continued)

Variables	Model 5	Model 6	Model 7
PP specialized	1.456**	1.346*	1.350*
	(.743)	(.738)	(.739)
PP reputation	-4.622**		-3.004
	(1.887)		(3.241)
PP status		-5.514***	-3.192
		(1.737)	(2.940)
PP firm type	-.298	-.301	-.237
	(.491)	(.491)	(.492)
PP last 5Y investment size	-.154***	-.129***	-.130***
	(.037)	(.039)	(.039)
PP focal year activity level	.063***	.080***	.081***
	(.013)	(.014)	(.014)
PP stage preference dummy	.462**	.497**	.494**
	(.235)	(.234)	(.238)
Last 5Y co-investment experience	.001	.101	.093
	(.102)	(.102)	(.102)
Status similarity	-.899	-.705	-.717
	(.576)	(.567)	(.568)
Distance company-PP	-443***	-.444***	-.445***
	(.055)	(.054)	(.054)
Distance LC-PP	-.149*	-.132*	-.137**
	(.070)	(.070)	(.070)
(PP specialized) X (LC reputation)	1.418	1.314	1.301
	(1.677)	(1.645)	(1.645)
(PP reputation) X (LC reputation)	.710		10.258
	(4.479)		(7.526)
(PP status) X (LC reputation)		-3.355	-11.027
		(3.950)	(6.943)
(PP firm type) X (LC reputation)	.790	.563	.304
	(1.159)	(1.165)	(1.186)
Log likelihood	-431.466	-427.422	-426.542
Pseudo-R^2	.154	.162	.163

Second, CVC lead investors are less likely to syndicate with influential investors who have good reputation and status. These results are inconsistent with prior research that acknowledged the preference for influential syndicate partners (Dimov and Milanov, 2010; Meuleman et al., 2010; Verwaal et al., 2010). While prior literature focused on the general VC context, this research focuses on CVC lead investors, who differ from other investors due to their strategic objectives (Chesbrough, 2002). CVCs' equity investment in emerging entrepreneurial firms is a result of both financial and strategic objectives. Unless constrained by co-investing VCs, CVC lead investors will avoid shared investment and seek to appropriate the value from the investment for their parent corporate (Hill et al., 2009; Masulis and Nahata, 2009). However, if an influential investor participates in the syndication, the CVC lead investor can be restricted in pursuing its strategic objectives (Hallen et al., 2014; Katila et al., 2008). Hence, to secure control over the management of the investee, CVC lead investors will exercise caution and consider the possibility for conflict with their future partner investors.

Third, CVC lead investors do not show a specific preference to invite either IVCs or CVCs to the syndicate. Considering that CVC co-investors also pursue strategic objectives and the resulting possibility of conflict with the CVC-led investor lead to the hypothesis that IVCs would be preferred as syndicate partners. This view was shared by previous research which has considered CVCs as risky partners who are less aligned with the interests of the investee and other co-investors and are more likely to misappropriate resources (Katila et al., 2008). It seems, however, that for the CVC-led investor, the

positive contributions of syndication with other CVCs, who can support the lead investor and the investee with their expertise, accumulated knowledge and experience counteracts the potential for conflict. This is supported by literature which reported that the participation of CVCs in a syndication improves the investment performance (Ivanov and Xie, 2010), multiple CVCs in a syndication provide a marginal improvement in the valuation of the investee at IPO (Maula and Murray, 2002), and that CVCs are recognized as attractive syndicate partners owing to their unique resources (Keil et al., 2010).

The results suggest managerial implications for CVCs and other investors who are concerned with CVC syndicate investments. For CVC lead investors, the results help to define and clarify partner selection criteria. These criteria will help the CVCs choose suitable partner investors and organize the syndicate in line with their financial and strategic objectives. For other investors, who perceive CVCs as attractive partners (Keil et al., 2010), the insight into CVCs' partner selection criteria can be used to establish strategies for joining CVC-led syndicate investments. Moreover, VCs also have to consider their perceived influence over the investees and power dynamics among syndicate partners before investment decisions.

Chapter 4. Overcoming the distance in distant search

4.1 Introduction

With increasing complexity and uncertainty in technological innovation, firms often turn to external sources to access and gain new ideas, novel technologies, and expertise (Fleming, 2001; Keil, 2004; Powell et al., 1996; Rosenkopf and Nerkar, 2001). Through combining existing internal knowledge with novel external knowledge, firms can quickly identify new opportunities and generate innovations (Kogut and Zander, 1992; Nelson and Winter, 1982; Rothaermel and Alexandre, 2009). However, the ability to acquire knowledge from external sources is constrained by the firms' own experiences and knowledge base (Cohen and Levinthal, 1990; Lane and Lubatkin, 1998). Prior studies have proposed that a firm's search for new knowledge shows a curvilinear relationship between the technological distance and the associated innovation outcomes (Gilsing et al., 2008; Nooteboom et al., 2007). Given that both the potential for novel combination and the complexity of the search increase with increasing technological distance, prior studies have suggested an optimal distance and efficient strategy for external search (Ahuja and Katila, 2001; Dushnitsky and Lenox, 2005; Gompers and Lerner, 2000; Mowery et al., 1998). However, few studies have investigated how to overcome the distance and facilitate distant search for novel recombination (Enkel and Heil, 2014; Zhang, 2016).

Searching for technologically distant technologies, however, is becoming increasingly important for firms operating in high-tech industries where the rapid technological progress requires firms to innovate in order to build up and maintain competitive advantages.

This research attempts to explore ways to overcome the technological distance and enhance the distant search in external knowledge sourcing. Specifically, it focuses on corporate venture capital (CVC) activities, which allow firms to take cognizance of technological trends and access novel and distant technologies held by innovative entrepreneurial firms (Benson and Ziedonis, 2009; Dushnitsky and Lenox, 2005; Van de Vrande et al., 2006). This study analyzes firms' search outcomes in CVC investments and moderating factors that enhance the knowledge transfer from the investees to the investing firms. Drawing on literature on distant search and CVC, I suggest an inverted U-shape relationship between technological distance and knowledge transfer in CVC investments. Building on literature on learning and technology transfer, I also argue that the number of syndicate partners and an integrated CVC unit structure positively moderate the extent of knowledge transfer and can support parent corporates in transferring knowledge from technologically-distant investees. The empirical analysis based on a sample of CVC deals conducted by firms in the biopharmaceutical-industry confirms the predicted inverted U-shape relationship between technological distance and knowledge transfer. It also confirms that integrated CVC-units are better suited to transfer

knowledge from the investee firms. It fails, however, to find evidence for a positive effect of the number of syndicate partners but rather shows that an increasing number of partners can hinder the transfer of knowledge.

I believe that this study provides contributions to the fields of external search and innovation. By shifting the focus away from the conventional issue of identifying the optimum technological distance towards the fundamental issue of external search and novel recombination, this study complements the literature on organizational learning and innovation. Moreover, by linking the CVC context and theories on external knowledge search, this study complements and extends the literature on both external knowledge search and CVC investments. It also provides direct managerial recommendations for managers whose companies want to use CVC investments to open windows on new technology and access the knowledge of technologically distant entrepreneurial firms.

The remainder of this paper is structured as follows: First, I develop the hypotheses on the relationship between technological distance and knowledge transfer as well as on the moderating effects of syndicate partners and organizational structure of the CVC unit. Then, I describes the dataset and approach used to empirically test the hypotheses of this study, and presents the results of this analysis and describes additional robustness tests. The final section of this chapter provides a discussion of the results and their implications, and discusses the limitations and highlights suggestions for further research.

4.2 Research hypotheses

4.2.1 The relationship between technological distance and performance

Literature on distant search has hypothesized on the relationship between (technological) distance and learning and innovation outcome (Nooteboom 1992). Given the complexity of external search, a firm might be tempted to search in the vicinity of its existing knowledge base. Searching at a low technological distance, however, will result in finding technologies and knowledge which are similar to the one the firm already possesses (Mowery et al., 1998). Knowledge available from technologically proximate external sources has a low novelty value to the firm, thus gives little motivation to learn from others (Nooteboom et al., 2007; Song et al., 2003). While this eases knowledge transfer from the source, there is a limit to creating innovation from a set of same or similar knowledge elements (Katila and Ahuja, 2002). Consequently, while identification, acquisition and assimilation of the knowledge are relatively easy, it will not significantly contribute to the firm's learning outcomes.

Adding distant knowledge, on the other hand, provides the firm with inputs which are novel and vastly different from its current knowledge base. The addition of such new knowledge results in a higher chance of finding suitable and successful recombination and consequently improving innovation performance. However, increasing technological distance introduces additional difficulties and costs to the search process. With decreasing

similarity between the firm's existing knowledge base and the search targets, having to understand unfamiliar technologies raises the complexity of the search and has a detrimental impact on innovation performance (Cohen and Levinthal, 1990, Lane and Lubatkin, 1998).

These basic assumptions can also be expected to hold true for CVC investments, an increasingly employed mode of external search. Through CVC investments, corporations search and access new knowledge held by the investees (Dushnitsky and Lenox, 2005; Keil et al., 2008; Lee et al., 2015; Schildt et al., 2005; Wadhwa and Kotha, 2006; Wadhwa et al., 2010). In investment cases where the investee's knowledge is very similar to that of the parent corporation, the similarity eases communication and knowledge transfer. However, due to the high degree of knowledge similarity, the benefits for the parent corporation are limited. As CVC investments are often seen as a window on new technology, in most practical cases, the technological distance between the parent corporation and the investee is high. While this allows the parent corporate to access new technologies, the large differences in the knowledge bases complicate the identification, transfer, and application of the investee's technology.

In summary, increasing technological distance provides increasing benefits of accessing new knowledge, while at the same time, the complexity and cost of the search process increase too. These positive and negative effects lead to the following hypothesis:

***Hypothesis 4-1**: Technological distance has an inverted U-shape relationship with knowledge transfer.*

4.2.2 The moderating effect of syndicate partners

Absorptive capacity has been defined as 'the capacity to recognize the value of new external information, assimilate it and apply it to commercial ends' (Cohen & Levinthal, 1990, p.128). Within the firm, this capacity resides in resources such as organizational processes or routines.

The process of external learning is often limited by the focal firm's lack of these resources. The extended resource-based view expands the understanding of the firm's resources by acknowledging that firms do not only access their own internal resources, but that the use of resources can span firm boundaries (Dyer and Singh, 1998; Lavie, 2006). For example, firms can access and use resources held by alliance partners or other cooperating organizations. Firms access these resources of the partners to complement their own internal resources and to quickly access, e.g., knowledge which would take significant time and efforts to build up internally. Firms who can access such external sources of knowledge are have more opportunities to develop their absorptive capacity (Zahra and George, 2002). The partners' complementary resources allow to enhance learning and develop new capabilities (Harrison et al., 2001) which in turn supports the firms in identifying, acquiring, and applying external knowledge from sources such as

their investees. Also other research has highlighted the role of ties with partner firms in information sharing and joint problem solving (McEvily and Marcus, 2005).

Most venture capital investments take place in syndicates involving two or more venture capital firms (Lerner, 1994b), and CVC investments generally operate in the same way (MacMillan et al., 2008). VCs syndicate their investments for various motives such as improved venture selection, monitoring skill, value-added, and knowledge sharing (Brander et al., 2002; Manigart et al., 2006). Among them, value-added motives of syndicate investment, such as accessing complementary sources of expertise and reducing information asymmetries between the investors and the investee, provide more insights into early stage investments (Lockett and Wright, 2001; Manigart et al., 2006). VC syndicates are not characterized by pooled interdependence, in which each partner independently invests only funds. Rather, syndicates are characterized by reciprocal interdependence that provides combined value-added contributions and capabilities of each partner (Thompson, 1967). With greater value-added abilities, VCs contribute more to identifying opportunities for technology development and commercialization. Accordingly, by leveraging their syndicate partners' expertise and prior experiences, focal CVC investors can reduce the information asymmetry between themselves and the investee, and consequently better identify and understand the investee's technology and market opportunities (De Clercq and Dimov, 2008; Hopp, 2010).

Further, through interacting with syndicate partners, the focal CVC investor can create an opportunity for organizational learning by gaining access to its partners' knowledge,

experience, and expertise (Clarysse et al., 2013; Hopp, 2010; Meuleman and Wright, 2011). Syndicates function as forums for information exchange and knowledge flow among the participating partners (Anokhin et al., 2011). Thus, the opportunities for vicarious learning from the accumulated experiences and insights of the partners allow firms to extend their capabilities and overcome their deficiency in distant knowledge (Grant and Baden-Fuller, 2004; Levitt and March, 1988).

In summary, interacting with syndicate partners helps the CVC investor recognize and identify the investee's technology and opportunities more easily and helps to overcome the problems associated with transferring technology and knowledge which are distant from their own knowledge base.

Hypothesis 4-2*: The size of the syndicate has a positive moderating effect on the relationship between technological distance and knowledge transfer.*

4.2.3 The moderating effect of operational structure

Once the unit within the firm tasked with external search has recognized and identified useful ideas and novel knowledge held by an external source, it would try to assimilate and transfer the knowledge to the firm's relevant business or R&D-units. However, mere exposure to external knowledge is insufficient to ensure a successful

process of assimilation and internalizing. Active efforts are required to transfer the knowledge from the source (Hansen, 1999; Kogut and Zander, 1992). Hansen (1999) provides two explanations for the knowledge transfer problems faced by organization subunits: willingness and ability. Organization subunits might be unwilling to share its knowledge because of misaligned incentives or an intra-organizational atmosphere of secrecy and competition. Or, subunits might be unable to transfer or assimilate the knowledge because of the inherent difficulty of the task. The transfer is more difficult as far as the knowledge is a set of interdependent components (Teece, 1986), tacit (Kogut and Zander, 1992; Polanyi, 1966), or deviates from one's core knowledge and capabilities (Cohen and Levinthal, 1990).

Prior studies have suggested that shared perspective and strong social interactions among organization subunits enhance the knowledge sharing and knowledge transfer between subunits (Ghoshal et al., 1994; Hansen, 1999; Tsai and Ghoshal, 1998; Tsai, 2000). Shared perspective and values both facilitate communication and the willingness to share knowledge and experiences (Ghoshal et al., 1994; Kogut and Zander, 1992). Social ties serve as channels for the flow of information and knowledge between employees of different units and thus the units themselves. Strong ties foster two-way interaction and increased time spent together allows for a better articulating of the knowledge and a build-up of trust (Hansen, 1999; Tsai and Ghoshal, 1998).

Strong ties among subunits and efficient internal communication also apply to the distant search through CVC investments. As CVCs aim at achieving strategic objectives

besides the financial objectives, intense communication and collaboration with business units and the R&D department are emphasized as important components of the operation of CVC (Lee et al., 2015; Napp and Minshall, 2011; Souitaris and Zerbinati, 2014). In a survey of 48 CVC organizations, about 62 per cent of CVCs stated that having a parent company R&D or business unit as investment sponsor is extremely important or very important to the decision to invest (MacMillan et al., 2008). Accordingly, strongly tied relationships between the CVC unit and other subunits allow more efficient communication and knowledge transfer from the investee firms to the CVC unit, and to the business or R&D units of the investor (Lee et al., 2015; Maula et al., 2003; Yang, 2013).

