The Corporate Venture Capital as a Strategy for Knowledge Transfer

Fatima Shuwaikh[1]

Emmanuelle Dubocage[2]

Abstract

The purpose of our study is to investigate the impact of the corporate venture capital (CVC) investment on the level of knowledge transferred from corporate investor to their backed-companies. Our empirical results based on a large panel of U.S. start-ups over a 19-year period provide evidence that higher amounts of CVC investments are associated with a higher transfer of knowledge. The results of this research suggest that corporate investors need a proper mechanism of knowledge transfer if they are to maximize the innovative outcome of CVC investment. This mechanism is the strategic fit and the geographic proximity between the partners. This study argued that this mechanism increase the level of knowledge transfer from the corporate investors to the backed companies. Moreover, we present evidence that the knowledge transferred from the corporate investor to the company increases the financial valuation of the company. Finally, the absorptive capacity of companies has a positive moderator role that leads to higher levels of knowledge transfer from the corporate investor to the company after receiving the CVC investments.

Keywords: Corporate venture capital, knowledge transfer, strategic fit, valuation, patent.

[1] Doctor, Faculty Jean Monnet, Paris Sud University, 54, bd Desgranges 92331 Sceaux, France. Email address: fatima.shuwaikh@u-psud.fr

[2] Professor, IAE Gustave Eiffel, Paris-Est Créteil University, 61, avenue du Général de Gaulle 94010 Créteil Cedex France. Email address: Emmanuelle.dubocage@u-pec.fr

1. Introduction

The ability of the firm to gain and expand valuable capabilities and essential resources is related to a large extent to looking for knowledge outside its boundaries as well as combining the new window of knowledge with what it already has (Teece, Pisano, & Shuen, 1997). In this vein, corporate venture capital (CVC) is a way the firms follow to acquire external knowledge. CVC is the equity investment in a relatively new independent entrepreneurial venture by the incumbent firms (Gompers & Lerner, 1998). One of the most essential and primary motivations to make CVC investments by firms is to improve their pioneering efforts by gaining a window onto new valuable technologies (Siegel, Siegel, & MacMillan, 1988).

The activities of CVC are the vehicles provider to exploit knowledge, explore the new development, and monitor the development of technologies (Keil, 2004) and to become more innovative (Dushnitsky & Lenox, 2005a, b). Earlier researchers have focused on the relation between the parent performance and the CVC investments by analysing their learning implications (M. Maula, Autio, & Murray, 2003) empirically. In the avenue of corporate venturing, knowledge flow from the firm (corporate investor) to the company is a valuable knowledge as a firm has more resources to share with the backed company (M. V. J. Maula, Autio, & Murray, 2009). CVCs are remarkable in the support and the technology they provide to general business knowledge (M. V. J. Maula et al., 2009) that enlighten in turn the strategic fit between the partners. Strategic fit is defined as an alignment, internal consistency, and adjustment (Ensign, 2001). Strategic fit is linked to desirable performance implications according to the theoretical literature. Successful companies support and back their strategies with the most suitable and appropriate processes and structures and accomplish strategic fit. Firms will endeavour to achieve this strategic fit to reach the peak of the performance.

In our study, we look for the importance of strategic fit in supporting the knowledge transfer from firms to CVC-backed companies (measured by patenting) after receiving the CVC investment. We test the significance of the shorter geographical distance between the partners in the decision of funding. We investigate the relationship between the geographic proximity and the knowledge transferred between the partners. Previous researchers

have focused on the limited financial revenues for new ventures as a result of the venture capital investments done by the corporations. We provide evidence that higher levels of CVC investments are associated with a more top transfer of knowledge in addition to a positive and direct effect of strategic fit on the level of patenting output. Moreover, our empirical results show that the knowledge transfer from the firms to the CVC-backed companies increases their financial valuation. This research found that for a CVC-backed company with a good stock of absorptive capacity, the rate of knowledge flow, as a result, will be higher. This finding explains the effect of the absorptive capacity in increasing the innovative outcome after receiving the CVC investments. In this study, we test the role of the absorptive capacity as a moderator in the process of funding, and it is a positive moderator with a substantial impact on enhancing the transfer of knowledge. We have not found an effect on Tobin's Q on the number of patents, but it affects the citations. The post-money valuation in addition to Tobin's Q is used to track if the financial valuation of the company has an impact on the transfer of knowledge between the partners.

