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Effects of corporate venture capital investments

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Abstract

The traditional venture capital is independent venture capital (IVC), new ventures have traditionally relied on IVC firms to provide financial and managerial resources. Corporate Venture Capital (CVC) is the equity investment of non-financial companies in venture capital for financial and strategic motivation. What's the difference between CVC and IVC when they doing deals? How is CVC classified? What are the conditions of CVC investments? How CVC investments doing deals? What's the relationship of CVC and innovation firms and how CVC effects those firms? This study aims to finding the strategy of CVC funding and the beneficial influence of CVC funding. By studying existing documents and literatures to find the difference between IVC and CVC, also to find the beneficial influence of CVC funding for innovation firms.

Key words: Corporate venture capital investment, Independent venture capital, Innovation.

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1 Introduction

It is known that there are two major sources of private equity capital for firms: venture capitals and business angels. For business angel investment, it is an investment in very early-stage companies that often lack mature business models and revenues, and some even lack complete product and business plans. The achievement of angel investment often depends on the investor's trust in the investee and the understanding and prediction of the invested project. Angel investments are generally small. VCs often invest in companies that are in the early stages of entrepreneurship and are in urgent need of rapid growth, so VC is also known as venture capital. VC values the prospects of the company and expects to achieve high returns through the growth of the startup company. The amount of investment is often determined according to the company's own situation and the industry in which it is located.

The traditional venture capital is independent venture capital (IVC), also just called venture capital (VC). New ventures have traditionally relied on IVC firms to provide financial and managerial resources. IVC funds are typically private partnerships with funding from larger institutions (e.g., university endowments, pension funds) that invest in high-risk/high-return ventures.

Corporate Venture Capital (CVC) is the equity investment of non-financial companies in venture capital for financial and strategic motivation. Here we will discuss what is corporate venture capital and what strategy used. And how they practice the CVC investment, what kind of relationship between CVC and innovation firms, and the comparing the differences between CVC and IVC.

Chapter 2 introduced what is corporate venture capital and different types of corporate venture capital. Also, in this chapter discussed the strategy of volunteer

disclosure of corporate venture capital.

Chapter 3 introduced the relationship of CVC investments and their practices. In this chapter we can find how CVC investments doing deals with practices and the conditions when the practices choose variate or abandon.

Chapter 4 introduced the relationship of corporate venture capital and innovation. In this chapter discussed corporate venture capital takes value for new ventures and the application in different industries, and the relationship of CVC portfolio and firms' innovation.

Chapter 5 introduced what is independent venture capital (IVC). In this chapter discussed the relationship of independent venture capital and portfolio firms' and the difference between CVC and IVC of doing deals.

For last chapter 6, gives a summarization for all paper to better understanding.

2 Concept and Strategy of CVC

This part will study about what is CVC and what strategies used in the process of investments. Corporate venture capital has several types and different features, so all those types and their features will be discussed in this part. The strategy and innovation of CVC will be discussed in this part.

2.1 Different types of CVC

Corporate venture capital investments differ along two dimensions. First is technology fit, defined as the degree to which companies in the investment portfolio are linked to the investing company's current operational capabilities (resources and processes). Second is market fit, defined as the degree to which investments of the corporate parent constitute strategic benefits for the corporate parent. These two dimensions allow differentiating among four different types of CVC investments: Driving, Enabling, Emerging, and Passive. Shows as figure 1.

- 1) Driving CVC investments are characterized by a tight link between the new venture and the technology/operational capability of the corporation, as well as high market development potential and taking the strategy as the starting point. For example, Microsoft has set aside \$1 billion to invest in startups that are helping to push the new Microsoft Internet service architecture "Net," which has prompted more companies to embrace their standards.
- 2) Enabling investments have high market development potential but are only loosely linked to the corporation's operational capability, the main purpose is to consider strategic development. This type of investment philosophy believes

that successful investments do not need to establish close ties with startups, and they naturally benefit the company itself. Intel is a typical example of this type of investment, investing in hundreds of video, audio and graphics hardware and software companies. These companies' products require higher performance microprocessors, which stimulates sales of Intel Pentium chips.

- 3) Emerging investments do not provide market development potential, although they have tight links to the corporate parents' operational capabilities. However, once the business environment or corporate strategy changes, it is likely that the startup will suddenly show its strategic value.
- 4) Passive investments match neither operational capabilities of the corporation nor are they capable of extending the firm's market presence.

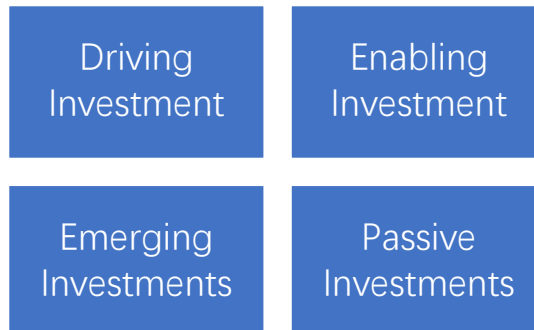


Figure 1 Four types of CVC

In order to classify all CVC deals into those four groups, we need to use a multistep algorithm. There are three steps to classify the CVC deals. Firstly, we need to combine the information include in VentureXpert and the Yearbook with CVC deals committed during the special period, especially for the startup's industry. According to the classification of VentureXpert and the description of new venture and its industry of Yearbook, we will assign NAICS codes to the new ventures. Then comparing the corporate parents' NAICS code with new ventures. In the case of matching (at two- to

four-digits aggregation), we assign a value of 1 to the deal on the Operational Capability Link (OCL) dimension, otherwise 0. Secondly, we explore the Bureau of Economic Analysis' Input-Output tables. We record how much of the corporate parent industry's output is consumed by CVC investees' industries. We then classify the new ventures as having high market development potential for the corporate parent if their industries account for a certain portion of the consumption. Thirdly classifying CVC investments into four groups we think that a CVC investment may combine the two properties—operational capabilities and market development. If the deal is high in both the OCL and MDP dimensions, it is classified as driving. If the value on the OCL scale is 1 and the MDP scale is 0, then classify it as emerging. If the value on the OCL scale is 0 and the MDP scale is 1, then classify it as enabling. Investments with 0 on both dimensions are considered passive.

2.2 Voluntary disclosure of CVC

In innovation-driven industries, corporations invest heavily in research and development (R&D) to maintain leadership in their current market or to become a leader in new markets in the future. Corporations are often silent about their current R&D projects to provide as little information to competitors as possible. Doing so could otherwise affect their future competitive position in the market. In contrast, other corporations' issue clear announcements as to strategically communicate to investors their corporate objectives and thereby influence anticipations.

Disclosing privately valuable information can provide clear signals to the market, even though some of this information may also be valuable to competitors. On the gain side, voluntary information disclosure affects liquidity of shares and, thus, the cost of equity capital. These different findings suggest that disclosing information on investments in innovation is likely strategic.

In this part, we will discuss two points. Firstly, we will discuss the factors driving the disclosure of innovative ideas in the context of corporate venture capital (CVC); secondly, we discuss the impact of deal syndication and organizational structure of CVC program.

There are several factors driving the disclosure of innovation in the context of corporate venture capital. We will list them and discuss one by one.