In practice, parent corporates set up their CVC programs following two distinctive models: 'integrated' or 'arm's-length'" (Souitaris and Zerbinati, 2014). CVC programs that follow an integrated investment logic are closely aligned with the norms of the parent, such as corporate referrals, screening deals for strategic potential, and linking the venture with the parent. On the other hand, CVC programs that follow an arm's-length logic tend to be aligned with the norms of the VC industry. Thus, an 'Integrated' or 'Direct Investment' type of CVC programs is strongly tied to the parent corporate, and has a higher level of communication (Dushnitsky, 2006; Lee et al., 2015; Souitaris and Zerbinati, 2014). A study from the field also acknowledged that corporate centered CVC organizational structures, i.e., integrated (Souitaris and Zerbinati, 2014) or direct investment (Dushnitsky, 2006), have advantages over independent CVC subsidiaries or

dedicated VC funds structures (Corporate Strategy Board, 2000). The former are better suited to identify gaps in the parent corporate's ongoing R&D that can be overcome through CVC investments. The close proximity to other business units of the parent corporate also helps to promote awareness for the important role of CVC investments within the organization.

In consequence, the advantages of integrated CVC units, mainly the closer linkage with the parent corporation's subunits and the more efficient communication, reduce the technological-distance related difficulties faced in the knowledge transfer between investee and the parent corporate. This leads to the following hypothesis:

Hypothesis 4-3*: Conducting the investment using an integrated, rather than arm's-length CVC unit has a positive moderating effect on the relationship between technological distance and knowledge transfer.*

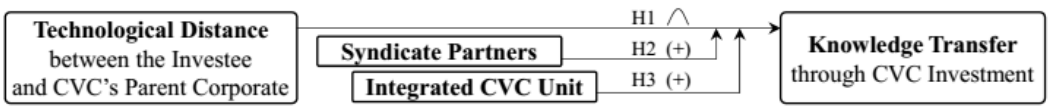


Figure 4-1 Conceptual model for Chapter 4

4.3 Methods

4.3.1 Data sample and analysis

The data set for the empirical analysis of this study consists of firms from the biopharmaceutical industry. The firms were selected from the Forbes 2015 List of the "The World's Largest Drug and Biotech Companies" (Forbes, 2015). CVC activities of the firms in the sample were confirmed and CVC investment units were matched to the individual corporates using available news reports and prior studies on biopharma CVC activities (Baldi et al., 2015). Due to the different nature of their industry, medical device companies were excluded. Similarly, this study does not consider CVC investments made by non-profit organizations and universities operating in the biopharmaceutical field.

For the remaining firms, data on CVC investments done both directly through the corporate as well as through dedicated CVC units was collected from the VC/PE Module of the Thomson One database. CVC data was collected for the 2000-2007 timespan. The start date of 2000 was selected as most biopharmaceutical companies launched CVC units and the biopharma industry notably increased CVC related activities from the early 2000s (Baldi et al., 2015; Reaume, 2003). The end date of 2007 allows sufficient time to analyze the outcomes of the CVC investments. At this point, data on the patenting activity of the investee firms was obtained from the United States Patent and Trademark Office database. Owing to the focus on technological distance and the study's reliance on patent-based

indicators, CVC investment cases in which the investee did not apply for at least three patents were discarded. The unit of analysis for the remaining cases are both the corporate and the individual deals. Individual deals are distinguished based on the corporate's first CVC investment in a given investee, i.e., if the CVC participated in several investment rounds of the same target, the deal is considered to have taken place in the first year of investment. The data on CVC deals and the patent data was supplemented with firm-level data obtained from Datastream. The final sample used in the analysis consists of 16 corporates, 137 investees, and 161 individual investments. The number of investments is higher than the number of investees as some investees received investments from more than one corporate in the sample. Zero-inflated negative binomial regression was used to analyze the sample.

4.3.2 Dependent variable

The dependent variable is the knowledge transfer between the investee and the corporate, specifically the increased activity of the corporate in technologies areas that are considered core technologies of the investee. Previous literature has for the most part focused on the direct contributions of parent companies' CVC activities to their innovation performance and thus focused on direct knowledge transfer, e.g., citations the parent corporation made to patents held by the investee (Lee et al., 2015). This research, however, aims at highlighting the role of CVC in providing a window on new

technologies. This window is often broader than a definition based on the investees direct patents would indicate. Investees do not just provide the parent corporation with information on what they patented, but they open a window to fields of similar technologies. To capture this important aspect of CVC investments, this research employs a definition based on the parent corporate's citations to patents in certain core classes (Phene et al., 2012). Specifically, knowledge transfer is defined as the increase in citations to patents belonging to one of the core classes of the investee firm when comparing the three-year period preceding the CVC investment and the three-year period after it, considering the application dates of the patents. Core classes of the investee are defined as all patent classes which account for 20% or more of the investees patent stock.

4.3.3 Independent variables

The measure for the technological distance between the corporate and the investee in this study is based on the definition of angular separation introduced by Jaffe (1986). It is based on the degree to which the two firms' technological vectors, containing information on the firms' patents, point into the same direction. It is based on the patents granted to the corporate which were applied for in the three years preceding the investment as well as all patents granted to the investee and is calculated based on the following formula:

$$(\text{Technological distance})_{ij} = (f_i\, f_j') \,/\, \text{SQRT}((f_i\, f_i')(f_j\, f_j'))$$

where f_i is the ith row of F, representing firm i's technology profile.

Syndicate size is defined as the total number of investors investing into a given investee, irrespective of the investment round and investor type.

The Integrated CVC Unit dummy variable indicates whether a deal was conducted by a CVC unit which is an integral part of the corporate or by an arm's-length (external) CVC unit. The distinction was performed based on data, e.g., the name of the investor. Eli Lilly (Lilly ventures) is an example for an arm's-length subsidiary, while e.g., Roche and Novo Nordisk A/S used integrated CVC units. In my sample of 16 companies, 4 companies used integrated CVC units only, 8 companies used arm's-length CVC units only, and 4 companies used both types of CVC unit.

4.3.4 Control variables

To account for other factors which might affect the knowledge transfer between the investee and the corporate, this study introduces a number of control variables on the level of the parent corporate, the investee, the focal investment, and the CVC unit. To account for the absorptive capacity of the parent corporate, the study considers the firm's R&D intensity in the year preceding the investment. Following Cohen and Levinthal (1990), R&D intensity is defined as the firm's R&D expenditures divided by its sales. The study also considers the parent corporate's knowledge diversity, measured using the Herfindahl Index on the patent classes of the patents granted to the firm and applied for in the 5-year period preceding the investment. While CVC investments are an increasing

common tool for established firms to access technology from external partners, there are other external knowledge sourcing modes such as M&As or strategic alliances. This study controls for the parent corporate's use of these modes by considering the number of M&A deals and strategic alliances conducted in the three-year period preceding the investment. Last, the study considers the total number of CVC investment deals the parent corporate participated in during the year of the focal investment.

On the investee level, this study controls for the knowledge stock, i.e., the total number of patents granted to the investee, as well as the age of the investee measured in years since its establishment. On the level of the focal investment, the control variables include the total size of the investment as well as the total size of investments made by CVCs into the given investee. Both values are log transformed. For the CVC, I control for the total investment experience, measured as the number of firms invested in from the launch of the CVC until the year before the focal investment, and the diversity of this investment experience. Investment experience diversity is measured using a Herfindahl Index measure on the 3-digit SIC codes of the firms which received investments from the CVC. Additionally, I calculated the CVC's degree centrality based on the VC industry syndication network of the five years preceding the focal investment. On a dyadic level, this study controls for the existence of prior strategic alliances between the parent corporate and the investee using the alliance involvement measure devised by Wadhwa and Kotha (2006). Finally, the study includes year dummies as well as nationality dummies to account for the different time periods as well as the different location of the CVC firms.

4.4 Results

Table 4-1 shows the descriptive statistics and the correlations among the variables used in this study. To check for the presence of any multicollinearity problem, I performed a variance inflation factor (VIF) test. The results of this VIF test are shown in Table 4-2. The low average value and the low values for the key variables indicate that I do not have any problems with multicollinearity.

Table 4-3 presents the results of the empirical analysis. Model 1 contains only the control variables used in this study. It can be seen that the knowledge diversity of the parent corporation has a significant positive influence on the knowledge transfer from the investees. This can be interpreted as knowledge diversity, i.e., prior experience in different technological fields, increasing the parent corporation's absorptive capacity which in turn eases the knowledge transfer.

Models 2 and 3 test the basic hypothesis of this study, i.e., the existence of an inverted U-shape relationship between technological distance and knowledge transfer. While the linear term Tech. distance in Model 2 is negative, the inclusion of the quadratic term in Model 3 reveals the hypothesized inverted U-shape relationship. Further, the slope is sufficiently steep at both ends of the data range, and the estimated turning point is at 0.246 of the technological distance, which is located well within the data range (Haans et al., 2015).

Table 4-1 Descriptive statistics and correlation table

#	Variables	Mean	SD	1	2	3	4
1	Tech. distance	0.555	0.332	1.000			
2	Syndicate size	13.732	6.449	-0.256	1.000		
3	Integrated CVC unit	0.168	0.375	-0.099	0.091	1.000	
4	Sales	17.095	0.655	0.214	-0.194	-0.163	1.000
5	PC R&D intensity 1yr	0.140	0.040	-0.175	0.214	0.135	-0.682
6	PC knowledge diversity	0.784	0.129	0.125	-0.124	-0.344	0.432
7	PC no. of alliances	15.255	8.021	-0.085	-0.007	0.254	0.219
8	PC no. of M&As	8.062	4.063	0.039	-0.082	-0.126	0.472
9	PC no. of CVC deals	16.571	9.754	0.063	-0.114	-0.534	0.479
10	Investee knowledge stock	11.981	12.740	-0.159	0.108	0.028	0.013
11	Investee age	6.124	3.510	-0.061	0.122	0.008	-0.063
12	Total investment size of the focal deal	11.283	0.804	-0.185	0.654	0.036	-0.152
13	CVC investment size in the focal deal	8.515	0.996	0.008	-0.146	-0.097	-0.021
14	CVC total investment experience	55.732	41.618	0.270	-0.200	-0.482	0.686
15	CVC investment portfolio diversity	0.600	0.233	0.308	-0.071	-0.319	0.460
16	SA between PC and investee	0.093	0.292	-0.135	-0.027	0.371	-0.201

N = 161 CVC investments

Table 4-1 (continued)

#	5	6	7	8	9	10	11	12	13	14	15
1											
2											
3											
4											
5	1.000										
6	-0.677	1.000									
7	-0.097	-0.159	1.000								
8	-0.570	0.619	0.309	1.000							
9	-0.442	0.573	-0.030	0.397	1.000						
10	-0.022	-0.077	-0.004	-0.057	0.021	1.000					
11	0.167	-0.136	-0.078	-0.131	-0.016	0.311	1.000				
12	0.172	-0.115	-0.123	-0.176	-0.218	0.165	-0.027	1.000			
13	-0.069	0.080	0.021	0.030	0.001	0.135	-0.081	0.273	1.000		
14	-0.483	0.629	-0.290	0.302	0.587	-0.022	-0.029	-0.117	-0.017	1.000	
15	-0.363	0.322	-0.048	0.255	0.503	0.048	-0.044	-0.138	-0.105	0.589	1.000
16	0.156	-0.316	0.006	-0.322	-0.272	0.231	0.007	0.072	0.002	-0.255	-0.168

Table 4-2 VIF of variables

Variables	VIF	1/VIF
CVC total investment exp.	6.46	0.154771
Sales	5.46	0.183017
PC knowledge diversity	4.87	0.20521
PC R&D intensity	3.73	0.26801
Total investment size of the focal deal	2.79	0.358624
Syndicate size	2.63	0.380639
PC no. of M&As	2.52	0.39752
PC no. of CVC deals	2.5	0.400399
PC no. of alliances	2.04	0.49073
CVC investment portfolio diversity	1.97	0.50657
Integrated CVC unit	1.92	0.521188
CVC investment size in the focal deal	1.48	0.674691
SA between PC and investee	1.43	0.699947
Investee knowledge stock	1.32	0.760183
Tech. distance	1.28	0.778823
Investee age	1.24	0.805015
Mean VIF	2.73	

Table 4-3 Zero-inflated negative binomial regression results

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Sales	-1.448	-1.396	-2.213**	-2.208**	-1.928**	-1.941**	-2.833***	-1.137	-0.965	-0.973
	(1.154)	(0.895)	(0.907)	(0.906)	(0.855)	(0.856)	(0.955)	(1.029)	(1.053)	(0.960)
PC R&D intensity	-27.263	-29.450	-42.434***	-41.674***	-34.829**	-35.817**	-45.185***	-20.015	-17.348	-16.107
	(21.402)	(14.689)	(14.846)	(14.960)	(14.093)	(14.365)	(14.570)	(15.523)	(15.940)	(14.425)
PC knowledge diversity	9.738***	9.987***	9.143***	9.480***	6.616***	6.539***	8.223***	5.561**	5.213**	3.860*
	(2.785)	(2.103)	(2.024)	(2.028)	(2.070)	(2.084)	(2.024)	(2.194)	(2.245)	(2.198)
PC no. of alliances	-0.006	-0.017	-0.014	-0.012	0.003	0.000	-0.031	-0.058*	-0.057*	-0.039
	(0.043)	(0.034)	(0.031)	(0.031)	(0.030)	(0.030)	(0.033)	(0.033)	(0.032)	(0.032)
PC no. of M&As	-0.100	-0.060	-0.093	-0.092	-0.040	-0.047	-0.088	-0.125	-0.114	-0.082
	(0.119)	(0.090)	(0.087)	(0.088)	(0.082)	(0.083)	(0.087)	(0.084)	(0.084)	(0.078)
PC no. of CVC deals	0.052	0.055**	0.058**	0.061**	0.063**	0.062**	0.057**	0.036	0.035	0.043*
	(0.034)	(0.028)	(0.027)	(0.027)	(0.025)	(0.025)	(0.026)	(0.026)	(0.026)	(0.025)
Investee knowledge stock	0.054***	0.018	0.019	0.019	0.026**	0.026**	0.020*	0.017	0.017	0.022**
	(0.016)	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)	(0.010)
Investee age	-0.073*	-0.032	-0.001	0.000	-0.017	-0.020	-0.003	-0.001	-0.001	-0.014
	(0.044)	(0.036)	(0.035)	(0.034)	(0.034)	(0.035)	(0.034)	(0.032)	(0.031)	(0.031)
Total investment size of the focal deal	-0.138	-0.238	-0.108	0.078	0.189	0.195	-0.091	-0.023	-0.030	0.231
	(0.188)	(0.159)	(0.156)	(0.226)	(0.217)	(0.218)	(0.152)	(0.139)	(0.139)	(0.207)
CVC investment size in the focal deal	-0.067	0.199	0.100	0.020	-0.008	-0.017	0.093	0.034	0.030	-0.053
	(0.168)	(0.141)	(0.135)	(0.153)	(0.141)	(0.143)	(0.130)	(0.124)	(0.124)	(0.133)
CVC total investment exp.	0.003	0.003	0.007	0.005	0.008	0.007	0.019	0.026**	0.026**	0.024**
	(0.012)	(0.011)	(0.010)	(0.010)	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)	(0.011)
CVC investment portfolio diversity	-0.956	0.287	-0.059	0.198	0.254	0.320	0.364	-0.660	-0.743	-0.329
	(1.869)	(1.181)	(1.172)	(1.190)	(1.110)	(1.123)	(1.112)	(1.164)	(1.162)	(1.115)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
SA between PC and investee	0.435	0.095	-0.007	-0.063	-0.147	-0.153	-0.646	-0.897	-0.865	-0.844
	(0.788)	(0.633)	(0.609)	(0.609)	(0.572)	(0.573)	(0.690)	(0.643)	(0.633)	(0.604)
Year dummies					(Included)					
Nation dummies					(Included)					
Tech. distance		-3.388***	2.711	2.412	6.238***	5.106	3.573*	2.551	2.690	5.306***
		(0.451)	(1.828)	(1.831)	(1.988)	(3.714)	(1.869)	(1.788)	(1.791)	(1.913)
Tech. distance_sq			-5.505***	-5.330***	-6.469***	-5.362	-6.150***	-5.505***	-5.630***	-6.267***
			(1.611)	(1.604)	(1.527)	(3.426)	(1.631)	(1.544)	(1.548)	(1.469)
Syndicate size				-0.030	0.044	0.030				0.031
				(0.027)	(0.034)	(0.052)				(0.032)
Tech. distance x syndicate size					-0.188***	-0.100				-0.149***
					(0.056)	(0.250)				(0.052)
Tech. distance_sq x syndicate size						-0.088				
						(0.243)				
Integrated CVC unit							1.255*	-0.321	0.125	-0.470
							(0.757)	(0.783)	(1.116)	(0.750)
Tech. distance x integrated CVC unit								7.245***	3.246	6.670***
								(1.895)	(7.425)	(1.855)
Tech. distance_sq x integrated CVC unit									4.581	
									(8.372)	
Log likelihood	-936.833	-914.832	-909.343	-908.722	-903.774	-903.709	-907.998	-900.867	-900.705	-896.809

N = 161 CVC investments

*, **, *** denotes significance at the 10 percent, 5 percent or 1 percent level, respectively.