The results tested in our research enhance the available CVC research in many approaches. Previous empirical research has focused on the strategic benefits of venturing activity (Maula, Autio, & Murray, 2009), financial payoffs to new start-ups investment (Gompers & Lerner, 1998), the innovativeness output of the firm after CVC funding (Dushnitsky & Lenox, 2005b). None of these studies evaluate the strategic fit and the geographical proximity between the partners. Moreover, we assess the effect of the CVC funding on the CVC-backed companies using patenting information.

This study is composed of four sections: in the first section, we present the literature review and a layout of the hypotheses that are related to our framework. In the second section, we provide information about the data and their measures and the methodology used in this study. In the third section, we analyze the empirical results. In the fourth section, we present the study and discuss our results, implications and future research.

2. Literature review

Based on the inter-organizational learning and CVC literature, we build the development of our hypotheses. The review focuses on the industrial relatedness, the geographical area between the CVC-backed company and

the firm, the valuation of the CVC-backed company after receiving the CVC investment and the impact of the absorptive capacity of the CVC-backed company as a moderator on the strength of knowledge transferred from the firm to the company.

2.1 Strategic fit

The critical task in project company is making decisions to follow the suitable and relevant projects to draw out the business success and to sustain competitive advantage (Cooper, McDonald, & Mills, 2000). One of senior management's basis authority who is financially responsible for project portfolios is ensuring the strategic fit between the partners. This puts the firm at the gate of its responsibilities in taking the decisions of funding the company to select the most suitable investment. We focus on the strategic fit as the prime objective of investing in companies in the process of enhancing the knowledge transfer and increasing the valuation for these backed companies. Strategic fit is accomplished when the companies are aligned with the firm's business strategy. According to Cooper and Edgett (2003), the senior management's core activity is to establish a strategic fit between the firm and the company and to ensure it.

Earlier researchers shed the importance of portfolio management and alignment of business strategy (Srivannaboon & Milosevic, 2006), for example, portfolio management (Herfert & Arbige, 2008), programme (Lycett, Rassau, & Danson, 2004). The firms that seek for implementing strategy via CVC- backed companies need to follow the strategic fit in their investments, and this is considered of vital importance for their prosperity. In sum, the importance of those activities at operational aspects draw the demand to link firm strategy to company strategy, and this is according to Morris and Jamieson (2005). The strategic fit has not been analysed in the specific context of CVC investments. Moreover, the relational attitudes between the partners are mentioned in a limited discussion. We expect more refining knowledge, building and incremental learning with more strategic relatedness. Incremental learning is supported by the sharing of essential characteristics that related industries have.

H1: The strategic fit between the firm and the company increases the transfer of knowledge from the firm to the company after being funded by CVC investments.

2.2 Geographic proximity

Investors are more likely to make their investment decisions based on the "twenty- minute rule" which says that if a start-up who is seeking a venture capital fund is far from the venture capital's office more than twenty-minute drive, then it will not be funded (T. E. Stuart & Sorenson, 2003). According to Sorenson and Stuart (2001), relationships are more likely to be formed based on geographically proximate. The proximity in the geographical sense is considered in this study as the similar area between the company and the firm. Doloreux, (2002) contributes in his paper that faster communication between actors and less cost of exchanging knowledge and information are a result of the shorter geographical distance between the partners. Geographic proximity is measured upon the North America Metropolitan Statistical Area (MSA). It is a variable that will capture the geographical operating location for the area of the company and the firm. We expect that geographic proximity influences the propensity to learn between firms and their backed companies and the capabilities to transfer knowledge and improve future performance.

H2: There is a positive relationship between the geographic proximity between the company and the firm and the transfer of knowledge between the partners.