- 1) For information asymmetry, information disclosure can help the parent company reduce uncertainty, so, parent companies suffering most from information asymmetry are more likely to disclose their CVC investments.
- 2) For size of parent company, larger parent companies are more likely to disclose their CVC investments, because their shares are affected by the price of institutional investors holding large stocks, on the contrary, retail investors hold more shares in smaller companies, which are less affected by such liquidity problems.
- 3) For early-stage investment, early-stage investments are less likely to be disclosed. Because there are risks and uncertainties in the early stages of the project, and outsiders may not be able to properly assess project potential.
- 4) For leverage of parent company, parent companies that depend more on private debt are less likely to disclose their CVC investments, because disclosure may lead to information disclosure to other interested parties. However, the parent company with low leverage has more benefit from disclosure because it directly affects the cost of equity.

- 5) For market competition, parent companies operating in less concentrated and, thus, more competitive markets are less likely to disclose their CVC investments. because the disclosure of information will make them bear higher costs.
- 6) High-tech industry: Parent companies active in high-tech industries disclose less, because the disclosure of information will make them bear higher costs.

Next we will discuss the impact of deal syndication and organizational structure of CVC program.

- 1) For organization structure of CVC program, externally managed CVC programs have greater incentives to disclose, because the disclosure of information by the manager of the external CVC program can increase his visibility of business activities and affect top management's interest in the CVC program.
- 2) For syndicated deals, CVC investments syndicated with independent VC funds are more likely to be disclosed and profit from them.

2.3 The effect of prior CVC investments on subsequent strategic alliances

New business development is a process of risk and uncertainty, especially in the early stages of new business development. Uncertainty in the development of new business generally includes uncertainty of partners, uncertainty of technology, and uncertainty of the market. In order to deal with these uncertainties, companies need to make strategies. Here, we apply real option theory to discuss how companies can reduce

uncertainty in the face of new business. According to real option theory, under high uncertainty (such as new business development), firms should make small initial investment (option creation), which can be carried out later through follow-on investment. When uncertainty is reduced, the investment firms can determine possible follow-on investments. CVC investment is a small equity investment in young start-ups, a possible way for firms to understand new technology opportunities. For the early stages of technology development, CVC investments are an attractive way to create a portfolio of different technology options, and investment firms can initially understand technology and business opportunities. If the technology is promising, a larger follow-up investment may take the form of a strategic alliance between venture capital and a business unit of the investment company, or it may lead to the acquisition of a startup by a corporate investor. So, the strategic technology alliance is a supplement to CVC investment.

Strategic alliance refers to the cooperative effort of two or more independent organizations working together to share mutual benefits while maintaining their company status (Bamford, Gomes-Casseres, & Robinson, 2003; Kale, Dyer, & Singh, 2002; Vanhaverbeke et al., 2002). CVC and strategic alliance are different. CVC investments focus on venture capital, while strategic alliances do not require equity investments. In CVC investment, the investment company's goal is different from that of the portfolio company's management team; investors unilaterally invest in portfolio companies and claim multiple rights. In the technology alliance, focus on partners to achieve common goals, and strive to maximize financial returns through cooperation. If the prior CVC investment in the startup increased, then the likelihood that the corporate investor would subsequently establish a strategic alliance with the startup would increase. Now we will discuss the uncertainties.

(1) Partner uncertainty

The more investment rounds a corporate investor participates in, the less likely

it is that corporate investors and portfolio companies will participate in strategic alliances. Investors participating in multiple rounds of investment can reduce information asymmetry, and investors will gain more knowledge about the technology being developed and better understand the technology, thus reducing the possibility of establishing strategic alliances with start-up companies.

(2) Technological uncertainty

The positive impact of the likelihood of a follow-up strategic alliance between a corporate investor and an entrepreneurial venture is the technical proximity between them. Technical proximity refers to the relative overlap between the technical knowledge bases of the two binary partners. If this overlap is small and the two firms have little common knowledge, CVC investment can be considered a highly exploratory and high-risk investment in unrelated technology. Conversely, if the overlap is large, CVC investments can be viewed as less exploratory investment or investment in related technologies. Therefore, CVC's investment in start-ups with related technologies will reduce the technical uncertainty of investors and identify promising start-ups as alliance partners.

(3) Market uncertainty

Late-stage investments lead to the possibility of establishing strategic alliances with start-ups that are more likely than early-stage investments. Venture capital firms and corporate investors typically invest in startups at different stages of development. In the early stages, the uncertainty about the actual value of the development technology is particularly high. But as the technology develops, the cost of each phase is usually higher than the previous one, which increases the commitment and reduces the uncertainty of technology and market. So, when uncertainty is reduced, the investment company can decide on

subsequent investments through strategic alliances with the company.

2.4 Effect of the investment environment

A good investment environment is a necessary condition for promoting the development of enterprise innovation. We will discuss from two perspectives. One is strategic management perspective and another one is institutional perspective.

For strategic management perspective, the company's decision to execute a venture capital plan is a trade-off that involves the strategic and economic benefits that it expects for such a plan and the cost of managing and financing the corresponding portfolio. Corporate firms activities and CVC activities have positive value for the financial performance and strategy of the invested company and the parent company. Often companies create or acquire new capabilities through external procurement models to innovate. Knowledge-based perspectives are also a strategic resource and a sustainable and competitive resource. Innovation-driven companies and technology-based companies need to constantly update their knowledge to help innovate and build new choices. So, companies based on environments with high levels of innovation activity are more likely to operate venture capital projects.

For institutional perspective, the different norms, perceptions, and configurations of regulatory agencies in each country can lead to similarities and differences in the risk investment behaviors of each region. Affiliated VC programs may rely on local independent venture capitalists to identify quality investment opportunities, to reduce overall risks and transaction costs, to increase the quantity and quality of their own deal flow and to increase exposure to entrepreneurial thinking, culture, and practices (Manigart et al., 2006). Prior research has empirically shown that “entrepreneur-

friendly” regulations in general and bankruptcy laws in particular are positively associated with entrepreneurial entry rates (Armour & Cumming, 2006, 2008; Levie & Autio, 2011). Therefore, the legal conditions for giving entrepreneurs a low administrative burden or providing a “second chance” provide good macroeconomic conditions for corporate activities and may also promote enterprise risk management plans. For entrepreneurs, a regulatory-friendly business environment not only affects the available potential transaction flows, but also the costs and benefits of managing such investments and exit opportunities and is critical to venture capital, and more benefit to running venture capital.

3 CVC investments and practices

3.1 The practices of CVC doing deal

In this section we will discuss various aspects of the CVC investment process that are different from independent venture capital's process. From the literature we can find that different stages of venture capital deal, like deal organization, screening, and structuring. But the theory of independent venture capital doing deal is not suitable for corporate venture capital. There are two reasons to explain: (1) CVC generally has only one single limited partner who owns all the funds provided by the unit and this unit is the parent company. But independent VC can get funding from multiple limited partners. (2) CVC units' limited partners typically seek financial and strategic interests, but independent VC units' limited partner is usually only interested in financial returns.

From the literature and case study, we find CVCs unique eight 'corporate investment practices'. Corporate investment practices reflect the pressure of CVC units from parents' company, also reflects utilize of valuable corporate resources and capabilities. There are two different investment logics that emphasize the different degrees of CVC's investment practices: 'arm's-length' versus 'integrated' toward the corporate parent. Programs that aligned with the norms of the parent followed an integrated investment logic (internal focus of isomorphism), programs that aligned with the norms of the VC industry followed an 'arm's-length' logic (external focus of isomorphism). Figure 2 shows the logics of investment.