Models 4, 5, and 6 test the moderating effect of the size of the syndicate on the relationship between technological distance and knowledge transfer. While Model 4 reveals no direct effect of syndicate size, Model 5 shows a significant negative first order moderation effect, which shifts the turning point to the left, i.e., firms investing in a larger syndicate start to experience the problems in the knowledge transfer already at a lower technological distance (Fig. 4-2(a)). This is contrary to Hypothesis 4-2, which assumed a positive effect of the size of the syndicate.

Models 7, 8, and 9 test the moderating effect of the type of CVC unit, i.e., integrated vs. arm's-length, on the relationship between technological distance and knowledge transfer. Model 7 reveals a direct positive effect for integrated CVC units. Model 8 shows a significant positive first order moderation effect, which shifts the turning point to the right, i.e., firms investing using integrated CVC units experience the onset of negative effects on the knowledge transfer from their investees at a higher level of technological distance than firms investing using arm's-length CVC units (Fig. 4-2(b)). These findings support Hypothesis 4-3. Finally, Model 10 is the full model containing all direct and first-order moderating variables. The results lend further support to Hypotheses 4-1 and 4-3 and contradict Hypothesis 4-2.

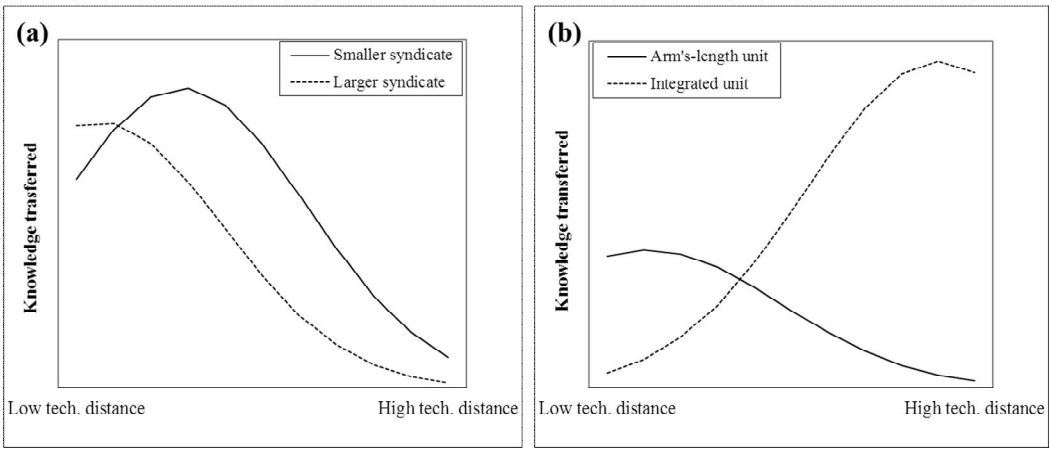


Figure 4-2 Moderating effect of (a) syndicate size and (b) CVC unit structure on the relationship between technological distance and knowledge transfer in CVC investments.

Table 4-4 Zero-inflated negative binomial regression for robustness test

Variables	D.V.: Increased citations 10% cutoff	25% cutoff	30% cutoff	D.V: Increased patents (20% cutoff)		
	Model 11	Model 12	Model 13	Model 14	Model 14	Model 15
Sales	-2.430***	-1.550	-1.706	-0.667	-1.329	-1.261
	(0.684)	(1.170)	(1.160)	(0.983)	(0.887)	(0.909)
PC R&D intensity	-46.048***	-34.609*	-33.473*	-21.021	-33.556**	0.818
	(11.896)	(19.343)	(19.279)	(17.083)	(14.951)	(18.654)
PC knowledge diversity	8.709***	4.180	3.669	5.281**	4.655**	0.456
	(2.079)	(2.581)	(2.583)	(2.266)	(2.196)	(2.451)
PC no. of alliances	-0.048	-0.064	-0.068	0.045	0.031	0.011
	(0.035)	(0.044)	(0.042)	(0.030)	(0.028)	(0.026)
PC no. of M&As	-0.183**	-0.161	-0.152	-0.066	-0.104	0.037
	(0.082)	(0.115)	(0.111)	(0.086)	(0.074)	(0.079)
PC no. of CVC deals	0.061**	0.046	0.031	0.076***	0.072***	0.083***
	(0.025)	(0.030)	(0.030)	(0.027)	(0.026)	(0.022)
Investee knowledge stock	0.017	0.034***	0.036***	0.019	0.019*	0.012
	(0.012)	(0.013)	(0.013)	(0.012)	(0.011)	(0.012)
Investee age	0.039	-0.009	-0.028	0.025	0.032	0.031
	(0.032)	(0.040)	(0.039)	(0.037)	(0.035)	(0.033)
Total investment size of the focal deal	0.026	0.254	0.217	0.031	0.056	0.129
	(0.227)	(0.238)	(0.241)	(0.144)	(0.135)	(0.222)
CVC investment size in the focal deal	0.051	-0.063	-0.037	-0.034	-0.021	-0.005
	(0.151)	(0.149)	(0.147)	(0.134)	(0.125)	(0.116)
CVC total investment exp.	0.018	0.012	0.017	-0.010	-0.009	0.034**
	(0.012)	(0.014)	(0.014)	(0.009)	(0.008)	(0.017)
CVC investment portfolio diversity	-1.292	-0.225	0.086	-0.311	-0.508	0.592
	(1.213)	(1.290)	(1.269)	(1.110)	(1.098)	(1.054)
SA between PC and investee	-0.373	-1.034	-1.103	0.233	0.092	-0.589
	(0.745)	(0.739)	(0.752)	(0.568)	(0.544)	(0.563)
Year dummies			(Included)			
Nation dummies			(Included)			
Tech. distance	4.110*	5.264**	5.407***	-3.522***	1.235	1.537
	(2.078)	(2.090)	(2.068)	(0.425)	(1.792)	(2.200)
Tech. distance_sq	-6.678***	-5.975***	-6.023***		-4.125***	-4.120***
	(1.612)	(1.671)	(1.680)		(1.532)	(1.566)
Syndicate size	-0.001	0.013	0.003			0.001
	(0.034)	(0.039)	(0.039)			(0.033)
Tech. distance x syndicate size	-0.003	-0.141**	-0.128**			-0.027
	(0.053)	(0.059)	(0.059)			(0.063)
Integrated CVC unit	-0.502	-0.860	-0.513			2.769***
	(0.731)	(0.840)	(0.835)			(0.914)
Tech. distance x integrated CVC unit	4.438***	6.136***	6.004**			2.986
	(1.231)	(2.376)	(2.349)			(2.466)
Log likelihood	-963.236	-867.143	-849.287	-471.626	-468.233	-463.551

N=161 CVC investments; *, **, *** denotes significance at the 10, 5, or 1 percent level, respectively.

To increase the reliability of the results, this study performed two additional robustness tests are reported in Table 4-4. The first robustness test is performed using various levels for the cutoff, which defines the technological core areas of the investee. While the main analysis was performed using a cutoff level of 20%, the robustness test used 10%, 25%, and 30%. Hypothesis 4-1, i.e., the base hypothesis predicting an inverted U-shape relationship between technological distance and knowledge transfer is confirmed at all cutoff levels. The negative moderating effect of syndicate size found in the main analysis is confirmed at the 25% and 30% cutoff, but found to be insignificant at the 10% level. Hypothesis 4-3, i.e. the positive moderating effect of integrated CVC units, is confirmed at all cutoff levels.

For the second robustness test, I changed the definition of the dependent variable, which in the main analysis is based on an increase in parent corporate's patent citations to patents in core technological areas of the investee. In the robustness test, it is based on patents applied for by the parent corporation in these classes. The number of patents is divided by the patent count deflator, an index employed to account for a possible change in the biopharmaceutical industry's propensity to patent, which might be mistaken for an increased knowledge transfer. Based on Phene et al. (2012), it is calculated for each observation year as the number of patents in classes relevant to the biopharma sector granted in a time period from three to one year before the observation year, divided by the number of such patents granted in the one to three-year window after the observation year. Following prior literature (Rothaermel and Thursby, 2007), patents in USPTO patent classes 424, 435, 436, 514, 539, 536, 800, and 930 are considered biopharmaceutical

patents. The empirical results confirm the existence of an inverted U-shape between technological distance and knowledge transfer and further support the Hypothesis 4-1. However, the results cannot further confirm the moderating effects of syndicate size and type of CVC unit. The discrepancy in results between the definitions based on citations and patents could be explained by the fact that, especially in technologically distant fields, fully utilizing the knowledge of the investee and being able to patent innovations in these fields takes more time and effort rather using acquired knowledge at a level where it is recorded as a patent citation.

4.5 Discussion

The objective of this study was to investigate the moderating factors that enhance knowledge transfer and learning in distant search. Utilizing external partners and enabling efficient internal communications were expected to complement and facilitate distant search. By analyzing CVC investments of biopharmaceutical companies and their learning outcomes, I was able to verify the following results:

First, also in the CVC investment context, knowledge transfer has an inverted U-shape relationship with technological distance. Through CVC investments, firms are able to access and gain novel knowledge and technologies. However, when the technological distance reaches a certain degree, the learning potential is reduced as the increasing dissimilarity of the knowledge bases leads to increasing negative effects. Prior studies

have found this relationship in technology-based alliances, alliance networks, and M&A deals (Ahuja and Katila, 2001; Gilsing et al., 2008; Nooteboom et al., 2007). As Nooteboom et al. (2007) argued, while novelty develops through the interaction of different knowledge and perspectives, too much distance hinders mutual understanding and knowledge transfer.

Second, the number of syndicate partners has a negative influence on the knowledge transfer in CVC investments. Contrary to our Hypothesis 2, which predicted that the syndicate partners complement and improve the learning from CVC investments, a larger number of syndicate partners negatively moderates the relationship between technological distance and the knowledge transferred in CVC investments. This result is inconsistent with prior studies, which, adopting organizational learning theory and a resource-based perspective, have characterized the positive role of partners in organizational learning and innovation (Afuah and Tucci, 2012; De Clercq and Dimov, 2008; Inkpen, 2000; Lavie, 2006; Rosenkopf and Almeida, 2003). The agency cost perspective might provide an explanation that can account for this inconsistence. Besides financial returns, CVCs have strategic objectives (Chesbrough, 2002), which other syndicate partners might not share. Hence, VCs or entrepreneurial firms often question CVCs' intentions, and are concerned about possible leakage of key technologies and a loss of competiveness (Katila et al., 2008). In that sense, syndicate partners could attempt to curb CVC's opportunistic behavior which hinders the knowledge flows to the CVC's parent corporate (Hallen et al., 2014; Masulis and Nahata, 2009). In other word, CVCs might face principal-principal

conflicts with their syndicate partners (Eisenhardt, 1989; Dalziel et al., 2010; Wright and Lockett, 2003; Young et al., 2008).

Third, establishing efficient communication between the CVC unit and the parent corporate improves knowledge transfer in CVC investments. The results of this study indicate that CVCs operating using an integrated structure achieve more knowledge transfer from their investees. As a result, parent corporates, through CVC investment, are able to access and understand the distant knowledge held by their investees. CVCs, pursuing strategic objectives, communicate with the parent corporate's business or R&D units to obtain advice, support, or assistance on target selection, value-added, and strategic value creation. Hence, closely communicating with these units is emphasized as an important factor to obtain the desired strategic returns in CVC investments (Lee et al., 2015; Napp and Minshall, 2011; Souitaris and Zerbinati, 2014). Subunits within a single organization share a social context, similar values, and common corporate language that can facilitate communication and provide a foundation for a firm to leverage its internal knowledge (Tsai, 2000). Thus, although distant and complex knowledge increases transfer-related issues (Cumming and Teng, 2003; Hansen, 1999), integrated CVC units that allow efficient communication between CVC unit and R&D or business units could help firms to overcome and facilitate the knowledge transfer from distant sources (Miller et al., 2007).

Overall, the findings indicate that the limitation of distant search which was demonstrated in various other settings, was also confirmed to hold true for CVC

investments and relevant knowledge transfer. The findings also partially illustrate how to overcome the distance in distant search. Although external search units such as CVC units can reach novel and distant technologies, there is a limit to identify and understand the value of the technology in distance. To overcome these limitations in distant search and enhance knowledge search and learning, companies need to secure strong communication between the external search unit and internal business or R&D units. However, the results suggest that it is difficult to acquire the ability to identify and recognize novel technologies by using extended capabilities of collaborating partners. This finding may need to be examined in other contexts with different types of collaborations.

The results of this study provide several implications for firms that decide to seek distant knowledge through CVC investments. First, it confirmed that the inverted U-shape relationship between technological distance and knowledge transfer, which had been previously studied in other contexts, also holds true in CVC investments. A large technological distance between the parent corporate and the investee complicates the knowledge transfer. However, as providing a window on new and distant technologies is one of the key motivations for firms to conduct CVC investments, simply finding the optimal point on the curve is often not a suitable option. Thus, this study provides important implications on factors moderating the relationship. It finds that a strong communication between the parent firm and the sub-unit can help to overcome the problems caused by the technological distance. Parent corporates wishing to conduct CVC

investments in technologically distant investees are thus encouraged to use integrated CVC units rather than arm's-length types of organizational structures and to foster communication between the CVC unit and the staff, especially R&D workers, of the parent.

In terms of syndication, while literature points towards a positive effect, due to the parent firm being able to access knowledge and experiences of the syndicate partners, the empirical analysis revealed a negative moderating effect. Managers of firms planning to conduct CVC investments are thus encouraged to keep the pros and cons of syndication in mind.