2.3 Knowledge transfer

Knowledge transfer is a continual competing advantage. Developing the knowledge is an essential process for both technology-based ventures and innovation-driven corporates as a result of their demand and need to learn. The ability to get external knowledge resources is an approach to one of the ways of survival, and this is according to DeCarolis and Deeds (1999). For companies striving for competitive advantage and innovation, new knowledge, knowledge transfer enhance, open and augment the companies' ability to exploit them (Yli-Renko, Autio, & Sapienza, 2001). The flow of new knowledge is faced with many constraints for many reasons. First, to innovate rapidly, established companies need the stocks of knowledge (Dushnitsky and Lenox, 2005a). Second, and according to Henderson (2009) and Tushman and Anderson (1986), established companies have obstacles in achieving innovations through the development of internal knowledge. Finally, the assimilation of mostly distinct knowledge assets is

of the requirements of innovation. Fourth, companies and in order not to be trapped by the available knowledge stocks that exist within their companies, search for knowledge out of their boundaries (Levinthal & March, 1993).

According to some scholars, the development of new knowledge needs external search where companies explore outside their boundaries to look for diverse and unrelated knowledge domains (Grant, 1996). As a result, such search beyond the boundaries allows companies to acquire more related outcomes from superior knowledge than those that result from local processes (Levinthal & March, 1993). CVC investment is the approach and the unique opportunity to achieve this survival, to have a prestigious and well-established company, and to get the access to the external resources.

A developing clue suggests that CVC investment grants established firms to access a pool of new external knowledge from start-ups. CVC investment is the primary approach used by large firms to explore knowledge and new opportunities outside their firm boundaries (Keil, 2004). Developing relationships with foreign partners is the tool used by firms to access new external knowledge. In sum, to provide the established companies with the access to get such collection of external knowledge is the avenue of CVC investments. Henceforth, we are going to test the impact of the CVC investments on the level of transfer of knowledge from the firm to the company.

H3: The mechanism of CVC funding increases the level of knowledge transferred from the firm to the company.

2.4 Absorptive capacity

The capability of a company to perceive the external source of knowledge and assimilate it to apply it to its needs is related to the stock of innovative capabilities. The marginal effects of CVC investments on innovation rates are not the same across all companies. The absorptive capacity of a company affects the extent to which a company may learn from the CVC investments. The external and internal sources of innovations are interdependent (Cohen & Levinthal, 1990). The likelihood of cooperative research and development (R&D) with other companies is increased in the presence of an internal R&D department; this is according to Kleinknecht and Reijnen (1992) in their absorptive capacity argument.

Also, researchers have reported that companies who own experience in a specific domain can improve the absorption of external information (Veugelers, 1997). In this study, we will test the impact of what the company already knows on the learning transferred and the flow of knowledge between the partners. We expect that the impact of knowledge transfer in CVC investments will be more significant on companies who have a healthy stock in innovation. To increase the level and the effect of the knowledge transferred from the firm to the company, it should have a sufficient technical understanding of that knowledge.

H4: The absorptive capacity of companies positively moderates the relationship between level of knowledge transferred from the firm to the company and the CVC investments.

2.5 Valuation

Dushnitsky and Lenox (2006) contribute that CVC investment creates company value only when they seek strategic sense. They provide evidence that the creation of company value is associated with the CVC investments. The possibility that CVC may provide an orientation to company innovation and a window on technology has significant implications. The capabilities acquired that allow a company to achieve encouraging strategic positions and the ability to earn valuable resources are centrally the competitive success accomplished by companies (Teece et al., 1997). The successful firms are those who exploit knowledge external to their boundaries in case of internal deficiency in generating their assets (R. Henderson & Cockburn, 1994).

To capture the company value creation, we followed Dushnitsky and Lenox (2006), and we used Tobin's q as a valuation of the company over the value of its tangible assets. They find a relationship between the CVC investment and the creation of the value of the company but under two conditions the temporal and the sectoral factors. We add the post-money valuation variable which is the equity value of a company including the round of financing besides Tobin's Q to capture the financial valuation of the company regardless of the sectoral factors. Gompers and Lerner (1998) conjecture in their paper that investors receive indirect benefits that offset the potential loss due to the structural deficiencies implicit in CVC program. To explore the relationship between the transfer of knowledge and the

financial valuation of the company we conjecture the following:

H5: There is a positive impact of the valuation of the company on the level of the knowledge transferred from the firm to the company.