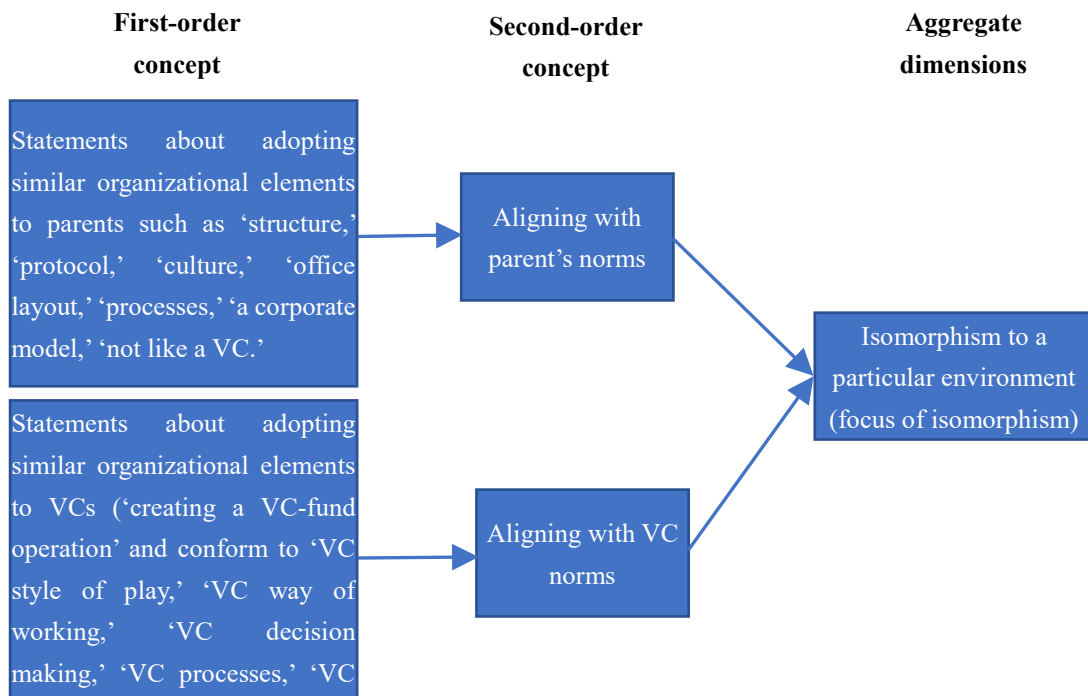


Figure 2 the logics of investment

Now we will explain CVCs eight 'corporate investment practices' for each stage. The eight stages are: (1) referrals from business units (2) strategic potential for the parent (3) feedback to the parent (4) internal technical due diligence (5) securing a sponsor (6) syndication with complementary funds (7) corporate involvement in deal approval (8) link the venture to the parent. Figure 3 shows the relationship of it.

(1) referrals from business units

The conditions of CVCs use corporate referrals are strategic fit of the deals, the pressure from parents company because of the risks, utilizing the unique technical capabilities of corporate contacts can increase opportunities for success and reduce information asymmetry.

(2) strategic potential for the parent

The strategic potential of the parent company is CVC's additional transaction screening criteria. CVC must consider both their parents' financial returns and whether they can get benefit from the proposed business. The strategic fit of

means the company's participation, which resonates with the senior management of the parent company.

(3) feedback to the parent

CVC will feedback an emerging technology and markets to the business unit so that it can maintain strategic connection with parents.

(4) internal technical due diligence

Expert advisors of CVCs technical potential typically rely on the corporate business unit and match the technology of the parent company. Internal due diligence indicates that CVCs can work with other parts of the company, and CVCs can obtain unique resources, the technical expertise of the business unit can reduce information asymmetry and adverse selection. That why CVC reliance on internal due diligence

(5) securing a sponsor

CVCs secure sponsors of deal specific within its limited partners (parent companies). Securing sponsors is a resource commitment and a strict test of strategic fit.

(6) syndication with complementary funds

CVCs do not focus their networking efforts on similar funds but tends to syndicate with independent VCs. Because of strategic constraints, CVCs does not complement other CVCs. However, independent VCs can provide complementary resources and benefits. In the VC federation network, unique CVC resources enable them to gain a central position.

(7) corporate involvement in deal approval

CVCs tend to have their single limited partner (parent company) participate in

deal approval. The practice of companies participating in the approval of CVC deals guarantees the strategic fit of investment and the involvement of parents in the approval process will create a sense of participation in the company, also CVCs have access to and can utilize corporate knowledge and expertise.

(8) link the venture to the parent

CVC can act as a resource intermediary between the parent company and the portfolio company, helping the company acquire the parent's technology and marketing capabilities and helping the company leverage the corporate reputation.



Figure 3 CVCs eight 'corporate investment practices'

We find that there are three reasons prove that corporate investment practices exist collectively. The first is CVCs need to secure a strategic fit with your parents. The second is CVCs connect with the rest of the corporation. The third is CVCs can utilize existing corporate resources and capabilities.

3.2 The conditions of practice variation and abandonment

When organizations adopt new practices, they often modify practices to fit to the new environment. The degree of variation in practice depends on two types of professional experiences of these managers who implement the new practices: the experience of the practice itself and the experience of assessing the fit between the practice and the adoption of the firm. The translation perspective, offered by Scandinavian institutionalism, portrays a process view of practice variation in which practices are posited to undergo change every time they are applied in a new context (Czarniawska-Joerges & Sevón, 2005; Sahlin & Wedlin, 2008).

Firstly, we will discuss the conditions of practice variation. Practice variation can be shaped by organizational and technical fit between diffusing practices and adopting organizations (Ansari et al., 2010; Meyer & Goes, 1988). Practices can be modified as they are implemented in the organization, as the goals of the practice may change, resulting in changes in the operator's practices.

First, we analysis the experience of implementing managers. While the organization sets the direction of practices, individuals who implement practices bring their expertise, preferences, and cognition to the task of implementing and operating new practices, thereby affecting practice changes. So, the specific knowledge gained from an individual's previous work is one way in which professional experience can influence practice change. In the case of CVC managers with IVC experience, the

practice of goal orientation and operational strategies can reduce change in the new environment. Because such CVC managers understand both the way to achieve financial goals and have conditions to pay attention to goals. At the same time, the implementation managers could also gain experience.

We distinguish between two types of experience: one is organizational fit-specific experience and the other is technical fit-specific experience. The organizational fit-specific experience is primarily based on the degree of fit between the organization's practices and organizational (i.e., strategic, cultural, and political) aspects. The organizational fit of the assessment practice needs to consider two points, one is the practice and its compatibility with the existing social environment, and the other is the adoption of the firm's business strategy. Implementing managers with organizational professional experience may find differences between the practice of the canonical version and organizational objectives and social environments that leading to their custom practices. Therefore, in the context of the CVC unit, the implementation managers with the organizational fit-specific experiences will modify the goal orientation and practice's the operational strategy, and the higher the proportion of implementation managers, the greater the possibility of modification.

For the technical fit-specific experience, it means focus on fit between the technical aspects of the practice and the systems and technologies that organization have been used. Individuals who implement the practices used can also influence the degree of change in practice if they have professional experience that can assess practice and adopt technical matching between organizations. CVC managers with engineering experience will be more likely to modify IVC practices by investing in a more strategically oriented, operational strategy target for late-stage investments. And the higher the proportion of implementing managers, the more the goal orientation and operational strategies that are adopted in CVC are modified.