In terms of academic implications, this study shows the need for further academic work on CVC operations. The topic of CVC investments has been mostly covered from a practice point of view, such as in reports of consulting firms or individual case studies. What is still lacking is a deeper academic perspective on issues such as strategic returns, and other success metrics for CVC investments.

Chapter 5. Complementary or conflictory?: The effects of the composition of the syndicate on VC-backed IPOs

5.1 Introduction

Venture capital (VC) positively affects many economic and managerial phenomena such as the foundation of public companies, technological innovations and economic growth (Kortum and Lerner, 2000). In a fast changing market and technology environment, the role of VCs in supporting high agility entrepreneurial firms has been enormously strengthened. Further, VCs have a beneficial effect on the investee's exit through IPO, which is considered as an important factor related to an entrepreneurial firm's performance early in its life (Ritter and Welch, 2002; Sutton and Benedetto, 1988). VCs provide financial and non-financial support to their investees (Large and Muegge, 2008), and play a certification role in IPOs (Megginson and Weiss, 1991). Further, VC-backed firms are more efficient and have more effective corporate governance and independent boards, which leads to a higher possibility of successful exit through IPO (Baker and Gompers, 2003; Campbell and Frye, 2009; Chemmanur et al., 2011; Suchard, 2009). Though previous research has investigated the significant roles of VCs and their

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This study is forthcoming in *Economia e Politica Industriale* (Journal of Industrial and Business Economics). The title of the paper is "Complementary or conflictory?: The effects of the composition of the syndicate on venture capital-backed IPOs in the US stock market".

critical success factors (Baum and Silverman, 2004; Sapienza, 1992), the basic assumption has been that VCs are homogeneous. In practice, however, VCs are heterogeneous in their experiences, resources, capabilities and objectives (Elango et al., 1995). VCs exhibit strong variation in the quality and effectiveness of their financial investment and non-financial value-added. Hence, the objective of this paper is to investigate the effects of the VC type on the performance of VC-backed entrepreneurial firms.

Prior research has classified VCs into financial investors, such as independent venture capitalists (IVCs), and strategic investors, such as corporate venture capitalists (CVCs), and identified their characteristics and differences (Alvarez-Garrido and Dushnitsky, 2016; Arping and Falconieri, 2010; Chemmanur et al., 2014; Hellmann, 2002; Maula et al., 2005; McNally, 1997). Although previous studies have investigated the characteristics and different effects of IVCs and CVCs, they put less attention on the syndicate investments among IVCs and CVCs. In this paper, I analyze syndicate investments among IVCs and CVCs and their influence on the IPO of the investee firms. When IVCs and CVCs engage in syndication, the resource-based view provides a foundation for explaining the complementary relationship between them, as both hold different but complementary resources and capabilities (Alvarez-Garrido and Dushnitsky, 2016; Teece, 1986; Penrose, 1959). On the other hand, the agency theory perspective suggests that syndicate investment among IVCs and CVCs, who have different objectives and time

horizon, may face conflicts of interest (Eisenhardt, 1989; Jensen and Meckling, 1976; Masulis and Nahata, 2009; Wright and Lockett, 2003). Hence, I discuss and test the two conflicting hypotheses of either a complementary or conflictory relationship in syndicate investment among IVCs and CVCs and the resulting effect on the IPO of the investee firms.

The data sample used in this study is composed of 188 VC-backed US firms which attracted their first VC investment from 2001 to 2010 and achieved IPO exit. To investigate the effects of the syndicate investment on the investees' performance, this paper conducts survival analysis and treats 'time to IPO' as the dependent variable that measures the months between the first VC investment and IPO exit.[4] The results indicate that syndicate investments among IVCs and CVCs delay the IPO exit due to agency costs and conflicts among syndicate partners.

Overall, this study makes a number of contributions. First, it analyzes the syndicate investments among different types of investors such as IVCs and CVCs, and their impact on the investee's exit through IPO which for the most part has not been a focus of previous literature. I believe this research provides a valuable theoretical and empirical

[4] Considering the strategic objectives of CVC, which might not see the investee firms' IPO as a priority objective, one could question the validity and applicability of analysis on CVC investments with IPO exit. However, prior research address mixed results in the choice of an exit route of CVC investments. Searching for acquisition candidates is a well-known objective or motive of CVC investments, and has been recognized by several survey based and theoretical studies (Siegel et al., 1988; Sykes, 1990), as well as empirically supported by a study using a European dataset, that showed that CVC-backed firms are more likely to exit through an acquisition than IVC-backed firms (Cumming, 2008). However, another line of research has shown that CVC-backed firms exit more frequently through IPO than IVC-backed firms (Gompers and Lerner, 2000). Moreover, Maula and Murray (2000) found that only 5.8 percent of the entrepreneurial firms which received CVC financing are acquired by the parent company of the CVC fund. Therefore, measures based on IPO exit activities are a viable approach when researching phenomena related to CVC investment.

extension of the existing literature on entrepreneurial finance and IPOs. Second, this paper uses various theoretical lenses such as the resource-based view, agency theory, and the relational view to shed light on the relational characteristics among syndicate partners.

5.2 Research hypotheses

In the VC industry, a large proportion of the investments take place in syndicates (Lerner, 1994b). VC firms syndicate their investments for various reasons such as risk sharing, portfolio diversification, access to the future deal flow, improved venture selection, monitoring skill, value-added, and sharing of knowledge (Manigart et al., 2006). Accordingly, syndicate investments not only result in higher returns to VCs (Brander et al., 2002), but also increase the product and financial market value of their investee firms (Wright and Lockett, 2003). However, a limited number of literature points out that the syndicate partners could get both gains and pains from their syndicate investments. While VCs benefit from improved venture selection, monitoring skills, value-added, and the sharing of knowledge (Brander et al., 2002; Manigart et al., 2006), syndicate investments also incur costs due to the uncertainty about partners' expertise or principal-principal conflicts from misaligned goals (Casamatta and Haritchabalet, 2007; Meuleman et al., 2010; Wright and Lockett, 2003).Similarly, syndicate investments among IVCs and CVCs can be expected to result in both complementary and conflictory relationships (Keil et al., 2010; Masulis and Nahata, 2009).

5.2.1 Complementarity in value-added contributions

The resource-based view explains that firms build a sustainable competitive advantage depending on the resources and capabilities they possess (Penrose, 1959; Wernerfelt, 1984). The complementary resources and capabilities possessed or accessed by the firm also play a key role in benefiting from technological innovations and competitive advantages (Teece, 1986). Hence, firms are endeavoring to acquire complementary resources and capabilities through strategic alliances and M&As (Rothaermel, 2001). Although entrepreneurial firms have positive traits such as entrepreneurship, flexibility, and rapid response, which stimulate innovation, they often struggle with development, commercialization, innovation or even survival due to a lack of resources and capabilities (Baum et al., 2000). Thus, entrepreneurial firms utilize external cooperative relationships to complement their internal deficiencies or attract VC investments to not only benefit from financial supports but also non-financial value-added contributions (Baum et al., 2000; Gorman and Sahlman, 1989). For entrepreneurial firms, value-added from VCs could be another way to access complementary resources. In addition to financial investments, VCs provide entrepreneurial firms with value-added contributions like development and operations, personnel management, financial participation, and management selection which are complementary to entrepreneurial firms' capabilities (Hellmann, 2000; Sapienza, 1992). Accordingly, VC-backed firms are more likely to bring their products to the market faster (Hellmann and Puri, 2000) and

reach a successful exit (Gompers and Lerner, 2000). However, these value-added contributions to entrepreneurial firms are different depending on the characteristics of the VCs. VCs can be characterized by not only their fund size, investment experiences, and industries in which they specialize, but also their objectives and source of capital. IVCs and CVCs, which have different sources of capital, have clearly different characteristics, and thus provide distinct value-added contributions.

Due to the differences in knowledge, resources, capabilities, and social capital they possess, CVCs provide entrepreneurial firms with value-added different from IVCs (Alvarez-Garrido and Dushnitsky, 2016; Keil et al., 2010; Maula et al., 2005). CVCs can access and utilize key resources held by their parent corporations, such as R&D facilities, distribution channels, knowledge and experiences, and social capital on related technologies and markets (Chemmanur et al., 2014; Maula et al., 2005). Further, CVCs provide entrepreneurial firms with certification benefits, which can provide endorsement to the entrepreneurial firms and decrease the liability of newness (Stuart et al., 1999). However, CVCs have several shortcomings in value-added contributions, such as a sparse network with the financial sector that make it difficult to attract additional investments, the lack of deal making experiences, a limited recruiting pool of employees within the corporation (Maula et al., 2005), and weak incentives for value-added activities of CVCs due to the limited compensation schemes (Cumming and Johan, 2010; Gompers and Lerner, 2000). Hence, relying solely on CVC to invest in an entrepreneurial firm results in the lack of certain value-added contributions to the investee.

On the other hand, IVCs' characteristics and value-added contributions differ from those of CVCs (Gorman and Sahlman, 1989; Maula et al., 2005). Based on their numerous deal making experiences with other venture companies, IVCs can play the role of a coach, giving advice about managerial decisions and growth strategies suitable for entrepreneurial firms (Hellmann, 2000). The IVCs' strong and close relationships with the financial sector and venture communities also may facilitate the raising of additional capital and help to recruit potential key employees (Maula et al., 2005; Sapienza, 1992). However, the lack of deep industrial and technological understanding could limit their value-added to managerial consulting. Board members with no operating experience, such as pure financial investors, may be valued lower in terms of their managerial advice (Rosenstein et al., 1993).

Taken together, CVC and IVC respectively provide entrepreneurial firms with complementary value-added that helps entrepreneurial firms to build competitive advantage. Notably, CVC and IVC provide non-overlapping and "different but strongly complement" value-added contributions (Maula et al., 2005). That is, IVC provides "enterprise nurturing" value-added which is needed during the early growth of an entrepreneurial firm, while CVC provides "commerce building" value-added which is needed for product development, manufacturing, and sales (Maula et al., 2005). One of the strong motives for syndication in the venture capital investment is the improved value-added (Brander et al., 2002). Hence, entrepreneurial firms that have received investments from both CVCs and IVCs can access a balanced and complete set of value-

added that leads to the development of a competitive advantage and a successful exit (Teece, 1986). CVCs provide unique benefits to entrepreneurial firms that make them attractive as a syndication partner for IVCs (Keil et al., 2010). Therefore, the following hypothesis can be posed:

Hypothesis 5-1a*: A balanced share of CVC and IVC in the syndicate positively influences the investee's performance. In other words, there will be an inverted U-shaped relationship between CVCs' share of the total amount of investment within the syndicate and the investee's performance.*

5.2.2 Conflicts in operational control

Inter-organizational collaborations have been recognized as an efficient way to access each other's resources and capabilities and build up competitive advantage (Gulati, 1995b), but they also involve risks of not achieving desired outcomes or even losing competitive advantages (Lavie, 2007). Behaviors that pursue self-interest with deceit to achieve gains at the expense of the others cause partner opportunism in alliances (Das and Rahman, 2010). That is, agency costs are incurred in inter-organizational cooperation along with conflicts of interest among collaboration partners (Eisenhardt, 1989).

VC syndication can be considered as a kind of collaboration between firms, which is similar to equity joint ventures (Wright and Lockett, 2003). While VC syndication has benefits in improved selection, value-added, risk sharing, deal flow, and project size

(Brander et al., 2002; Lerner, 1994b), it also imposes agency costs which stem from conflicts and opportunism among syndicate partners who have different objectives (Wright and Lockett, 2003). Syndicate partners only can arrive at a decision through a process of renegotiation and reaching of collective agreements whenever they make an investment, provide managerial advices, or take action with respect to investee firms (Wright and Lockett, 2003). Undergoing a difficult and time-consuming renegotiation process, not only do syndicate partners suffer from complications and delays in decision-making but also the investees are negatively affected. In this situation of complications and conflict, shared ownership may bring about coordination problems among syndicate partners, while an imbalance in ownership may ease the complications and make decision-making less time consuming (Geringer and Herbert, 1989).

CVCs and IVCs invest considering their own often distinctive objectives. Financial returns are a fundamental objective of the investment and are used as an important performance index for IVCs. IVCs are seeking the grandstand such as faster growth of their investee firms and higher fund returns to demonstrate their ability to their potential limited partner investors (Gompers, 1996). On the other hand, CVCs, besides financial returns, also put emphasis on strategic objectives (McNally, 1997). With their strategic objectives, CVCs may be less preoccupied with the investee firm's success, and even in some cases, CVCs put pressure on the investee firms to pursue a technology agenda that is favorable to the parent corporation but would result in suboptimal financial returns (Katila et al., 2008).

The differences in the structure of CVC and IVC investments also manifest themselves in different investment, fund operation, time horizon, and exit strategies. Due to their structure in which a management company manages funds from partners for a pre-determined time period, an IVC fund has to conclude its investment activities, for example by exiting through an IPO, within a given timeframe (Bertoni et al., 2013). Hence, IVCs have higher discount rates than institutions and corporations, and design their optimal investment structure, time horizon, and exit strategy based on returns (Bayar and Chemmanur, 2011). On the other hand, CVCs are venture investment arms of established corporations in which fundraising activities may not be needed. CVCs are unconstrained by the fixed lifetime of a fund, thus having lower discount rates and longer investment time horizons (Guo et al., 2015; Large and Muegge, 2008). Moreover, the accumulated experiences of the parent corporation in production and innovation make the CVCs more tolerant to failure that result in a long-term investment perspective (Tian and Wang, 2014). Consequently, CVCs and IVCs have somewhat different properties with respect to funding operations and the time horizon, which may lead to conflicts related to investment and exit decisions. CVCs' strategic objectives could affect their syndication with IVCs and the allocation of control rights between them due to the possible conflicts of interest with both the entrepreneurs and other VCs (Masulis and Nahata, 2009).

In summary, while IVCs and CVCs collaborate as syndication partners, they may engage in the management of the investee firm guided by their own objectives and time plans. Hence, there is a possibility of conflicts among the syndicate partners that leads to

delayed decision-making and increasing coordination costs (Das and Rahman, 2010). The conflicts may get worse with shared equity ownership among syndicate partners rather than with imbalanced syndicates (Gaur et al., 2015; Geringer and Herbert, 1989). In that conflict situation, investees could have difficulties in obtaining the appropriate support and advice in time, and may not be able to deal with rapidly changing market environments. Therefore I can draw the following hypothesis:

Hypothesis 5-1b*: A balanced share of CVC and IVC in the syndicate negatively influences the investee's performance. In other words, there will be a U-shaped relationship between CVCs' share of the total amount of investment within the syndicate and the investee's performance.*

5.2.3 Trust relationship between syndicate partners

The trust between inter-organizational collaboration partners has been described and analyzed as a significant determinant of collaboration (Dyer and Singh, 1998). Trust not only reduces the possibility of opportunistic behavior (Ganesan, 1994; Hill, 1990), but also builds up cooperative relationships between partners that enhance the transfer of resources and know-how across the exchange interface (Kale et al., 2000; Zaheer et al., 1998). Trust can be built through repeated relationships between partners, which create an initial base of inter-partner trust. Accordingly, prior relationships enable partners to "have greater understanding of each other's needs and capabilities" and reduce "the hazards

associated with future transaction" (Gulati, 1995b).