3. Methodology

3.1 Data collection

To construct the panel data on companies' and firms' venturing activity, we used Venture Economics' VentureXpert database, a division of Thomson Financial. To obtain the necessary financial and accounting information we use Standard and Poor's Compustat database, which is our second data source. Moreover, OECD Patent Quality Indicators database is used to collect patent implication information. Finally, Bloomberg which is our fourth database is used to track the ticker symbol and to collect the missing data from other used sources. We choose to gather data for the period 1998-2016. We begin our analysis in 1998 because it corresponds to the increase of a crest of CVC investment among firms and companies. We construct our sample of CVC investors by identifying the list of VCs that undertake investments from corporations as reported by the Thomson VentureXpert database, and we select the type of the firm as corporate venture capital. We define our companies as a CVC-backed if it receives financing from at least one CVC investor. We work manually to identify parent corporations of CVC on different sources as LexisNexis and Google. We collected Standard Industrial Classification (SIC) codes to look for the industry classification of those parent corporations referring to the definition of CVCs as subsidiaries invested by non-financial corporations and then to compute the degree of strategic fit between the firm and the company. Moreover, a venture capital firm whose industry classification is not a financial institution and has only one Parent Corporation is considered as CVC, and we neglect those CVCs with a financial institutions parent corporation's classification or those which we cannot define their parent corporations. To combine the Thomson One data with the patent database from OECD data and with Compustat database, we control by hand the names of the companies, one by one, in all databases. In some cases, a company may have different names, and therefore we need to check its history using Google and LexisNexis. We

obtain our final sample at the company level, which consists of 1279 U.S. companies with first investment year 1998.

3.2 Method

Our dependent variables (patents) and (citation-weighted) are the count data per year applied by a company; they do not have negative values and exhibit significance over-dispersion. Because our data are over-dispersed count patenting data, we follow the literature by using a negative binomial model. It is a nonlinear model applied to avoid heteroskedasticity, which is generalized from a Poisson model and allows for over-dispersion by combining an individual, unobserved effect into the conditional mean. Since the mean and variance of the patent data are not proportional so we cannot apply Poisson model that cannot be used when the standard deviation of the dependent variable exceeds its mean value (Hausman, Hall, & Griliches, 1984).

Firm effects are a conventional method in panel data models. Moreover, we have some unobserved terms in our panel model. To correct the unmeasured characteristics derived from the heterogeneity problem, we apply both firm fixed effects and firm random effects. We ran the Hausman test in Stata for both the fixed and random effects to identify which estimation we have to choose. Because the relationship between each of our dependent variables and the property effects of each variable is statistically significant, the fixed-effects estimate is suitable for our panel data.

3.3 Dependent variables

Knowledge transfer

Firm's innovativeness is measured by a lot of identifiers in the literature. R. Henderson & Cockburn (1994) identify R&D expenditures, Acs and Audretsch (1988) identify new product announcement, Griliches (1990) identifies patents and finally patent citations (Dushnitsky & Lenox, 2005a, 2005b; Trajtenberg, 1990). The most popular measure identified among these is the patent citation (Dushnitsky & Lenox, 2005a). Patent citations or weighted patent counts are used to capture the value of innovation. Our variables to measure knowledge transfer from a firm to a company will be the number of patents at the assignee level and the forward citations per

patent. The first measure of this variable is the patent level as the number of citations the company's patent refers to any patent of partners in year t (Schildt, Maula, & Keil, 2005). An increase in this measure represents an increase in the degree to which the company's patent builds upon the knowledge of its partners. To construct the measure of knowledge transfer from the firm to the company, we used the OECD database, and we collect the patent number, the application date, the grant date, the company to which the patent is assigned, and references to previous patents for each granted patent. Thus, OECD innovation index is ideal for measuring the level of knowledge transfer from the firm to the company. Our second main measure of knowledge transfer is the weighted patent counts (WPC).

$$WPC = \sum_{i=1}^{n_t} (1 + c_i)$$

3.4 Independent variables

3.4.1 Strategic fit

We build the independent variable strategic fit counting on the Standard Industrial Classification (SIC) codes. This index will take the value of 1 in the case of same SIC code, and in the case of completely different SIC code, it will take the value of zero. As a result, the strategic fit is based on the four-digit SIC which is overlapped between that of a firm and that of its company.