Then we will discuss the conditions of organization abandon practice and when do firms abandonment practice. The firm’s decision to abandonment may depend on social learning and influence as well as experiential learning. Practice performance and strategic variation are all reasons for abandonment. The unprecedented 1990s boom in the venture capital industry encouraged many corporations to adopt CVC practices (Gaba and Meyer, 2008). The share of corporate venture capital investment increased rapidly from 2% in 1994 to 15% in 2000. Then, the recession and the collapse of the stock and IPO markets in 2000 ended the boom in the venture capital industry. In the first quarter of 2001, CVC investment fell by 81%. Figure 4 shows the dollar investment and the number of information technology firms that make CVC investments each year.

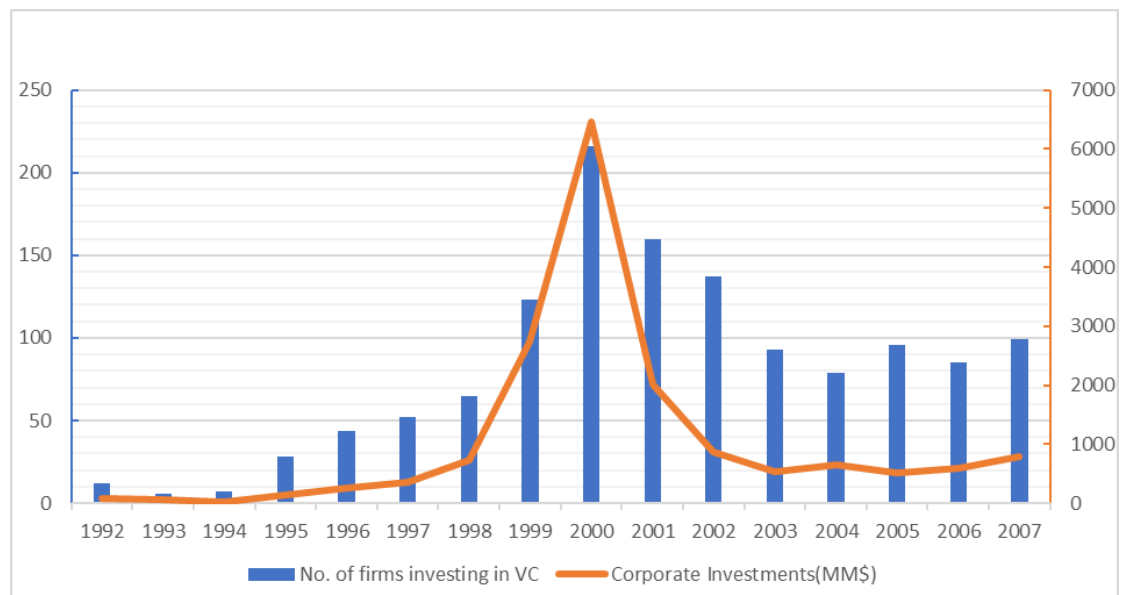


Figure 4 CVC investments each year

When firms’ industry and practice referents do abandonment, they also choose abandon. Abandonment depends on expectations for the future, even if the past performs well, but when the environment changes, the company may choose to abandon. Because the firm is confident in its expertise through repeated use of practices, and through repeated investment commitments, they are unlikely to be abandoned. Therefore, adopting a high utilization approach will be less likely to be abandoned. Staffing options

are a key component of the firm's implementation practices. Adoption practices using high-level practice employees are unlikely to be abandoned. They have a background in expertise that brings knowledge and experience to practice. The high level of experience gained through practice makes companies relatively unaffected by industry peers and practitioners. Because firms gain professional knowledge through repeated practice, which makes them confident in their own judgments, making them relatively independent of social influence, and the experiential learning they get is firm-specific and can infer the impact of practice on company performance.

4 Corporate venture capital and innovation

4.1 Corporate venture capital takes value for new ventures

New ventures need to consider a trade-off when they want to choose corporate venture capital (CVC) funding. Corporate investors can provide complementary assets to enhance the commercialization of new ventures technologies. However, the close relationship between new ventures and corporate investors also has drawbacks and may limit new ventures' access to complementary assets in the open market. So, considering this trade-off, we want to find the conditions that CVC funding is beneficial for new ventures.

4.1.1 New ventures access CVC funding

In traditional way, new ventures depend on independent venture capital (IVC) to provide financial and management resources. Independent venture capital refers to “professional venture capitalists who invest in newly established, fast-growing and promising start-ups”. Their sole goal is to achieve capital gains by selling venture equity in exits event such as an IPO or acquisition. IVC participates actively in helping new ventures succeed by providing management advice and recommendations to potential customers, alliance partners and other investors.

In contrast, established firms operate CVC programs to achieve both financial and strategic objectives. And their strategic are more diverse and complex than IVC. Like

IVC firms, CVC programs looking for capital gains by selling venture equity in exits event such as an IPO or acquisition. On the one hand, the CVC program enables established companies to exploit their existing capabilities. On the other hand, On the other hand, the CVC program allows established firms to identify new products that might replace existing products or accelerate into new markets.

Everything has two sides, also for accessing CVC funding. For new ventures, accessing CVC funding existing both advantages and disadvantages. On the positive side, by accepting CVC funds, new ventures not only obtain financial capital, but also obtain supplementary assets of corporate investors. As new ventures often face significant challenges in developing complementary assets in the short term, so the funds from those companies that can provide complementary assets may let new ventures' technology commercialization processes more efficient and ultimately improve their performance. On the negative side, CVC companies are interested in maximizing the overall value of their parents' companies, and their interests may conflict with the interests of new ventures. Due to the lack of experience of CVC companies, there is a lack of efficient incentives and low-quality supervision compared to IVC. Otherwise, accepting CVC funds from corporate investors may undermine the ability of new ventures to source complementary assets from the open market.

4.1.2 Beneficial conditions for new ventures accessing CVC funding

There are two beneficial conditions for new ventures when they access CVC funding.

- (1) CVC funding will be more beneficial to new venture performance when new ventures require specialized complementary assets compared with new

ventures that require generic complementary assets.

- (2) CVC funding will be more beneficial to new venture performance when new ventures operate in uncertain environments compared with new ventures that operate in stable environments.

4.1.3 Concept of complementary assets

Complementary assets are a series of factors that are formed during the process of enterprise innovation and marketization and those factors are hold and controlled by the enterprise. Complementary assets are closely related to professional manufacturing capabilities, distribution channels, service networks and complementary technologies and so on of commercialization of new technologies. Complementary assets not only play a role in specificity, may also shape future corporate strategies. Figure 5 shows the composition of complementary assets.

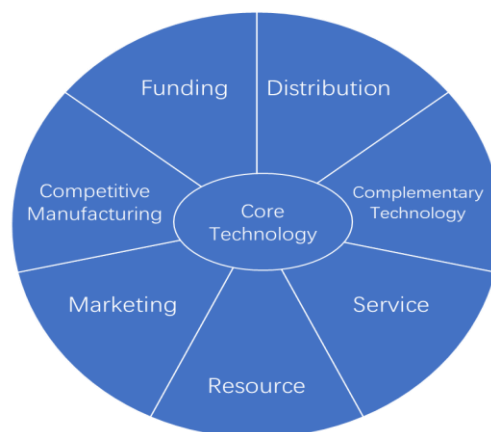


Figure 5 The composition of complementary assets

Due to the different characteristics of enterprises and industries, the complementary assets involved are also different, so there is no uniform classification of complementary assets. The most common classification is to classify the dependence of different complementary assets in the commercialization process of innovative products. In addition, complementary assets are divided into market-based assets and non-market-based assets in the telecommunications industry. Otherwise, complementary assets can also be divided into marketing resources, production resources and human resources according to different functions.