In VC investment, where syndication frequently occurs, the social capital among VCs plays a significant role from the deal sourcing to the fund performance. Accordingly, VCs seek to syndicate with other investors who have good reputation, competence, or trust that have been built up through prior relationships (Sorenson and Stuart, 2008; Wright and Lockett, 2003). Trust among syndicate investors has an effect on both cooperative activities and opportunistic behavior. Due to mutual trust which has been built up through repeated interactions (Gulati, 1995b), participants form cooperative relationships, actively integrating their resources and capabilities and refraining from opportunistic behaviors (Kale et al., 2000). Hence, by combining and delivering complementary resources and capabilities, syndicate investment provides a better value-added contribution to entrepreneurial firms. Further, with reduced information asymmetries and behavioral uncertainty (Casciaro, 2003), syndicate partners will focus on the collective interest and not the individual strategic interest, in turn contributing to a better performance of the investee firms. Consequently, the prior co-investment experiences among syndicate partners, including IVC and CVC, will strengthen their complementarities while reducing conflicts. Therefore I postulate that:

Hypothesis 5-2*: Prior co-investment experiences among syndicate partners positively moderate the relationship between the share of each type of investment and the performance of the investee.*

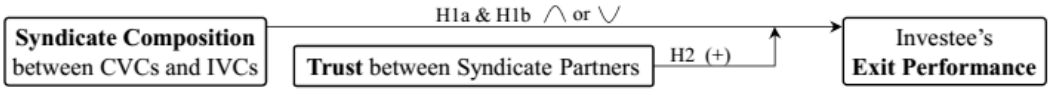

Figure 5-1 Conceptual model for Chapter 5

5.3 Methods

5.3.1 Data and sample

The data used in this paper have been extracted from the PE/VC module of the Thomson Reuters Thomson One database. The database provided the dates of entrepreneurial firm foundation, the dates of IPO, details of financing history, the VC types, co-investment experiences and industrial classifications. I constructed a sample of VC-backed U.S. firms which attracted their first VC investment from 2001 to 2010 and achieved IPO exit until 2014. The observation period was chosen to start with the end of the dot-com bubble, when the VC industry had shrunk back to about half of its peak after enjoying a sudden surge in the late 1990s. This was done since investments made during the late-1990s have raised questions about the rationality of the participating investors and less sophisticated contracts (Valliere and Peterson, 2004). While trade sales are another major exit route for VCs and VC-backed firms, IPO and trade sale to another company have differences in their characteristics, such as the motive of the entrepreneur, the maintenance of ownership, and subsequent exit strategies and contract terms

(Cumming and Johan, 2008; Giot and Schwienbacher, 2007). Considering the complexity of the research that takes all these circumstances into account, this study focused on the exit through IPOs. As the focus of this study is placed on syndicates among financial investors and strategic investors such as IVCs and CVCs, I classified investor types such as Bank Affiliated, Insurance Firm Affiliated, Investment Management Firm, Private Equity Firm, and Private Equity Advisor as financial investors (Hellmann et al., 2008), and the investor type of Corporate PE/Venture as strategic investors or CVCs. While bank affiliates or insurance firm affiliates are classified into captive VCs, their priority lies in building up financial relationships, and providing value-adding support is not their main concern (Hellmann et al., 2008). Investor types such as University Program, Government Affiliated Program, Angel Group, Individual, Endowment Foundation or Pension Fund, Incubator/Development Program, Service Provider, and Others were not considered in the analysis for their different nature and structure of investments (Sorenson and Stuart, 2008). The final sample consists of 188 VC-backed IPOs and 1963 VCs who invested into these entrepreneurial firms. Among these VCs, 237 are CVCs.

5.3.2 Dependent variable

This study adopts the IPO as an early-stage measure for the performance of entrepreneurial firms backed by syndicate investment. Since the conventional measures for firm performance such as revenue, growth, or profitability are not suitable to measure the performance of entrepreneurial firms, existing research has often used the IPO event

as a measure for performance in the early stage of entrepreneurial firms (Chang, 2004; Deeds et al., 1997; Stuart et al., 1999). Through the IPO, entrepreneurial firms can become known to the market, utilize multiple financing opportunities, gain legitimacy, raise capital, expand their businesses, and become publicly traded enterprises, therefore, the IPO event is considered as an important factor related to an entrepreneurial firm's performance early in its life. By selling equity to the public, entrepreneurial firms often generate much-needed capital as well as provide an opportunity to equity holders to exchange stock for cash. Venture capital firms typically wish to take entrepreneurial firms public as soon as possible to realize their profits and invest the proceeds in other entrepreneurial firms. Since a longer time to exit raises the opportunity costs for entrepreneurial firms (Jovanovic and Rousseau, 2001; Cumming and Johan, 2010), both entrepreneurial firms and VCs routinely wish to undertake IPO quickly. Therefore, the firm-level performance outcome that I examine here is the speed at which entrepreneurial firms undertake an IPO. To investigate the effects of the syndicate investment on entrepreneurial firms' performance, I used the *time to IPO* as the dependent variable, as measured by the months between the first VC investment and IPO exit.

5.3.3 Independent variables

Two independent variables are used in this study. The first independent variable, CVC share, is the *CVCs' share* of the total amount of investment within the syndicate. The syndicate, in a narrow sense, is defined as a co-investment within the same investment

round, but in a broader sense, is defined as a co-investment to a company indifferent to the time of investment (Brander et al., 2002). Following the broader definition, the ratio of the amount of total CVC investment to the total amount of investment within the syndication was measured as the CVC share variable. For example, a value of one means that the syndicate is composed entirely of CVCs. To figure out the relational characteristics among syndicate partners, I developed a second independent variable that measures the prior co-investment experiences (Gulati, 1995b). I defined the *co-investment experience* variable of each syndicate investment as the average number of deals that two VC firms out of the syndicate partners co-invested in the same company in the same year during the last five years.

5.3.4 Control variables

I included control variables that could affect the IPO of the investee into their model. For the investment-level controls, I included a measure of each investments' characteristics, such as total amount raised, number of rounds, syndicate size, and CVC lead investor dummy. The variable *total amount raised* measures the total amount (in million USD) raised from VCs until the IPO. This variable was log transformed. I expect that the more capital an entrepreneurial firm raises, the greater is the possibility that it will go public (Deeds et al., 1997). I controlled for overall principal-principal conflicts between syndicate partners. Partners with different objectives and time constraints give rise to principal-principal conflicts and increased monitoring costs (Dalziel et al., 2010; Hoskisson et al., 2002; Young et al., 2008). As the number of partners increases, their

variety might increase, leading to an increase in overall principal-principal conflicts. Hence, I included *syndicate size*, which is defined as the number of VC firms engaged in the focal investments, as a control variable. I also controlled for *number of rounds* of financing that the investee obtained.

Further, I captured the signaling effect of venture capital investment with two measures, syndicate partners' reputation and status (Jensen and Roy, 2008). The two terms, reputation and status, have been often used interchangeably to proxy the perceived quality of the firm, but developed in different fields and connote different aspects. Dimov and Milanov (2010) distinguished two concepts as follow: "While reputation is an economic concept that is closely coupled with the firm's past actions and track record, status is a sociological concept that captures a firm's social rank based on its external affiliations". Following and modifying the method used in Dimov and Milanov (2010), I measured the syndicate partners' reputation and status. I measured the *syndicate partners' reputation* relevant for its activity in year (t) as a composite of the syndicate partner's age in year (t), the total number of investments involved in during the last five years (t-5 to t-1), and the total number of companies exit through IPO which were backed by the syndicate partner during the last five years (t-5 to t-1). The composite reputation scores were based on standardized values for each components for each year, and I normalized the scores for each year across VC firms so that the lowest value in each year as the normalized value of zero and the highest one as the normalized value of one. Then, I averaged the normalized scores for all participating syndicate partners in a deal. To measure *syndicate partners' status*, I constructed a matrix of relationships between all VC firms in the Thomson One database for each year. For a matrix constructed for year (t),

each element (Rij) represented the number of times firms (i) and (j) had co-invested in the same company over the last five years (t-5 to t-1). Using Bonacich's (1987) centrality measure, I measured a VC firm's network status in year (t), and calculated a centrality score for each VC firm and each year and normalized the score (Dimov and Milanov, 2010; Podolny, 2001; Sorenson and Stuart, 2001). I averaged the status for all participating syndicate partners in a deal.

I also considered the general environment of the IPO market since these are taken into account by both entrepreneurs and VCs. The IPO market conditions are proxied using Ritter's (1984) index of hot issue market as a time-varying covariate (*market environment*). Ritter measured the degree of hot issue market as the difference between the offer price and the closing price on the first day of trading. Since the time-varying covariate was updated quarterly, I took the 3-month weighted average of the IPO first-day returns.

For the investee-level controls, I included the *industry dummy* as control variables. Follow the classification given in the Thomson One database, industries are classified as either Biotechnology, Communications and Media, Computer related, Medical / Health / Life Science, Semiconductors / Other Electronics, and Non-High Technology industries. Finally, for use in the hazard model, I control the months between the official establishment of the company and the first VC investment (*time to investment*).

5.3.5 Analysis

In this study, I used the time to IPO as a measure for investees' performance. Survival

analysis allows the efficient modelling of the time that it takes till the first event occurs. Following Stuart et al. (1999), Chang (2004), and Yang et al. (2011), the Cox proportional hazard model was used in this study (Cox and Oakes, 1984). The Cox proportional hazard model is a semi-parametric model that assumes a baseline hazard function without specifying its distribution, and estimates the effects of explanatory variables on the hazard of the event focusing only on time-ordering of observed events. The hazard rate that I can estimate from the Cox model is the conditional probability that the event occurs at a particular point in time and, in this study, is defined as the likelihood that a firm will go to IPO in each period. Thus from the model, I can estimate the influences of explanatory variables on the likelihood that a firm will go public in each period. A positive regression coefficient for an explanatory variable means that a higher positive value on that variable is linked to higher hazard rate of IPO events and thus a lower expected duration of time to IPO. Hence, in this study, positive coefficients imply shorter time to IPO that is, higher performance of the investee firms.

5.4 Results

Table 5-1 shows the descriptive statistics and correlation matrix of variables analyzed in this study. Of the investments, the mean value of CVC share is 0.081, with a maximum value of 0.520. Stand-alone investment of CVCs has not been observed in the sample of this research. It has been discussed in previous literature that CVCs usually invest in syndication with IVCs (Keil et al., 2010). Table 5-1 also shows the absence of strong correlation among the different variables.

Table 5-1 Descriptive statistics and correlation table

#	Variables	Mean	S.D.	Max	Min	1	2	3	4
1	CVC share	0.081	0.104	0.520	0.000				
2	Co-investment Experience	1.536	1.965	0.000	0.000	-0.088			
3	Time to Investment	22.734	25.078	136.000	0.000	0.020	-0.240		
4	No. of Rounds	8.126	3.309	21.000	1.000	-0.072	0.086	0.050	
5	Syndicate Size	10.676	4.189	24.000	3.000	0.149	0.003	-0.072	0.403
6	Market Environment	1.107	0.879	4.699	-0.066	-0.004	0.009	0.002	-0.001
7	Total Amount Raised	11.646	0.744	14.740	8.949	-0.035	0.190	-0.096	0.475
8	Syndicate Partners' Reputation	0.171	0.115	1.000	0.016	-0.068	0.349	-0.220	-0.093
9	Syndicate Partners' Status	0.118	0.079	0.470	0.000	-0.068	-0.136	0.478	-0.235
10	Communications and Media	0.097	0.296	1.000	0.000	-0.007	0.015	0.009	-0.095
11	Computer Related	0.265	0.441	1.000	0.000	-0.147	0.178	0.003	-0.031
12	Medical/Health/Life Science	0.189	0.392	1.000	0.000	0.023	-0.071	-0.001	-0.055
13	Semiconductors/Other Electronics	0.029	0.167	1.000	0.000	0.234	-0.065	-0.084	-0.022
14	Non-High Technology	0.015	0.123	1.000	0.000	0.032	-0.080	0.008	-0.042

The table depicts the descriptive statistics for all variables. For the full sample there are 188 observations.

Table 5-1 (continued)

#	5	6	7	8	9	10	11	12	13
1									
2									
3									
4									
5									
6	0.010								
7	0.486	-0.029							
8	-0.090	-0.011	0.208						
9	-0.177	-0.197	0.091	0.695					
10	0.005	0.000	-0.031	0.009	0.073				
11	-0.201	-0.021	0.022	0.172	0.281	-0.196			
12	-0.105	0.022	-0.113	-0.046	-0.057	-0.159	-0.286		
13	0.124	0.005	-0.044	0.066	0.033	-0.057	-0.103	-0.083	
15	-0.101	-0.016	0.008	-0.107	-0.092	-0.041	-0.075	-0.060	-0.022

Table 5-2 Maximum likelihood estimation of Time-to-IPO

Variables	Model 1	Model 2	Model 3
CVC share		-0.696	-4.954***
		(0.839)	(1.867)
(CVC share)^2			13.612***
			(5.041)
Co-investment Experience			
(CVC share) X (Co-investment Experience)			
(CVC share)^2 X (Co-investment Experience)			
Time to Investment	-0.000	-0.000	-0.001
	(0.003)	(0.003)	(0.003)
Number of Rounds	-0.117***	-0.119***	-0.122***
	(0.031)	(0.031)	(0.031)
Syndicate Size	-0.013	-0.010	-0.007
	(0.024)	(0.025)	(0.025)
Total Amount Raised	0.276**	0.272*	0.297**
	(0.140)	(0.140)	(0.142)
Syndicate Partners' Reputation	-1.512	-1.514	-1.520
	(1.095)	(1.090)	(1.092)
Syndicate Partners' Status	2.046	2.044	2.029
	(1.434)	(1.431)	(1.428)
Market Environment	0.006***	0.007***	0.006***
	(0.001)	(0.001)	(0.001)
Communications and Media	-0.102	-0.107	-0.144
	(0.281)	(0.282)	(0.283)
Computer Related	0.129	0.114	0.081
	(0.210)	(0.211)	(0.212)
Medica/Health/Life Science	0.116	0.128	0.087
	(0.217)	(0.218)	(0.220)
Semiconductors/Other Electronics	0.175	0.272	0.047
	(0.476)	(0.489)	(0.505)
Non-High Technology	0.550	0.621	0.704
	(0.543)	(0.549)	(0.548)
Log likelihood	-749.487	-749.133	-746.018

Standard errors are in parentheses. Total of 4828 spells and 188 events (IPOs).
*, **, *** denotes significance at the 10 percent, 5 percent or 1 percent level, respectively

Table 5-2 (continued)

Variables	Model 4	Model 5	Model 6	Model 7
CVC share	-5.325***	-5.944***	-5.599***	-6.471***
	(1.897)	(2.111)	(1.979)	(2.395)
(CVC share)^2	14.631***	15.261***	14.633***	16.671***
	(5.109)	(5.264)	(5.196)	(6.003)
Co-investment Experience	-0.047	-0.058	-0.053	-0.064
	(0.045)	(0.048)	(0.047)	(0.051)
(CVC share) X (Co-investment Experience)		0.275		0.885
		(0.397)		(1.373)
(CVC share)^2 X (Co-investment Experience)			0.617	-1.910
			(1.183)	(4.162)
Time to Investment	-0.001	-0.001	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Number of Rounds	-0.119***	-0.123***	-0.121***	-0.126***
	(0.031)	(0.031)	(0.031)	(0.032)
Syndicate Size	-0.007	-0.008	-0.007	-0.008
	(0.025)	(0.025)	(0.025)	(0.025)
Total Amount Raised	0.309**	0.310**	0.309**	0.312***
	(0.141)	(0.142)	(0.142)	(0.142)
Syndicate Partners' Reputation	-1.557	-1.630	-1.603	-1.653
	(1.075)	(1.084)	(1.083)	(1.081)
Syndicate Partners' Status	2.659*	2.660*	2.645*	2.712*
	(1.537)	(1.534)	(1.538)	(1.531)
Market Environment	0.007***	0.007***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Communications and Media	-0.139	-0.132	-0.134	-0.132
	(0.283)	(0.284)	(0.284)	(0.284)
Computer Related	0.083	0.066	0.076	0.051
	(0.212)	(0.213)	(0.212)	(0.216)
Medica/Health/Life Science	0.072	0.056	0.067	0.036
	(0.220)	(0.221)	(0.220)	(0.226)
Semiconductors/Other Electronics	0.010	0.018	0.010	0.036
	(0.508)	(0.508)	(0.509)	(0.509)
Non-High Technology	0.642	0.683	0.669	0.691
	(0.551)	(0.553)	(0.553)	(0.553)
Log likelihood	-745.450	-745.222	-745.322	-745.114

Table 5-2 shows the results from the Cox proportional hazard model. Model 1 is the baseline model which includes the control variables. Among these control variables, total funded amount and market environment have a significant positive effect on the hazard rate of IPO events. The coefficient estimate implies that each $1million in additional venture funding multiplies the baseline rate by a factor of 1.32 (Exp(0.276)). These results are consistent with prior research which suggested that entrepreneurial firms experience more successful IPO exit when they raised bigger capital or underwent IPO in a hot market environment (Deeds et al., 1997; Giot and Schwienbacher, 2007).