3.4.2 Geographic proximity

Geographic proximity is measured upon the North America Metropolitan Statistical Area (MSA). It is a variable that will capture the geographical operating location for the area of the company and the firm; this variable is equal to 1 if both partners are in the same area and zero otherwise.

3.4.3 Annual CVC investment

The amount of CVC investment in millions of dollars is computed as all venturing funds by the firm in a year in the company.

3.4.4 Absorptive capacity

Absorptive capacity is the independent variable that we expect to moderate the relationship between the knowledge transfer and the CVC investment. It is measured using two indexes the patent stock and the R&D intensity. The patent stock of a company is employed as an index of the company's absorptive capacity (Cohen & Levinthal, 1990). The patent stock is a good proxy for the company's ability to absorb new knowledge and for knowledge capital. Following Blundell, Griffith, and Van Reenen (1995), the patent stock is measured by calculating the depreciated sum of all patents applied

$$Patent\ Stock_{it} = \ln (Patents)_{it} + (1 - \delta) Patent\ Stock_{it}$$

Company's R&D intensity measures the Absorptive capacity of companies. Specifically, we calculated it as the R&D expenditure of company i at a year and divided by the company's total asset size during the same period (Cohen & Levinthal, 1990).

$$Absorptive\ capacity_{it} = \frac{R\&D\ Expenditure_{it}}{Total\ Assets_{it}}$$

3.4.5 Company's financial value

Following the literature, we capture the company value by Tobin's Q (Dushnitsky & Lenox, 2006). It is a company's market valuation over the value of its tangible assets. Explicitly, Tobin's Q merges growth values of equity. It includes company valuations of current operations as well as company expectations for future growth (Yang, Narayanan, & De Carolis, 2014). Since Tobin's Q focuses on expected future earnings and covers the lag between the expected benefits and the amount of CVC investments, then it is a better measure of company value (Dushnitsky & Lenox, 2006).

Tobin's Q is computed according to (Chung & Pruitt, 1994):

$$Approximate\ Q = \frac{firm\ equity\ value + book\ value\ of\ long\ term\ debt + net\ current\ liabilities}{total\ assets}$$

In addition to Tobin's Q variable, we use the post-money valuation to capture the financial value of the company after receiving the CVC investments. The Post-Money Valuation is the equity value of a company including the round of financing and a proxy of valuation raised by Thomson Financial.

3.5 Control variables

The strategic and financial outcomes of CVC investments are influenced by company characteristics, industry attributes, and macroeconomic factors. We use Ln (Total Assets) in millions to measure the company size in our study. Additional control variable that affects the organizational knowledge transfer is the company age which is measured as the number of years of the company at the CVC investment date. As we used the number of patents as a dependent variable, we should control R&D expenses (Benner & Tushman, 2003). We expect that greater patenting output is related to larger in-house research expenditures (R. Henderson & Cockburn, 1994). Moreover, larger companies are more likely to patent more when they possess greater resources for investing in research (Cohen & Levinthal, 1990).

4. Results and discussion

Our dependent variable is the knowledge transfer as defined in the previous section. We use the negative binomial model, and we can address the discrete nature of this dependent variable. Table I indicates descriptive statistics and in table 2 we present the correlation matrix for all our variables of interest. The descriptive statistics show that the average age of the companies is 10.44 years. Their assets averaged $ 509.22M, and their sales averaged $243.23M. In our results, the average Tobin's Q for the company in our data is 0.92. The average Ln (CVC) among companies is approximate $3.73M per year. The research and development expenditure is $51.97M on average. The average time of exit for the companies in our sample is 1.17 years. The mean value for the post-money valuation is $2.2M. In our descriptive table, we see that the average number of patents for the companies is 7.93 per year and these companies receive 26 citations for every patent. Since in this study patent citation counts are used as the dependent variable, we used the negative binomial Poisson regression

model. When the standard deviation of counted data is greater than its mean, the negative binomial Poisson regression model is appropriate when dealing with over dispersion that can be made to the standard Poisson regression model.