(1) Classified by degree of dependence

The interrelationship between innovative behavior and related complementary assets is very different. In one case, complementary assets are almost generic and there are many potential suppliers. In another case, the successful commercialization of innovation relies primarily on a “bottleneck” asset, and specialized complementary assets usually have only one possible supplier. There is a case between the above two cases named co-specialized complementary assets, innovation and asset interdependence. So, we can divide complementary assets into three parts: General Complementary Asset, Specialized Complementary Asset, Co-specialized Complementary Asset, see figure 6.

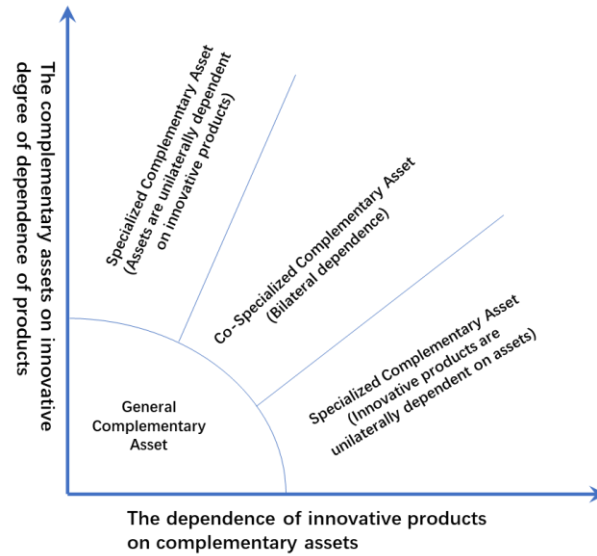


Figure 6 Complementary Assets

General complementary assets are the basis for forming a company's competitiveness. They are not specifically for innovation and can be obtained through market transactions without the need for specific innovative behavior customization. Therefore, the general complementary assets are not the source of competitive advantage and have little impact on the process of realizing the value of technological innovation. Specialized complementary assets show that the unilateral dependence of innovation on complementary assets. Co-Specialized complementary assets show bilateral dependence.

(2) Classified by acquisition method

Complementary assets in the telecommunications industry can be divided into market-based assets and non-market-based assets. Market-based assets include localized expertise, customer experience, and management experience and so on. Non-market-based assets include R&D subsidies, license creation, management, and operations and so on.

(3) Classified by different functions of the asset

According to the functions of complementary assets, they can be divided into

marketing resources, production resources and human capital.

4.1.4 The impact of complementary assets on incumbent and innovative enterprises

Due to the competitive relationship between innovative products and existing products, the dependence between innovative products and complementary assets, the complex relationship between innovative and incumbent enterprises, innovative enterprises want to enter the market and successfully commercialize innovative products, which will must have an impact on the development of incumbents.

Strategy Result	Legal/Technical Environment Strong Specificity	Legal/Technical Environment Weakly Specificity	
		Innovators and imitators are in a good position relative to the owners of complementary assets	Innovators and imitators are in a bad position relative to the owners of complementary assets
Innovators and imitators are in a good position relative to owners of independent assets	Contract	Contract	Contract
	Innovators will win	Innovators should win	Innovators or imitators will win, asset owners will not benefit
Innovators and imitators are in a bad position relative to owners of independent assets	Innovators can choose contract strategies under competitive conditions or integrate assets when necessary Innovators should win and may need to share benefits with owners of assets	Integration	Contract (Restricted exposure)
		Innovators should win	Innovators probably lose to imitators and/or asset owner

Tightness of exclusive rights

Market power level of innovators and complementary asset owners

Table 1 Innovator contract and integration strategies and results (specialized complementary assets as an example)

As showed in table 1, the vertical axis measures the level of market power of innovators and complementary asset owners; the horizontal axis measures the tightness of exclusive rights. It is obvious that the only serious threat to innovators is that specialized complementary assets are completely “locked up”. In this situation, the innovator can choose a contract strategy or integrate assets, which may win, or may share profits with asset holders. However, due to poor intellectual property protection, it is obviously that when innovators are looking for appropriate strategies, they often relax their vigilance against imitators or asset holders. At this point, the innovator's contract strategy, the commercialization of innovative products may fail. Regardless of the innovator or the incumbent, the best allocation of benefits can only be achieved by selecting the best strategy based on the environmental situation in which the innovative product is located.

4.2 Corporate venture capital portfolios and firm innovation

Innovation is a very important factor in organizational performance and longevity, so companies often form collaborative knowledge sharing relationships with other companies to improve their innovation performance. And innovation is a process of problem solving that finds solutions to economically valuable problems through an expensive search process. More and more research has examined how characteristics of a firm’s portfolio of this relationship between companies affects their learning and innovation. And in those researches show the importance of portfolio diversity and how the impact of portfolio diversity depends on other factors. We believe that portfolio diversity has an inverted U-shaped effect on innovation: the initial increase in diversity is beneficial for innovation, but ultimately it will make the negative exceed the medium level. As figure 7 shows.

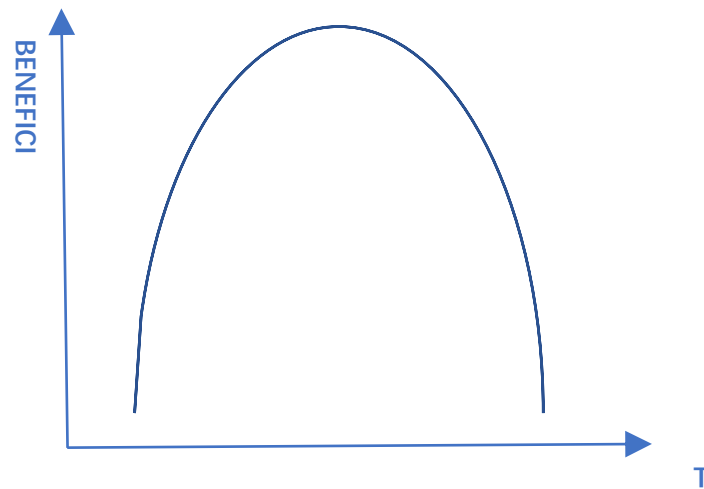


Figure 7 an inverted U-shaped effect on innovation

The depth of knowledge that companies can gain in their partnerships and the positive impact of portfolio diversity on innovation performance. Corporate venture capital is direct minority equity investments made by established firms in privately held entrepreneurial ventures and corporate venture capital is an increasingly important and prevalent means by which firms pursue interorganizational learning. We find that when corporate investors invest in moderately diversity portfolios of startups, their innovation performance is maximized, and this relationship is enhanced with the technical and social capital of venture capital.