Models 2 and 3 examine Hypothesis 5-1. The variable, CVC share, and its square are independent variables in these models. The results of Model 3 show that the coefficient of CVC share is negative and significant (β=-4.954, p-value<0.05). That is, the larger the CVC share, the lower the hazard rate which implies a longer time to IPO. The coefficient of the square term is positive and significant (β=13.612, p-value<0.05), showing the U-shaped relationship between the CVC share and the hazard rate of IPO event. The estimated turning point is at 18.2% of the CVC share. The estimation implies that when a firm A was funded by a syndicate with a CVC share of 20% and firm B was funded by a syndicate with no CVC participation, the hazard rate of IPO for firm B is 1.56 times higher than that for firm A. Thus, Hypothesis 5-1a is not supported, while Hypothesis 5-1b, which predicted that a balanced syndication between CVCs and IVCs will increase the investee's time to IPO exit, is supported.

In Models 4 through 6, I test Hypothesis 5-2 which focuses on the moderation effect

of co-investment experience between VCs on the main effect of Hypothesis 5-1. However, all the coefficients of the direct effect and moderation effects of the variable co-investment experience are insignificant. These results imply that the co-investment experience among syndicate partners neither has an impact on the duration before the IPO nor moderates the delaying effect caused by the presence of different types of VC in the syndicate investment. Consequently, the results do not support Hypothesis 5-2 which predicted that the co-investment experience between VCs reduces the conflict described in Hypothesis 5-1b.

Finally, the full model provides consistent results in which Hypothesis 5-1b is supported but Hypothesis 5-2 is not. In the full model, the estimated turning point is at 19.4%, showing a similar result as the one from Model 3. Both estimated turning points lie well within the range of the sample (Haans et al., 2015).

To grasp the overall picture relating to IPO and compare it with other studies, I additionally performed an analysis using another performance measure, the pre-money valuation of investees at IPO.[5] The pre-money value of an investee at IPO was measured as:

[5] Prevalent measures of IPO performance are based on the amount of money obtained by a firm at the IPO (Higgins et al., 2011; Useche, 2014), the pre-money valuation of the firm (Higgins and Gulati, 2003; LiPuma, 2012; Stuart et al., 1999), the age of the venture at IPO (Chang, 2004; Stuart et al., 1999; Yang et al., 2011), the valuation multiples (Ritter and Welch, 2002), or Tobin's Q (Bonardo et al., 2011; Useche, 2014). Among these, my dependent variable is the pre-money valuation of the firm at IPO. This is the firm's market valuation less the proceeds to the firm as a result of the IPO. Therefore, the pre-money valuation at IPO is the market valuation of the firm just preceding the first day of trading. Pre-money valuation is independent of the amount invested in the venture during the current IPO financing round, and is a more appropriate measure than post-money valuation (Lerner, 1994a).

$$V = p_{offer} (q_{total} - q_{offer}),$$

where p_{offer} is the IPO offer price, q_{total} is the total number of shares outstanding, and q_{offer} is the number of shares offered in the IPO (Stuart et al., 1999). The variable was log transformed. In unreported models with another valuation measure, based on the first-day closing price and the total number of shares outstanding, I observed results similar to those presented here. I used OLS to estimate the valuation models, and control for possible selection bias by using Lee's (1983) generalization of Heckman's (1979) two-stage estimator by generating a sample correction variable lambda and including it in the OLS models. Table 5-3 presents the results from the OLS estimation of the log of market value of investees at IPO. The results of the full model show that the coefficient of CVC share is negative and significant (β=-3.415, p-value<0.05), and that the coefficient of the square term is positive and significant (β=9.286, p-value<0.01). These results imply that CVC share has a U-shaped relationship with the market capitalization of the investees at IPO. The estimated turning point is at 18.4% of the CVC share, which is similar to the results presented in Table 5-2. However, the difference value between the minimum point and the zero CVC share point is quite small.

Overall, balanced syndication between CVCs and IVCs has a discouraging effect on investees' IPO exit, i.e., it delays the IPO exit and decrease market capitalization at the investees' IPO exit.

Table 5-3 OLS estimates of the log of market value of investees at IPO

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Independent variables							
CVC share		0.484	-2.013	-1.879	-2.874*	-2.3107	-3.415**
		(0.534)	(1.350)	(1.348)	(1.507)	(1.400)	(1.698)
$(\text{CVC share})^2$			7.114**	6.702*	7.788**	6.671*	9.286***
			(3.539)	(3.536)	(3.602)	(3.533)	(5.026)
Co-investment Experience				0.050	0.030	0.040	0.022
				(0.033)	(0.036)	(0.034)	(0.038)
(CVC share) X (Co-investment Experience)					0.425		0.990
					(0.292)		(0.863)
$(\text{CVC share})^2$ X (Co-investment Experience)						0.982	-1.776
						(0.866)	(2.556)
Control variables							
Total Amount Raised	0.811***	0.814***	0.828***	0.824***	0.830***	0.828***	0.832***
	(0.093)	(0.093)	(0.093)	(0.092)	(0.092)	(0.092)	(0.092)
Number of Rounds	-0.038*	-0.035*	-0.040*	-0.045**	-0.049**	-0.046**	-0.051**
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.022)
Syndicate Size	-0.022	-0.024	-0.019	-0.021	-0.020	-0.020	-0.020
	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Syndicate Partners' Reputation	0.639	0.589	0.604	0.634	0.510	0.576	0.451
	(0.656)	(0.659)	(0.653)	(0.651)	(0.654)	(0.653)	(0.661)
Syndicate Partners' Status	-0.666	-0.551	-0.641	-1.202	-1.265	-1.311	-1.152
	(1.011)	(1.020)	(1.012)	(1.074)	(1.071)	(1.077)	(1.085)
Market Environment	0.050	0.049	0.051	0.043	0.047	0.046	0.047
	(0.046)	(0.046)	(0.045)	(0.046)	(0.045)	(0.046)	(0.046)
Investee Age	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Communications and Media	0.846***	0.854***	0.849***	0.848***	0.876***	0.869***	0.876***
	(0.206)	(0.206)	(0.205)	(0.204)	(0.204)	(0.205)	(0.205)
Computer Related	1.394***	1.405***	1.411***	1.394***	1.386***	1.397***	1.369***
	(0.144)	(0.144)	(0.143)	(0.143)	(0.142)	(0.143)	(0.145)
Medica/Health/Life Science	-0.029	-0.029	-0.045	-0.041	-0.048	-0.039	-0.061
	(0.148)	(0.148)	(0.147)	(0.147)	(0.146)	(0.146)	(0.148)
Semiconductors/Other Electronics	1.164***	1.106***	1.069***	1.089***	1.092***	1.086***	1.102***
	(0.343)	(0.349)	(0.347)	(0.345)	(0.344)	(0.345)	(0.345)
Non-High Technology	0.588	0.586	0.623*	0.678*	0.686*	0.686*	0.682
	(0.382)	(0.383)	(0.380)	(0.380)	(0.379)	(0.380)	(0.379)
Lambda	-1.103	-1.060	-0.896	-1.001	-0.981	-0.996	-0.964
	(1.006)	(1.007)	(1.002)	(1.001)	(0.997)	(1.000)	(0.999)
Constant	9.936***	9.873***	9.742***	9.807***	9.826***	9.816***	9.836***
	(0.978)	(0.981)	(0.975)	(0.972)	(0.969)	(0.972)	(0.971)
R-squared	0.591	0.593	0.603	0.608	0.613	0.611	0.614

Standard errors are in parentheses; 188 IPOs.
*, **, *** denotes significance at the 10 percent, 5 percent or 1 percent level, respectively

5.5 Discussion

The objective of this study was to investigate the effects of CVC and IVC syndicate investments with varying compositions on the investee firms. The syndicate investment among different types of VCs, who have not only different objectives and time horizons, but also different resources and capabilities which, depending on the point of view, makes the relationships between them either complementary or conflicting. By analyzing 188 VC-backed IPOs, I was able to empirically verify the following effects.

First, the CVCs' participation in the syndicate investment delays the investees' IPO exit. As seen in Model 3 of Table 5-2, which tests the effect of the CVC share and its squared variables, the CVC share of investment in the syndicate exhibits a curvilinear relationship with the hazard rate of an IPO event of the investee firm. In other words, a more balanced equity ownership between IVCs and CVCs delays the investees' IPO, whereas an imbalanced equity ownership may provide a faster IPO exit for investees. This result shows that the syndicate investments among CVCs and IVCs are affected more by conflicts originating from their different motives rather than by positive effects from the complementary value-added contributions. This finding differs from those found in Cumming and Johan (2010), but corresponds well with the recent results found in the theoretical and empirical study of Guo et al. (2015). In prior studies on syndicate investments among CVCs and IVCs, it was revealed that CVC participation in a syndicate has a positive effect on the performance of the investee as measured by its

valuation at the time of IPO (Ivanov and Xie, 2010; Maula and Murray, 2002). However, these studies differ from my approach in the definition of performance, which I define as the time to IPO, and in general have not clarified the conflict between syndicate partners and resulting delays to the IPO exit. A more recent study by Colombo and Murtinu (2016) found evidence that in terms of impact on total factor productivity (TFP), conflicts in mixed IVC-CVC syndicates hamper portfolio companies compared to IVC-only or CVC-only investments. In addition, Colombo and Murtinu (2016) found evidence on the dynamics of the TFP impact of CVC-only investments which supports the view that CVC investors are more patient investors than IVCs. Meanwhile, current results also indicate that investees with an imbalanced composition of investors could gain more market capitalization. This result is consistent with research findings of previous research (Stuart et al., 1999). Delays to IPO exit would only increase the opportunity costs for both the entrepreneurs and VCs (Jovanovic and Rousseau, 2001).

Second, the trust relationship between syndicate partners has no influence on reducing the conflicts occurring within the syndicate and improving the performance of the investees. The relational characteristics between the syndicate partners neither have a direct positive effect on the hazard rate of IPO event (Model 4 in Table 5-2), nor do they moderate the relationship between the share of each type of investment and the hazard rate of the IPO event (Models 5 and 6 in Table 5-2). These results imply that the trust built up through prior co-investment experiences between syndicate partners does not affect the likelihood of opportunistic behavior and conflicts among them. However, these

results are inconsistent with previous studies that have consolidated the role of trust in inter-organizational relationship (Dyer and Singh, 1998; Hill, 1990; Zaheer et al., 1998). Prior literature has shown that trust can constrain the opportunistic behaviors of the collaboration partners (Ganesan, 1994), and trust-based relationships facilitate the transfer and integration of knowledge and information across boundaries (Kale et al., 2000). There are a few explanations that can account for these inconsistence. First, while prior relationships between partners create an initial base of inter-partner trust, there is also a downside of repeated interactions. Interactions between partners beyond the first few might provide diminishing amounts of information to the partners (Gulati, 1995a). Further, repeated ties with the same partners could lead to an inadequate monitoring and the adoption of suboptimal routines developed during prior relationships (Khanna, 2007). In light of these concern, I additionally extend and test the model with the co-investment experience variable and its squared term (these results are not reported in this paper). However, I could not find any significant relationships between prior interactions among syndicate partners and the hazard rate of the IPO event. Prior literature on IPOs, on the other hand, could provide another explanation for the inconsistent finding (Baker and Gompers, 2003; Campbell and Frye, 2009; Chemmanur et al., 2011; Suchard, 2009). Prior studies have shown that firms with effective corporate governance and independent boards have a higher probability of successful exit through IPO (Baker and Gompers, 2003; Campbell and Frye, 2009). In that sense, a trust-based relationship among insiders including syndicate VC partners could raise concerns about an inadequate monitoring and

possible moral hazard (Arthurs et al., 2008; Khanna, 2007; Tomkins, 2001). The trade-off between trustworthy relationship among insider VCs and board independence needs to be further considered with respect to the impact on the exit through IPO (Arthurs et al., 2008). Meanwhile, partner's reputation or social status may suggest a possibility of an alternative way of measuring trust. Partner's reputation or social status, which are built over time, are used to judge the quality of the partner (Jensen and Roy, 2008), and are providing a foundation of trust (Glückler and Armbrüster, 2003; Michell et al., 1998; Rousseau et al., 1998). Considering a high degree of network connectivity within the VC industry due to the frequent nature of syndicate investments, VCs having good reputation or taking important network positions are to be considered trustworthy (Glückler and Armbrüster, 2003; Meuleman et al., 2010; Sorenson and Stuart, 2008). However, the quality of the investors, judged by their reputation or social status, also provides a signal of quality of the investee to the market, which influences the exit through IPO (Krishnan et al., 2011; Nahata, 2008). Hence, using the reputation or status as a trust measure might result in a misleading interpretation. Further discussions are needed to determine an appropriate measure for trust among syndicate partners and to overcome the issue of interplay between trust among insiders and concerns by outsiders.

The results of this study provide managerial implications to both entrepreneurs and VCs. First, this study points out to entrepreneurs that when accepting VC funding, syndicate composition must be considered in view of the entrepreneurs' planned exit. The participation of different types of investors, especially in a balanced composition, results

in conflicts and was shown by this study to increase the investees' time to IPO exit. At the same time, it is known to also affect the valuation at exit. It is vital for entrepreneurs to understand the differences between the VC types, especially their motivations and possible contributions to an entrepreneurial firm's performance either in exit size or timing. Second, IVC and CVC investors also must understand each partner's characteristics related to their plans and exit strategies in order to assemble a syndicate as objectives need to be aligned and exit strategies must be discussed ahead of time. Although the different types of partners such as CVCs or IVCs who have unique, different and complementary resources are perceived as attractive partners (Keil et al., 2010), the syndication among them provides sources of conflicts. For VCs, some insights from this study can provide a guideline for predictions about the exit strategies and their post-investment activities (Gerasymenko and Arthurs, 2014).