Table 1: Descriptive statistics

Variables	# observ.	Mean	SD	Min	Max
Patent count	1279	7.93	19.99	0.00	249.00
Citation	1279	209.80	1523.34	0.00	42659.00
Patent stock	1279	33.53	71.12	0.00	859.00
Strategic fit	1279	0.02	0.11	0.00	1.00
Geographic P	1279	0.02	0.13	0.00	1.00
Age (Months)	1279	0.87	7.82	0.00	134.00
CVC	1279	3.73	51.80	0.00	1729.55
C (Asset)	1279	509.22	1767.53	0.04	40184.00
Sales	1278	243.23	743.57	0.00	12466.00
R&D expenses	1233	51.97	142.61	0.00	2666.00
Tobin's Q	1279	0.92	1.75	0.00	27.17
Valuation	1279	2.20	20.39	0.00	399.00
Time To exit	1279	0.16	1.17	0.00	15.70

Table 2: Correlation Between Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12
(1)Patent Count	1.0000											
(2)Citation-weighted	0.3828*	1.0000										
(3)Patent stock	0.4756*	0.1467*	1.0000									
(4)Strategic fit	-0.0151	0.0099	-0.1089*	1.0000								
(5)Geographic P	-0.0205	0.0299	-0.0963*	0.7201*	1.0000							
(6)Age at financing	-0.0359	-0.0111	-0.1052*	0.4223*	0.3358*	1.0000						
(7)CVC investment	-0.0434	0.0128	-0.1458*	0.7295*	0.6710*	0.6107*	1.0000					
(8)C size	0.3211*	0.0279	0.1633*	-0.1858*	-0.1482*	-0.1317*	-0.2055*	1.0000				
(9)Sales	0.2539*	-0.0068	0.0792*	-0.1670*	-0.1463*	-0.1194*	-0.1987*	0.8030*	1.0000			
(10)R&D expenses	0.4024*	0.0510*	0.3543*	-0.1111*	-0.0965*	-0.1189*	-0.1526*	0.6986*	0.4623*	1.0000		
(11)Tobin's Q	-0.0363	0.0263	0.0305	0.1859*	0.1277*	0.1159*	0.1891*	-0.3384*	-0.3054*	-0.1199*	1.0000	
(12)valuation	-0.0368	0.0246	-0.1407*	0.6099*	0.5618*	0.5128*	0.8084*	-0.1989*	-0.1594*	-0.1349*	0.1471*	1.0000

Using the patent count index, which is our first identifier for the dependent variable transfer of knowledge, we investigate the effect of the independent variables. In the first model in table 3, we can see the impact of the strategic fit on the transfer of knowledge. We can observe according to this positive coefficient how the strategic fit between firm and company could enhance the rate of knowledge transferred to the company. The economic magnitude is also significant. Thus, H1 is supported.

Table 3: Patent Count as Dependent Variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Strategic fit	0.60***						
	[0.12]						
Geographic P		0.35***					
		[0.11]					
CVC investment			0.06***	0.08***	0.19**	0.27***	0.27***
			[0.02]	[0.03]	[0.09]	[0.09]	[0.09]
Age financing				-0.07	-0.08	-0.10+	-0.09+
				[0.05]	[0.05]	[0.05]	[0.05]
Time to exit					-0.27	-0.28	-0.26
					[0.20]	[0.20]	[0.20]
Valuation						0.03	0.04
						[0.05]	[0.05]
Patent stock						0.83***	0.84***
						[0.05]	[0.05]
Tobin's Q							-0.29**
							[0.14]
R&D expenses	0.65***	0.65***	0.65***	0.65***	0.65***		
	[0.10]	[0.10]	[0.10]	[0.10]	[0.09]		
C size	0.08	0.08	0.07	0.07	0.06	0.23***	0.21***
	[0.09]	[0.09]	[0.09]	[0.09]	[0.09]	[0.04]	[0.04]
Constant	-0.35	-0.08	-0.04	-0.16	0.00	0.10	0.19
	[0.25]	[0.24]	[0.26]	[0.27]	[0.29]	[0.25]	[0.25]
Alpha Constant	0.71***	0.72***	0.73***	0.72***	0.72***	0.23***	0.23***
	[0.08]	[0.08]	[0.08]	[0.08]	[0.08]	[0.08]	[0.08]
Observations	1267	1267	1267	1267	1267	1279	1279
Log Likelihood	-3381	-3386	-3387	-3386	-3385	-3150	-3147
Pseudo R-Square	.057	.056	.055	.056	.056	.12	.12
Year fixed effects included	Includes	Includes	Includes	Includes	Includes	Includes	Includes