The creation and commercial use of technical knowledge (i.e. innovation) is often in the form of new products and services that are critical to the company's sustained economic performance and its survival. The companies often use collaboration and knowledge sharing to improve their innovation performance. Comparing portfolios of inter-enterprise relationships, the linkages in the portfolio can complement each other or conflict with each other, thus affecting the sum of the organization's benefit from the portfolio more or less than the value of the individual relationship. We believe that there are two characteristics of a company's partner portfolio will mitigate the impact of portfolio diversity on its innovation performance: (1) technology capital (i.e., the

inventory of technical knowledge owned by partners), and (2) social capital (i.e., partners, participation in collaboration, knowledge sharing between organizations).

A particularly appropriate setting in which to explore our question is corporate venture capital (CVC) portfolios—the collection of direct minority equity investments established firms make and maintain in privately-held entrepreneurial ventures. Firstly, new ventures often pursue new technologies, by establishing a border spanning relationship with new ventures, CVC relationships represent an important source of knowledge for CVC investors. CVC relationships could influence the innovation performance of an investment company by increasing the knowledge flow and diversity available to the investment company's innovation work. And, investors' evaluation and monitoring of their portfolios and their cooperation have promoted these flows. Secondly, this context helps to investigate how portfolio diversity affects the interdependence of partners in the portfolio.

CVC investments are formal inter-firm relationships that provide partners with access to each other's resources. Such access helps increase the knowledge flow and diversity available for corporate restructuring efforts, potentially increasing innovation. Firstly, before investing, corporate investors typically investigate on all aspects of the business, including their management team, business plans, finances, target markets, products and technologies. Secondly, when investing, corporate investors often get board seats or board observer rights with experienced business unit managers or R&D personnel who often serve on the board. In this way, it helps to promote the relationship of mutual benefit learning between venture capitalists and investors. Finally, corporate investors often engage in frequent and systematic meetings with portfolio companies to evaluate technology development and other performance indicators. We believe that an investor's portfolio of startups will influence investor recombination in terms of both breadth and depth, which will affect their innovation performance. Breadth, also named scope, refers to the diversity of different topical domains of knowledge an actor

searches, depth refers to the accumulated stock of knowledge in a domain accessible in an actor's search efforts. Then we will discuss the beneficial of investors' portfolio of startups from three aspects.

(1) Portfolio diversity

We believe that the diversity of the company's new ventures portfolio will be inversely U-shaped with its innovation performance. Diversity refers to the extent to which a system consists of unique and distinct elements, the frequency distribution of these elements, and the degree of difference between them. There are four ways of portfolio diversity to influence innovation performance. Firstly, portfolio diversity could affect the novelty of the knowledge available in the portfolio. Increasing portfolio diversity could increase investors' chances of acquiring novelty knowledge needed for innovation, increase the potential of novelty solutions and insights, and apply solutions in one domain to another domain. Secondly, partners' willingness to share knowledge and reduces partner protectiveness will be affected by portfolio diversity. Reducing portfolio diversity can have a negative impact on portfolio relationships but increasing portfolio diversity increases the opportunities for partners to share their knowledge. Thirdly, portfolio diversity will influence the

(2) Portfolio depth

We believe that the depth of technological knowledge a firm's portfolio of new ventures will ease the inverted U-shaped relationship between portfolio diversity and innovation performance.

(3) Portfolio firms' partners

We believe that the sum of the number of alliance partners in a firm's portfolio of new ventures will ease the inverted U-shaped relationship between portfolio diversity and corporate innovation performance.

4.3 The relationship of user and firm innovation

Sources of innovation include the company's employees, scientists of academic institutions and users. Users play a very important role in innovation and are an important source of innovation.

Innovation is a challenging and knowledge-intensive activity that is important for the growth and survival of technology-based companies. Firm's innovation research and development activities combine the knowledge that firm is familiar with and new knowledge to develop new products and develop new technologies. New knowledge can be obtained internally or from an external environment. At this point, the insights of innovative users have become new external knowledge of the firm's innovation.

The main reason users drive innovation is by expecting to generate beneficial through the innovation they create. Users innovation have three characteristics that distinguish it from the innovation process of most other companies and academic institutions. First one is identifying a variety of unmet needs of existing products. Unlike other companies that the innovation is to gain monetary benefits by selling innovation to others. Users can deeply understand the purpose of product design and product requirements. Because the users are the product user, they can discover the functional defects of the existing product which will bring value to innovation. Non-users may not be able to identify these requirements quickly. User innovation often indicates the area in which consumers need new functional elements.

Second one is users are immersed themselves in the context of the problem. Different users can use the product in different ways or under different environmental conditions. Different environments conditions maybe affect the operation of innovation.

If the environment in which the product is used is different from the actual use, this mismatch can cause non-user-designed products to fail in practice. So, companies need a more detailed understanding of the background of the product used. Working with innovative users can improve this problem and incorporate this knowledge into their innovation process.

The third one is users work together in an innovative community. Many users choose to work collectively in the community to share their resources, knowledge, ideas and innovative prototypes. These communities provide a platform for relatively free and open information exchange. Each user has a different background and a unique heterogeneous knowledge base. The use of heterogeneous knowledge bases can increase the diversity of solutions. Community users can provide feedback to improve innovation and reduce risk.

5 Comparison between corporate venture capital and Independent venture capital

5.1 Difference of portfolio firms' economic performance: independent versus corporate investors

Venture capital (VC) is considered to be one of the most appropriate financing methods for young high-tech startups to raise external capital. VC investors (VCs) are heterogeneous and exhibit differences in several aspects. In this chapter we will discuss the difference of portfolio firms' economic performance between independent. Both IVC and CVC investments will enhance the economic performance of portfolio companies. These effects are mainly because the increase in actual sales. But the average mixed syndicate consisting of CVC and IVC does not lead to any improvement in economic performance.

Independent venture capital and corporate venture capital have different objectives in investment activities. For IVCs, they only pursuing the financial objective. The only purpose of the IVCs is to seek capital gains on behalf of its limited partners. The main goal of IVCs is to achieve the maximum possible internal rate of return (IRR). Traditional independent venture capital firms manage a pool of funds designed to invest in promising companies (e.g., banks, pension funds, insurance companies, university endowment funds, wealthy individuals, etc.). The final goal of a traditional venture capital firm is to sell the portfolio company to another company or make it public in an initial public offering (IPO). Withdrawal from the funds raised by the investment can repay the investment and obtain additional profits. Portfolio firm means that the startup who gets the investment sells the ownership shares to the venture capital firm and gives

the venture capital firm a board seat, and they will become a portfolio company. For CVCs, they not only pursue financial objectives, but also pursue strategic objectives. CVC can provide portfolio firms with valuable complementary assets by its parent company. The choice of venture capital depends on the strategic fit between its technology and the CVC fund of parent company's technology. When technologies are complementary, CVC has a competitive advantage over IVC in providing value to portfolio companies. When technologies are substitutes, there is a trade-off between CVC's strategic and financial objectives. Because CVC's strategic objectives conflict with the strategic objectives of venture capital, CVC investments may negative effects portfolio firms.

There are different resources and capabilities between CVC and IVC. Companies supported by CVC can acquire the professional resources and capabilities of CVC investor parent organization (e.g., distribution channels, sales force, brand, production capacity, complementary technical capabilities). This is a good aspect of CVC versus IVC. CVCs may suffer from organizational defects, which may make their coaching and monitoring capabilities less effective than IVCs. Therefore, the different ownership and governance of IVC and CVC will influence the quality and intensity of value-enhancing activities brought about by IVC and CVC's advantages to portfolio companies, and finally affect their impact on overall economic performance.