Chapter 6. Conclusive remarks

6.1 Summary and contributions

In conclusion, this dissertation contributes to a better understanding of corporate venture capital (CVC) and its syndicate investments. CVC is broadly adopted as a tool for external search and innovation, but previous research has left gaps in the understanding of how CVCs syndicate their investments and how this syndication influences the investment outcomes. This dissertation provides the following key contributions and implications:

First, this dissertation addresses a gap in the research on syndicate investments of CVCs. While most CVC investments take place in syndicates, prior studies that examined CVC investments from the perspective of corporations have put little focus on the syndicate investment itself. Only a few studies have examined the characteristics and determinants of CVC syndicate investment while taking their strategic context into account (Anokhin et al., 2011). The empirical results of Chapter 3 indicate that CVC investors invite syndicate partners based on their strategic considerations. CVCs show a preference for partners who are specialized in the investee's industry, but are reluctant to engage with influential investors who can constrain the CVCs' strategic returns. Chapter 4 finds that syndicate partners negatively influence the knowledge transfer from the

investees to the CVC's parent corporation. An explanation can be given in that syndicate partners may attempt to curb CVC's opportunistic behavior which hinders the knowledge flows to the CVC's parent corporation (Hallen et al., 2014; Masulis and Nahata, 2009). The information exchange paradox (Anokhin et al., 2011) also provides a possible explanation as to why participating in a syndicate network may involve losses that outweigh the gains. The findings of Chapter 5 show that a more balanced equity ownership between CVCs and IVCs delays the investee's IPO. This result also provides evidence that syndicate investments among CVCs and IVCs are affected by conflicts originated from their different motives and structure, which is consistent with a recent study of Colombo and Murtinu (2016). Overall, these findings suggest that firms need to be aware of the syndication in their CVC investments, especially with respect to its potential influence on the investment performance, and utilize it appropriately.

Second, this dissertation reveals that the rationale behind the syndicate investments of CVCs relies on agency theory, specifically principal-principal conflicts, rather than the resource-based view and resource complementarities. While Chapter 3 proposes benefits from syndicate investments based on the rationale of resource complementarity, the overall results of Chapters 3, 4, and 5 indicate that the costs outweigh the benefits of syndicate investments of CVCs due to possible conflicts with syndicate partners. Thus, adding to prior studies that have examined principal-principal conflicts in the context of international joint ventures and board composition (Bruton et al., 2010; Dalziel et al., 2011; Filatotchev et al., 2006; Hoskisson et al., 2002; Yan and Gray, 2001; Young et al.,

2008), research on CVC syndicate investments could provide an appropriate context for the study of principal-principal conflicts. CVC activities and their syndicate investments have been explained through diverse theoretical lenses, such as financial perspective, resource-based view, relational theory, and network theory. Hence, through a comprehensive approach that integrates the CVC context with insights from diverse theories, including principal-principal conflicts, research on CVC syndicate investments will help to provide a better understanding and insights on partner selection, knowledge transfer, and overall performance.

Third, for companies that use CVC investment strategies, the results suggest ways to utilize syndicate investment. This dissertation confirms that syndicate investments do affect CVC activities and their resulting outcomes. The results of Chapter 3 suggest that it is necessary to work with partners with expertise in specific fields, while avoiding influential partners who can constrain the CVC's control over the management of the investees. The results of Chapter 4 propose that when learning distant technologies through CVC investments, the size of the syndicate should be limited. The results of Chapter 5 also suggest that it is better to form an imbalanced equity ownership among syndicate partners. In addition, depending on their purpose, companies need to operate their CVC units internally or externally. In the context of exploring distant technologies, internal CVC units can facilitate organizational learning. However, as there is a limit to efficient operation and autonomy, it is necessary to utilize an external CVC unit when seeking diverse targets. Alternatively, companies can operate CVC units both internally

and externally to ensure the effectiveness and diversity of investments.

Fourth, this dissertation provides implications for VCs. To syndicate with CVC investors, VCs need to possess characteristics that CVCs prefer. The results indicate that specializing in a specific industry, rather than diversifying is advantageous to syndicate with CVCs. VCs can improve their quality of investments by leveraging syndicate investments while enhancing their expertise (Norton and Tenebaum, 1993). Meanwhile, syndicate investments with CVCs can provide both gains and pains. Hence, when syndicating investment with CVCs, firms need to consider cooperation and conflicts together.

Last, this dissertation provides suggestions for VC and CVC investors, and CVC research in Korea. VC investors can complement each other's resources and capabilities through syndicating their investments, thus increasing investment efficiency and performance. However, in Korea, systematic information on VC investments is limited, and analysis and research on syndicate investment are rarely conducted. In particular, the status of CVC investors is not clearly understood, and only a limited number of studies have addressed CVCs (Kim et al., 2011). Unlike the U.S. National Venture Capital Association, which regularly reports statistics on CVCs, the Korea Venture Capital Association does not distinguish CVCs from other VCs, making it difficult to get a comprehensive understanding. To stimulate CVC investments and syndicate investments in Korea, the following can be suggested: First, public agencies such as KVCA or K-VIC need to define and list CVCs separately. Then, in order to survey the current status, it is

necessary to conduct an investigation to identify CVC investors. Last, there is a need to expand opportunities for VC investors, including CVC investors, to interact, exchange information, collaborate, and syndicate their investments.

In addition to the aforementioned overall contributions, each chapter of this dissertation provides contributions corresponding to their findings: Based on the findings of Chapter 3, this dissertation provides a number of contributions to the literature on inter-organizational relationship and CVC. First, Chapter 3 sheds light on the role of CVCs in leading VC syndicate investments. While CVC investments already account for about 10 to 15 percent of the total VC investments in the U.S. market and are of growing importance to the VC industry (National Venture Capital Association Yearbook, 2016), prior literature has regarded CVCs in syndicates only as passive investors (Hellmann, 2002; Masulis and Nahata, 2009). As more and more companies adopt CVC investments as part of their innovation strategy, the role and importance of CVCs in the VC industry is changing (Ernst & Young, 2010; MacMillan et al., 2008; Von Krogh et al., 2012; NVCA Yearbook, 2015). To the best of my knowledge, this study is the first to analyze the strategic objectives influencing CVC lead investors' partner selection. Second, Chapter 3 also contributes to the general VC literature. Existing studies have mainly focused on the motives for syndication and its beneficial impacts on the performance (Brander et al., 2002; Lerner, 1994; Manigart et al., 2006). Recent research suggests, however, that syndicate formation and partner selection decisions are partly influenced by the

underlying principal-principal conflicts and power dynamics among syndicate partners (Wright and Lockett, 2003; Zhang and Guler, 2015). This study extends perspective on syndicate investments further by identifying the importance of conflicts and power dynamics among syndicate partners.

I believe the contributions of Chapter 4 to be as follows: First, Chapter 4 aims to contribute to shifting the focus of research on external learning from pursuing efficiency or the optimum to distant search and novel recombination. Prior literature has demonstrated that firms are better able to understand and acquire external knowledge when they have related knowledge, a large knowledge overlap, or technological similarity (Ahuja and Katila, 2001; Dushnitsky and Lenox, 2005; Gompers and Lerner, 2000; Mowery et al., 1998). However, literature has given less attention to understanding how to overcome the distance and facilitate novel recombination. Only a limited number of studies have suggested factors, such as cumulative technological capital and a broad technological knowledge base, that facilitate knowledge transfer and organizational learning in distant search (Nooteboom et al., 2007; Zhang, 2016). Sourcing distant knowledge and forming new combinations from it is fundamental to producing path-breaking innovations or enabling the transition from a routinized to a new technological paradigm (Fleming, 2001; March, 1991; Nelson and Winter, 1982). By shifting the focus away from the conventional issue of identifying the optimum to a fundamental issue of external search and innovation, Chapter 4 complements and addresses an existing gap in the literature on organizational learning and innovation. Second, Chapter 4 contributes to

the increasing literature on external search by emphasizing the role of CVC investment as an increasingly employed avenue for distant search. Most prior empirical studies on external knowledge search have investigated search behavior using inter-organization alliances (Gilsing et al., 2008; Nooteboom et al., 2007; Rosenkopf and Almeida, 2003; Zhang et al., 2016). As an alternative way of accessing external knowledge, CVC investments allow incumbents to take cognizance of technological trends and future capability needs, and to gain novel technological knowledge that would not be accessible by local search (Benson and Ziedonis, 2009; Keil et al., 2008; Van de Vrande et al., 2013). Hence, research on CVC investment and its resulting search and learning outcomes provides an appropriate context for the study of external knowledge search. By combining the CVC context and theories on external knowledge search research, Chapter 4 complements and extends the literature on both external knowledge search and CVC investments.

Chapter 5 makes two contributions to the research on entrepreneurial finance and IPO. First, Chapter 5 contributes to the increasing literature on entrepreneurial finance. Prior research on VCs classified the types of VCs and mainly focused on the characteristics and the differences of financial and strategic investors (Alvarez-Garrido and Dushnitsky, 2016; Gompers and Lerner, 2000; Hellmann, 2002; Ivanov and Xie, 2010; Maula et al., 2005). However, prior studies did not pay much attention to syndicate investment among different types of investors such as IVCs or CVCs. By analyzing the syndicate investment of IVCs and CVCs and its impact on the performance of the investee, Chapter 5

complements and addresses an existing gap in the literature on entrepreneurial finance and IPO. Second, Chapter 5 contributes to explaining the VC investment phenomenon thorough diverse theoretical lenses. Complementing prior studies that mainly focused on financial perspectives such as investment and return (Gompers, 1996), Chapter 5 deals with various theoretical perspectives on strategy, including the resource-based view, agency theory, and the relational view, in explaining the nature and influences of syndicate investment among IVCs and CVCs. Through a comprehensive approach, Chapter 5 sheds light on principal-principal conflicts among syndicate partners and contributes to the research on partner conflict and its consequences in the context of entrepreneurial finance.

6.2 Limitations and future research

While making valuable contributions to the research on CVC and its syndicate investments, this dissertation has a number of limitations that might be addressed in future research:

First, a limitation stems from the use of a broad definition of syndicate in the empirical studies of Chapters 4 and 5. A syndicate, in a narrow sense, is defined as a co-investment within the same investment round, but in a broader sense, is defined as a co-investment to a company indifferent to the time of investment (Brander et al., 2002). Therefore, detailed information on the syndicate composition in each round, the order of

VC investment participation, and the stage of VC investment participation could not be included in the analysis. Additionally, while this dissertation analyzed the effects of syndicate size in Chapter 4 and syndicate composition in Chapter 5, also the effects of other factors used in prior studies to characterize syndication could be examined in future studies. Such factors can be investment round and stage, geographic distribution, lead-follow investors, complementarity between syndicate partners, conflicts among syndicate partners, trust relationships, or syndicate network position. Hence, it is expected that a more detailed investment data set would potentially reveal more interesting effects and relationships.

Second, similar to prior literature, this dissertation also treats CVCs as a homogeneous group sharing similar characteristics and objectives. However, in practice, one can argue that CVCs are heterogeneous, as each CVC possesses different resources, capabilities, and organization structure. Further, depending on the parent corporations' reason for investment, i.e., strategic and/or financial objectives, CVCs follow different strategies in organizing their investment portfolios. For example, Microsoft Venture, the venture investment arm of Microsoft, is focused on the strategic objectives of exploring and investing in entrepreneurial firms that can become strategic partners. Meanwhile, Softbank Capital, the venture investment arm of Softbank, invests mainly for financial returns and has an investment portfolio similar to independent VCs (Corporate Venture Capital Forum, 2014). In addition, the strategic objectives of CVC investment can be divided into various goals such as providing a window on technology and market intelligence, development of strategic relationships, leveraging of corporate assets, and

new product development (Battistini and Baschera, 2013; Maula, 2001). Therefore, depending on the individual investment, the CVC and the partner corporate may pursue different strategic goals. Accordingly, the criteria for partner selection can be changed (Chapter 3), or there may be differences in cooperation and conflict with their syndicate partners.

Previous studies, including this dissertation, have focused on CVC's objectives toward external search in general, and investigated the learning and innovation performance of CVC investments (Dushnitsky and Lenox, 2005; Ernst et al., 2005). Other research examined strategic alliance formation after a CVC investment (Van de Vrande and Vanhaverbeke, 2013), but neither distinguishes the objective of each investments. This common limitation of CVC studies arises from the fact that most of research on CVC relies on the same secondary data, the VentureXpert database. While using secondary data allows to access and analyze a wide range of information, it limits the set of variables, details of each investment, and the tacit nature of measures. To overcome this limitation and discern distinct characteristics of CVCs, future studies should utilize approaches based on surveys or in-depth interview methods.

Third, this dissertation did not further develop the discussion of how to minimize potential conflicts between syndicate partners and how CVCs develop complementary relationships with other VCs and entrepreneurial firms in the entrepreneurial ecosystem. If, while CVCs maintain a complementary relationship with syndicate partners, both parent corporate and entrepreneurial firms could achieve their own growth and innovation, it would be beneficial to all participants in a deal. Prior literature has suggested that trust

and control are the two principal factors reducing risk in inter-organizational collaborations (Das and Teng, 1998, 2001; Fryxell et al., 2002; Inkpen and Currall, 2004; Lin and Germain, 1998). In that sense, in Chapter 5, I examined the moderating effect of trust between CVCs and IVCs on exit performance, but the result shows that the trust relationship between syndicate partners has no influence on reducing the conflicts. Nonetheless, I believe that there are still undiscovered factors that may promote complementary relationships between CVCs and other players in the entrepreneurial ecosystem.

In addition to the overall limitations, the three empirical studies in Chapters 3, 4, and 5 also have some limitations that will require future research to overcome.

Relating to Chapter 3, I only considered the perspective of the CVC lead investors', excluding the other perspectives of the syndicate participating members including the entrepreneurs and the non-lead investors. Though lead investors hold a meaningful equity ownership and decision-making power (Wright and Lockett, 2003), syndicate partner selection would be a result of the negotiation and the agreement between the investees and lead investors. Moreover, I have no information on whether the non-realized ties are the results of not being invited to the syndicate or other causes. Unfortunately, data describing the entrepreneurs' perspectives and the decisions of the invited investors are quite limited, and feasible methodological approaches addressing these interdependencies are obscure. Future research should add the perspectives and characteristics of the entrepreneurs and the invited investors to complement the understanding of the partner selection in CVC-lead syndicates.

In addition, on the assumption that the lead investor usually initiates the deal and has the largest amount of money at stake, I identified 48 CVC-led syndicate investments which represent only a minor portion of the total CVC investments. This small sample size could undermine the reliability of research findings obtained in this study due to low statistical power. However, in the changing face of CVC investments and their role in the syndicate investments (Ernst & Young, 2010; MacMillan et al., 2008; Von Krogh et al., 2012; NVCA Yearbook, 2015), the results of this study can help provide an understanding of how CVCs make strategic investment decisions. The number of CVC-led syndicate investments varies depending on the quantitative approach used to define the lead investor (Hochberg et al., 2007; Hopp and Lukas, 2014; Megginson and Weisss, 1991). Future research should consider utilizing other approaches, including the use of newspaper articles and other quantitative definitions to identify the lead investor.