The dynamics of the performance impact of IVC and CVC investments over time are different. We compare the short-term and long-term impacts of venture capital (VC). Short-term refers to the first two years after the first round of venture capital investment; long-term refers to the first round of venture capital investment starting from the third year. For the short-term, IVCs investments and CVCs investments both have positive impact. Form the literature's research observed the data in the period 1992–2010, and the data show that for short-term performance of IVC investments are positive estimate of + 26%, The short-term performance of CVC investments is similar to IVCs

investment. For long-term investment, IVC and CVC investments have statistically significant and economically relevant effects on the overall economic performance of portfolio firms, the estimated of IVC is + 58%, and the estimated of CVC is + 67%. the channels through which IVC and CVC investments improve the portfolio firms' overall economic performance. The channels for IVC and CVC investments to improve the overall economic performance of portfolio companies show that the main improvement in performance resulting from IVC and CVC investments is output. The long-term impact on actual sales growth is close. The actual sales growth for IVC investments in the short term is twice that of CVC. IVC investors have accelerated sales growth for their portfolio companies.

There is a table 2 describe the difference between CVC and IVC.

Attributes		CVC	IVC
Objectives		Financial objectives and strategy objectives	Financial objectives
Organizational structure	Type	Diversity organizational structure (pooled fund, dedicated fund, self-managed fund, Internal CVC project...)	Limited Partnership
	Period	Short	Long
	Stability	Unstable	Stable
	Incentive System	Diversity: similar to IVC; traditional wages, bonuses and option incentives	Incidental interest; performance payments, management costs
	Autonomy	Indefinite	High
Management mode	Syndicate investment	Access to investment opportunities	Take risks, diversify, and access to investment opportunities
	Governance model	limited	diversity

Table 2 the difference between CVC and IVC

6 Conclusion

6.1 Summarizing table

The summarizing table is divided into 4 streams:

Stream (i) Concept and strategy of CVC

Stream (ii) CVC investments and practices

Stream (iii) Corporate venture capital and innovation

Stream (iv) Comparison between corporate venture capital and Independent venture capital

Stream	Authors	Article	Research question	Data	Research method	Findings
i	Sergey Anokhin & Joakim Wincent & Pejvak Oghazi	Strategic effects of corporate venture capital investments. 2016. Journal of Business Venturing Insights 5(2016)63–69	What types of CVC? Analyzes the strategic effects of corporate venture capital investments	Venture Xpert by Venture Economics and Corporate Venturing Directory & Yearbook by Asset Alternatives during 1998–2001	Data collection and analysis, using control variables	There are four types of CVC: driving, enabling, emerging, passive.
i	Abdulkadir Mohamed & Armin Schwienbacher	Voluntary disclosure of corporate venture capital investments. 2016. Journal of Banking & Finance 68	What is the driving factor for corporate venture capital announcements?	VentureXpert database a random sample (i.e., sampling without replacement) of 1000 investments made by corporate-affiliated US VC firms during the 2002–2012 period from a pool of 2588 CVC investments, Factiva	Sample statistics from database.	Investments are more likely to be publicly announced if the parent company of the CVC program exhibits higher degrees of information asymmetry, has more growth opportunities, and has lower leverage. Investments that are still at

Stream	Authors	Article	Research question	Data	Research method	Findings
		(2016) 69–83		database to search each of the 1000 investments		<p>the seed stage are less likely to be disclosed. Parent companies active in high-tech industries and in more competitive industries announce their CVC investments less often, consistent with the hypothesis that these factors increase costs related to disclosure. Externally managed CVC programs and investments syndicated with private VC firms are also announced more often. announced investments lead to positive abnormal returns for the stocks of parent companies and especially those with the most severe information</p>

Stream	Authors	Article	Research question	Data	Research method	Findings
						asymmetry problems.
i	Vareska Van de Vrande & Wim Vanhaverbeke	How Prior Corporate Venture Capital Investments Shape Technological Alliances: A Real Options Approach. 2013. DOI: 10.1111/j.1540-6520.2012.00526.x	how prior corporate venture capital (CVC) relationships between two firms affect the likelihood of their subsequently entering a strategic alliance	A sample of pharmaceutical firms (observation years: 1990–2000). The sample was selected using the Flemings Directory of Pharmaceutical Products Worldwide, which lists the largest pharmaceutical firms based on pharmaceutical revenues in 1989.	The setting is discrete-time, use complementary log–log model,	A prior CVC investment in an entrepreneurial venture increases the likelihood of the corporate investor subsequently establishing a strategic alliance with the entrepreneurial venture. Technological proximity between the corporate investor and the entrepreneurial venture has a positive effect on the likelihood of a subsequent strategic alliance between the two companies. The later the stage of investment in which the corporate investor has made its last investment, the greater the likelihood of the corporate investor

Stream	Authors	Article	Research question	Data	Research method	Findings
						<p>establishing a subsequent strategic alliance with the entrepreneurial venture.</p> <p>The more investment rounds a corporate investor participates in, the less likely it becomes that the corporate investor and the portfolio firm will engage in a strategic alliance.</p>
i	<p>Luc Armel G. Da Gbadji & Benoit Gailly & Armin Schwienbacher</p>	<p>International Analysis of Venture Capital Programs of Large Corporations and Financial Institutions. 2015. DOI:</p>	<p>What drives large companies (nonfinancial corporations and financial institutions) worldwide to run venture capital (VC)</p>	<p>Longitudinal panel data on the complete list of the 2008 Fortune Global 500 companies (2008 and 2011), data from DATASTREAM and COMPUSTAT, Accounting values taken from Fortune magazine. VentureXpert database.</p>	<p>Descriptive Statistics, empirical analysis.</p>	<p>characteristics of the local environment affect the propensity of companies to run a VC program. Using institutional theory and strategic management perspective to guide empirical analysis, highlights the importance of the characteristics of the local environment on</p>

Stream	Authors	Article	Research question	Data	Research method	Findings
		10.1111/etap.12105	programs, specifically targeting Fortune Global 500 companies			firms' CVC activities,
ii	VANGELIS SOUITARIS & STEFANIA ZERBINATI	How do corporate venture capitals do deals? An exploration of corporate investment practices. 2014. <i>Strat. Entrepreneurship Journal</i> Entrepreneur	How do corporate venture capitalists (CVCs) do deals?	Interviewed 23 managers within the 13 CVC programs	A multiple case study method	Derived eight 'corporate investment practices' of CVC programs: referrals from business units, strategic potential for the parent, feedback to the parent, internal technical due diligence, securing a sponsor, syndication with complementary funds, corporate involvement in deal approval, link the venture to the parent.

Stream	Authors	Article	Research question	Data	Research method	Findings
		ship J., 8: 321–348 (2014)				
ii	VANGELIS SOUITARIS & STEFANIA ZERBINATI & GRACE LIU	Which iron cage? Endo- and exoisomorphism in corporate venture capital programs. 2012. Academy of Management Journal	Through an inductive study of six corporate venture capital programs, we unravel how new organizational units resolve competing forces from two different institutional environments	Multiple sources of evidence, primarily interviews supplemented with archival data, written communication, and expert validation	Practice data induction and data iterative method	Identify the organizational practices of the CVC program as a dimension of organizational structure.
ii	GINA DOKKO	Venturing	When an	Using the 2000, 2001,	Empirical Methodology	The higher the proportion

Stream	Authors	Article	Research question	Data	Research method	Findings
	& VIBHA GABA	into new territory: career experiences of corporate venture capital managers and practice variation. 2012. Academy of Management Journal 2012, Vol. 55, No. 3, 563–583.	organization adopts a new practice, what are the conditions for modifying the practice to adapt to the new environment ?	and 2002 volumes of the Corporate Venturing Yearbook and Directory, VentureXpert database to collect longitudinal data on the goal orientation and operational strategies of all CVC units until the year 2008 (an unbalanced panel for 70 CVC units over the period 1992–2008).		of implementing managers who have practice-specific experience (i.e., career experience in IVCs), the less a practice’s goal orientation and operational strategies are modified when it is adopted. The higher the proportion of implementing managers who have organizational fit–specific experience (i.e., firm-specific career experience), the more a practice’s goal orientation is modified when it is adopted. The higher the proportion of implementing managers who have technical fit–specific experience (i.e., engineering career

Stream	Authors	Article	Research question	Data	Research method	Findings
						experience), the more a practice's goal orientation is modified when it is adopted at a CVC.
ii	VIBHA GABA & GINA DOKKO	Learning to let go: social influence, learning, and the abandonment of corporate venture capital practices. 2016. Strategic Management Journal. Strat. Mgmt. J., 37: 1558–1577 (2016)	When do firms shut down practices?	Using the data of Corporate Venturing Yearbook and Directory (2000, 2001, 2002) and 70 CVC units over the period 1992–2008.	Using Econometric methodology and control variable, regression experiment	As firms gain experience with a practice through utilization they are less likely to abandon it. CVC units with at least one CVC manager with IVC experience are less likely to be abandoned. High levels of experience gained by conducting a practice makes a firm relatively immune to contagion influences from both industry peers and practice experts. staffing a CVC unit with high levels of practice hires

Stream	Authors	Article	Research question	Data	Research method	Findings
						attenuates the abandonment pressures from CVC exits but amplifies them from IVC exits
iii	HAEMIN DENNIS PARK & H. KEVIN STEENSMA	When does corporate venture capital add value for new ventures? 2012. Strategic Management Journal. Strat. Mgmt. J., 33: 1–22 (2012)	When does CVC take value to new businesses? What are the good effects of new companies accepting CVC?	VentureXpert database, LinkSV (www.linksv.com), the Internet Archive service (www.archive.org), Factiva, Lexis-Nexis, and hand collected data from Internet searches, COMPUSTAT, the U.S. Patent and Trademark Office (USPTO), and Security Data Corporation (SDC) databases. The sample consisted of 198 wireless communications	Apply the bivariate probability model	CVC funding would be more beneficial to new venture performance when new ventures required specialized complementary assets compared with new ventures that required generic complementary assets.

Stream	Authors	Article	Research question	Data	Research method	Findings
				service, 111 computer hardware and 199 semiconductors.		
iii	Song yanfei & Shao Luning & You Jiangxin	Summary of research on complementary assets. 2013. Journal of Industrial Technological Economics	How do complementary assets affect innovation?	ABI database (1986-2012)	Theoretical and literature analysis, PFI model.	Complementary assets can be divided into three categories according to their degree of dependence, access methods, and different functions of assets. Complementary assets help new venture develop.
iii	Anu Wadhwa & Corey Phelps & Suresh Kotha	Corporate venture capital portfolios and firm innovation. 2015. Journal of Business Venturing 31	What are the conditions for a combination of corporate venture capital (CVC) relationships that affect	U.S. patents from the Delphion database belonging to Thomson Reuters. collected CVC data from the VentureXpert database and obtained investor firm financial data from Compustat, annual reports, SEC filings, the	Using patents to assess investor innovation, Poisson model	Portfolio diversity affects innovation performance, and the diversity of a company's new business portfolio will be inversely U-shaped with its innovation performance. Increasing the depth of the portfolio will improve the positive impact of

Stream	Authors	Article	Research question	Data	Research method	Findings
		(2016) 95–112	the innovation performance of corporate investors?	Japan Company Handbook, Worldscope, and Global Vantage. SDC M&A database, SDC alliance database, Factiva, Lexis-Nexis, and Dialog		diversity, increase the impact of diversity, and reduce the negative impact of diversity on corporate innovation performance.
iii	SHERYL WINSTON SMITH & SONALI K. SHAH	Do innovative users generate more useful insights? An analysis of corporate venture capital investments in the medical device industry.	What are the benefits of user innovation?	all CVC investments made by the four established medical device firms running formal CVC investing programs during the 1978 to 2007 time period. These four firms are Boston Scientific, Medtronic, Guidant, and Johnson & Johnson	Model and econometric approach	Established firms more frequently cite the patents of user-founded start-ups than they cite the patents of other start-ups. Established firms more frequently incorporate knowledge from user-founded start-ups than from other start-ups into their PMA applications.

Stream	Authors	Article	Research question	Data	Research method	Findings
		2013. Strategic Entrepreneurship Journal. Strat. Entrepreneurship J., 7: 151–167 (2013)				
iv	MASSIMO G. COLOMBO & SAMUELE MURTINU	Venture Capital Investments in Europe and Portfolio Firms' Economic Performance : Independent Versus Corporate Investors.	What are the similarities and differences between IVC and CVC?	The VICO dataset (includes 215 IVC-backed firms and 44 CVC-backed firms, out of which 18 firms received an initial investment syndicated by both IVC and CVC investors).	Regression analysis	both IVC and CVC investments improve portfolio firms' overall economic performance, whereas investments by syndicates composed of both types of VC investors do not

Stream	Authors	Article	Research question	Data	Research method	Findings
		2016. Journal of Economics & Management Strategy				

6.2 Research findings and discussions

CVC investments have been developing rapidly since 2000. Plenty of studies have indicated that CVC investments have different advantages comparing with IVC investments. There are different types of CVC investments includes driving, enabling, emerging and passive investments. Different investment methods reflect different investment attitudes. Information asymmetry may result in increased company costs, but it also reduces the need to provide information to competitors and increase market competitiveness. Therefore, the company faces different situations and has different options in order to avoid risks and increase costs: disclosure or not. CVC investments also need a good investment environment that is useful for innovation development.

CVC investments are designed to achieve financial and strategic goals. When CVC investments doing deals, they have different practices from IVC investments because CVC investments' goals. From the literatures we can find the practices of CVC investments doing deals and when to variate or abandon CVC investments.

CVC investments provide big support for innovation. New ventures benefit from complementary assets of CVCs especially specialized complementary assets. From the literatures we find that the portfolio diversity has an inverted U-shaped effect on innovation. The initial increase in diversity is beneficial for innovation, but ultimately it will make the negative exceed the medium level. Through portfolio diversity, portfolio depth and portfolio firms' partners those three factors can ease the inverted U-shaped relationship between portfolio diversity and corporate innovation performance. Another point is the direct users of innovative products can provide a lot of suggestions to develop the products.

CVC investments are different from IVC investments. Firstly, they have different goals. CVCs pursues financial and strategic goals, while IVC only pursues financial

goals. They have different organization structure and management mode. CVCs' period is long but IVCs' period is short.

The literatures give us a better understanding of CVC investments. We can find what it is CVC investments, what are the conditions of CVC investments, how CVC investments doing deals, what is the relationship of CVCs and innovation, what is the difference from CVCs to IVCs. From the literatures we can find the answer.

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