Another limitation of Chapter 3 is that this study only considers characteristics between a lead investor and a potential partner. However, in the case of collaborations or syndicates involving multiple partners, also the relationship and combinations with other partners, can influence partner selection decisions. Prior research on multi-party collaborations have demonstrated that collaborating partners' diversity and relationships have influence on the collaboration performance (García-Canal et al., 2003; Gong et al., 2007; Kim, 2014). So far, previous partner selection studies have focused predominately on dyadic and static partner selection analysis (Hopp and Lukas, 2014; Meuleman et al., 2010; Rothaermel and Boeker, 2008; Shah and Swaminathan, 2008; Sorenson and Stuart, 2008), and this study has similar limitations. Nevertheless, identifying the determinants of

partner selection from the dyadic perspective could provide important clues in determining the partner selection decisions from a portfolio perspective. Hence, this study helps to provide the basis for future research to identify CVC investor's partner selection determinants from a portfolio perspective.

Relating Chapter 4, I have to acknowledge that my focus on CVC activities in the biopharmaceutical industry limits the generalizability of the findings to other industries. Several characteristics of the chosen industry, such as its long product development cycles and resource-intensive new product development processes (Rothaermel and Deeds, 2004) might have influence on the firm's distant search for new technologies through CVC investments. I thus encourage future research to complement this study by applying its logic to datasets of CVC deals from other industries.

In addition, key indicators used in Chapter 4 rely on patent-based measures. Patent citations have been used as an important measure for understanding knowledge flow, diffusion, and spillover in prior research on innovation and knowledge management (Alcácer and Gittelman, 2006; Jaffe et al., 1993; Mowery et al., 1996). Such measures, however, are known to be affected by variations in the propensity to patent of individual firms, industries, and countries, and do not allow to capture innovation that is not patented (Pavitt, 1985, Kleinknecht et al., 2002). In addition, patent citations are also determined by patent examiners, which limits the understanding of the actual knowledge flow and organizational learning (Alcácer and Gittelman, 2006). The actual flow and transfer of knowledge between organizations can be identified using information on

licensing, acquisition of capital goods, and hiring of experts (Argote and Ingram, 2000; Mowery et al., 1996; Song et al., 2003). Future research could address these issues by including other measures, based, e.g., on surveys or other available data.

Further, while the results of this study indicate that the size of the syndicate negatively influences knowledge transfer in CVC investments, also the effects of other factors, used by prior literature to characterize syndication should be examined by future studies. Such factors could be geographic distribution, lead-follow investors, complementarity between syndicate partners, conflicts among syndicate partners, or trust relationships (Hopp, 2010; Meuleman et al., 2010; Sorenson and Stuart, 2008; Wright and Lockett, 2003).

Relating to Chapter 5, samples of VC syndicate investment with CVC participation may be biased. This is because it is rare for CVCs to invest independently or take part as a major investor. In this study, the maximum value of the CVC share variable was 0.553. Therefore, there is a limit to analyzing curvilinear relationships such as the relationship between CVC share and time to IPO.

In addition, in Chapter 5, I determined VC syndicates based on the broad definition of Brander et al. (2002) due to limitations of data. Therefore, the syndicate composition in each round and the order of VC investment participation were ignored. A more detailed investment data set would potentially reveal more interesting effects and relationships.

Further, Chapter 5 did not look into potential differences between exit types such as IPO and trade sale and has used a dataset of VC-backed entrepreneurial firms that exited through IPO. This poses limitations to generalize its findings. Besides IPOs, trade sales

are another major successful exit route for VCs and VC-backed firms. However, going public and trade sale to another company have differences in their characteristics, such as the motive of the entrepreneur, the maintenance of ownership, the continuity of business operations, and the market environment. Thus, depending on their exit route, entrepreneurial firms and their investors adopt different exit strategies and contract terms (Cumming and Johan, 2008; Giot and Schwienbacher, 2007). Further, the resulting return on investment shows significant differences between IPO and trade sale, where IPO is generally more profitable than trade sale (Black and Gilson, 1999; Nadeau, 2011). Hence, factors influencing the exit through IPOs could affect the exit through trade sales in different ways (Giot and Schwienbacher, 2007). Moreover, when CVC is included as an investor and the investee is trying to exit through a trade sale to another company, it might be required to avert potential conflict between the CVC investor and the potential acquirer (Masulis and Nahata, 2011). Yet, in order to obtain a full picture of VC investment and entrepreneurial firm development, also other exit types and their effects on performance should be included and compared in future research.

Measuring investees' performance using IPO data and a time-to-IPO variable is another limitation of Chapter 5. While IPO data have been used to examine the success and performance of investee firms (Beckman and Burton, 2008; Chang, 2004; LiPuma, 2012; Stuart et al., 1999; Yang et al., 2011), it can be affected by the exit strategy of the entrepreneur and the VC investors. Entrepreneurs may strategically choose when to go public, while VC investors may consider different strategies depending on their investment stake. Further, CVC investors who have strategic intention may engage in the

management of the investee firm based on their strategic returns. Hence, in a syndicate investment including CVCs, using IPO results of the investee as a performance variable cannot sufficiently capture the strategic aspects of the CVC investor. Prior literature have discussed the strategic investments of CVCs and the resulting performance of the investee firms (Alvarez-Garrido and Dushnitsky, 2014; Maula et al., 2005). However, they only analyzed the patent activity and long-term performance of CVC-backed entrepreneurial firms, while research that discusses CVC's strategic intention and the investee's performance together has remained largely unexplored. Future research on CVC will need to derive indicators that can capture the investee's performance as well as the CVC's strategic intention. Analysis using detailed data such as time-to-market of products and the productivity of the entrepreneurial firm based on surveys or in-depth interviews might complement the limitations of the existing research.

Another limitation of Chapter 5 is that this study focuses on the composition of the syndicate and the time to IPO as key concerns for both entrepreneurial firms and venture capitals. However, this is just one of many interesting facets of the IPO, a critical time for firms. Future research could look into other factors surrounding the IPO such as valuation at IPO, underpricing, lock up periods, long-term performance, or other factors. Further research is also required in the areas of influence and characteristics of the relationship between lead-follower investors and on the topic of agency problems and conflicts between investors and investees (Katila et al., 2008).

A further limitation of Chapter 5 is that the principal-principal conflicts were discussed only focusing on the composition of two types of partners, i.e., CVCs and IVCs.

As principal-principal conflicts occur due to goal incongruence and different time constraints among participating partners (Dalziel et al., 2010; Hoskisson et al., 2002; Young et al., 2008), other aspects of syndication such as syndicate size and partner diversity could be included in the model. Though the syndicate size was included in the model as a control variable, in this study, the result were statistically insignificant. Future studies should aim at investigating the principal-principal conflicts of the syndicate by further considering the diverse characteristics of the partners.

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국문초록

경쟁우위에서 기술의 중요성이 강조되며 기업은 끊임없이 기술혁신을 이룰 것을 요구 받고 있다. 이에 기업들은 내부 R&D를 넘어서 기업 외부의 혁신역량을 받아들이는 것을 중요한 혁신전략으로 활용하였고, 최근에는 벤처기업들로부터 혁신의 기회를 탐색하는 기업벤처캐피탈 또한 중요한 전략적 수단으로 부상하였다. 벤처기업이 기술혁신을 주도하고 있는 바이오제약산업과 IT산업에서는 이미 많은 기업들이 벤처기업에 투자하며 새로운 혁신의 기회를 찾고 있다. 이러한 추세는 전통적인 제조업이나 농업 등으로 확산되며 기업벤처캐피탈은 이제 일반적인 혁신전략으로 자리잡고 있다. 기업벤처캐피탈은 기존 기업들의 새로운 혁신전략으로 중요성이 증가하는 동시에, 벤처생태계 전반에서도 그 위상과 중요성이 증가하였다. 벤처기업들은 기업으로부터의 투자를 중요한 자금조달 방안으로 고려하고 있으며, 전통적인 벤처캐피탈 회사들도 기업벤처캐피탈과의 협력을 강화하고 있다.

이러한 추세는 학계에서도 드러난다. 혁신연구에서는 기업벤처캐피탈을 하나의 혁신전략 수단으로 그 특성과 성과를 분석하고 있으며, 벤처 관련 연구에서도 기업벤처캐피탈을 벤처생태계의 부분으로 인식하여 그 영향을 연구하고 있다. 하지만 두 분야의 관점을 함께 고려하는 논의는 충분히 이뤄지지 않았다. 기존 벤처캐피탈 연구에서는 대체 자금원으로 기업벤처캐피탈을 대하며 신디케이트 투자를 분석하는데 그쳤으며, 기존 혁신연구에서는 기업벤처캐피

탈의 신디케이트 투자까지 논의가 발전하지 않았다. 또한, 실제 기업벤처캐피탈 투자는 대부분 신디케이트 투자로 이뤄지는 만큼, 기업벤처캐피탈의 신디케이트 투자에 대한 이해는 실제적인 조언을 제공할 수 있을 것이다. 이러한 점에서, 혁신전략과 벤처연구를 접목한 기업벤처캐피탈의 신디케이트 투자에 대한 연구는 기업벤처캐피탈에 대한 이해를 넓히고 적합한 기업벤처캐피탈 활용 전략을 제시해줄 수 있을 것이다. 혁신전략 및 벤처 관련 연구와 기업벤처캐피탈과 관련된 중요한 이슈를 고려하여 본 논문은 '신디케이트 파트너 선택', '모기업의 원거리탐색 성과', 그리고 '피투자회사의 성과' 세 가지 주제를 분석하고 있다. 이들은 각기 기업벤처투자의 투자의사결정과 그에 따른 혁신성과 및 투자성과를 다루고 있다. 종합적으로는 기업벤처캐피탈의 신디케이트 투자 특성과 그에 따른 성과를 파악하고 있다. 다른 투자자와의 파트너쉽, 모기업의 혁신성과, 그리고 피투자회사의 성과에 신디케이트 투자가 미치는 영향을 분석하며 기업벤처캐피탈의 신디케이트 투자의 특성을 파악한다.

구체적으로, 3장에서는 기업벤처투자자의 신디케이트 파트너 선택 요인을 분석하였다. 기업벤처투자자는 기존 문헌에서 주로 분석한 독립적벤처투자자와 다른 특성을 보이는 만큼, 기업벤처투자자의 신디케이트 파트너 선택 의사결정에서 다른 요소들을 예측해볼 수 있다. 신디케이트 리드투자자로 역할하는 기업벤처투자자의 파트너 선택 의사결정을 분석한 결과, 기업벤처투자자는 피투자회사의 산업분야에 전문화된 경험을 지닌 벤처투자자를 선호하는 것으로 나타났다. 반면에, 투자 이후 의사결정의 통제에 대한 우려로, 기업벤처투

자자는 높은 명성과 지위를 지닌 벤처투자자를 투자파트너로 선호하지 않는 것으로 나타났다. 이러한 결과는 기업벤처투자자는 자원과 역량의 보완성과 함께 피투자회사에 대한 통제와 관련된 주인-주인 갈등문제를 고려하여 파트너를 선택 한다는 것을 알려준다.

4장에서는 조직학습이론과 자원기반관점에 바탕하여 기업벤처캐피탈을 활용한 원거리탐색과 지식이전성과 간의 관계를 확인한다. 그리고 원거리탐색에서 나타나는 한계를 극복하는 방안으로 신디케이트 파트너 및 조직구조의 조절효과를 확인한다. 기업벤처캐피탈은 새로운 기술과 시장기회를 탐색하는 전략으로, 근거리탐색을 넘어서 원거리탐색을 위한 방안으로 적합하게 활용될 수 있다. 하지만 다른 지식탐색 활동과 유사하게, 원거리탐색을 향한 기업벤처캐피탈 또한 흡수역량의 한계로 학습과 지식이전 성과가 크게 떨어지는 것으로 나타났다. 이런 한계를 극복하고자, 기업벤처투자자는 신디케이트 파트너를 통하여 흡수역량을 보완하거나, 기업 내부 사업부 및 연구개발부서와 기업벤처투자부서 간의 사회적 관계를 개선하여 흡수역량을 강화할 수 있다. 분석결과, 신디케이트 파트너 숫자는 오히려 원거리탐색에서 기업벤처캐피탈의 학습과 지식이전에 부정적인 영향을 강화하는 것으로 나타났다. 반면에 기업 내부조직 간 긴밀한 사회적 관계는 학습과 지식이전을 긍정적으로 조절하는 것으로 나타났다. 이러한 결과는 이론적 추론에 기반한 예상 및 기존의 벤처투자 연구들과는 다르게, 신디케이트 투자는 기업벤처캐피탈에서 다른 특징을 갖는다는 것을 보여준다.

기업벤처투자자는 투자의 목적, 자금조달, 보유 자원 및 역량 등에서 독립

적벤처투자자와 많은 차이점을 갖는다. 이렇게 이질적인 특성을 가진 벤처투자자들이 참여하는 신디케이트 투자는 다양한 결과를 예측해볼 수 있게 한다. 5장에서는 기업벤처투자자와 독립적벤처투자자와 같이 이질적인 벤처투자자들이 신디케이트 투자를 할 때의 관계적 특성을 검토하고, 이것이 피투자회사인 벤처기업의 시장공개(IPO) 성과에 미치는 영향을 분석하였다. 분석 결과 기업벤처투자자와 독립적벤처투자자는 신디케이트 투자에서 상호보완적인 관계가 아닌, 갈등을 내포한 관계인 것을 확인하였다. 구체적으로, 기업벤처투자자와 독립적벤처투자자가 균형적으로 주식을 소유할 경우 벤처기업의 시장공개는 더 늦어질 것으로 나타났다. 이는 서로 다른 투자 목적과 투자 기준을 가진 투자자들 간의 갈등이 상호보완적인 협력보다 더 크게 나타나는 것으로 해석할 수 있다. 한편, 투자자 간의 반복적인 공동투자로 형성된 신뢰는 이러한 관계에 영향을 끼치지 않는 것으로 나타났다. 종합적으로, 5장의 연구결과는 신디케이트 투자에서 기업벤처투자자가 겪을 수 있는 갈등 문제를 밝히고 있다.

본 논문의 연구 결과는 다음과 같은 의의를 제공한다. 첫째, 기업벤처캐피탈의 신디케이트 투자를 연구함으로써 기업벤처캐피탈 연구의 관점을 확장시킨다. 혁신연구, 벤처연구 등 분야별로 이뤄지던 기업벤처캐피탈 연구를 여러 주체들과의 협력과 교류를 포괄적으로 통합하여 분석함으로써 기업벤처캐피탈의 역할과 특성을 파악하였다. 둘째, 본 논문의 연구결과는 자원기반이론과 함께 주인-주인 갈등에 대한 논리가 기업벤처캐피탈을 이해하는데 적절한 설명을 제공한다는 점을 보여준다. 기업벤처캐피탈의 신디케이트 투자를 대상으로 주인-주인 갈등의 논의와 함께 다른 이론들을 통합적으로 적용하여 연구를 확

장할 수 있다. 종합적으로, 벤처생태계에서 기업벤처투자자의 중요성이 증가하는 상황에서, 본 논문은 기업벤처캐피탈의 신디케이트 투자를 이해하고 기업벤처캐피탈 자체에 대한 이해를 높여주는데 기여한다. 셋째, 신디케이트 투자는 기업벤처캐피탈 활동과 그 성과에 영향을 준다는 점을 확인하였다. 기업벤처투자 연구와 실제 전략에서 신디케이트 투자는 중요한 요인으로 고려되어야 할 것이다.

주요어 : 기업벤처캐피탈, 신디케이션, 파트너 선택, 원거리 탐색, 기업공개 성과
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