t statistics in parentheses *p<0.05 **p<0.01 **p<0.001

In model 2 table 3 we investigate the effect of the geographical proximity on the transfer of knowledge. The coefficient of geographical proximity is positive with support at 1% level, which gives support to our hypothesis that there is a significant correlation between the geographic proximity and the level of knowledge transferred from the firm to the company.

H3 argues that higher CVC investments lead to higher knowledge transfer from the firm to the company. The amount of CVC investments affect the level of knowledge transferred from firm to company and increases the flow of knowledge to the company as well. In model 3 table 3, the correlation coefficients show that the amount of CVC investments is positively and strongly correlated with the patent count. Thus H3 is supported. Table 3 includes four regression models 4 through 7 to test the impact of the CVC amounts invested on the transfer of knowledge. The

coefficient of CVC is strongly supported at the 1% level in all the models. This is consistent with our theoretical prediction that the CVC investments improve the degree of the transfer of knowledge and that they are highly correlated. In model 4, we control for the CVC investments but not for the other independent variables. In model 5, we control for the time to exit and age at financing in addition to the CVC investments, and we find that they don't have an impact on the patent count.

In model 6, we add the control on the valuation and patent stock in addition to the CVC investments. We found a clue, to the hypothesis H4 that, absorptive capacity motivates and enhance the levels of knowledge transfer from the firm to the company after receiving the CVC investments. The same positive coefficient results in model 7 for the patent stock. The absorptive capacity has a positive and statistically significant effect at the 1% level on the transfer of knowledge. Thus, H4 is supported. The companies with higher absorptive capacity can improve higher innovation levels after receiving the CVC investment.

In model 7, we control for Tobin's Q in addition to all the independent variable that has been controlled for in model 6. The coefficient of Tobin's Q has a negative sign with the patent count, and there is no relation between the post-money valuation and the patent count.

Using the weighted patent citations index, which is our second identifier for the dependent variable transfer of knowledge, we will investigate the effect of the independent variables. In model 8 table 4, we examine the impact of the strategic fit on the transfer of knowledge. The results give a proof of our prediction that the strategic fit between firm and company could enhance the rate of transfer to the rate of transfer to the companies. The economic magnitude is also significant. Thus, H1 is supported.

Table 4: Citation Count as Dependent Variable

Variables	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
Strategic fit	1.43***						
	[0.33]						
Geographical proximity		0.81***					
		[0.28]					
CVC investment			0.17***	0.25***	0.58***	0.54***	0.54***
			[0.05]	[0.07]	[0.18]	[0.14]	[0.14]
Age at financing				-0.28**	-0.30***	-0.28***	-0.28***
				[0.11]	[0.11]	[0.09]	[0.08]
Time to exit					-0.80**	-0.72**	-0.72**
					[0.32]	[0.30]	[0.30]
Valuation						0.20**	0.20**
						[0.08]	[0.08]
Patent stock						0.93***	0.93***
						[0.07]	[0.07]
Tobin's Q							-0.06
							[0.24]
R&D expenses	0.61***	0.58***	0.62***	0.59***	0.62***		
	[0.16]	[0.15]	[0.16]	[0.16]	[0.16]		
company size	0.18	0.20	0.17	0.20	0.15	0.27***	0.27***
	[0.15]	[0.14]	[0.15]	[0.14]	[0.15]	[0.06]	[0.06]
Constant	4.67***	5.27***	5.21***	4.71***	5.18***	5.12***	5.14***
	[0.40]	[0.40]	[0.41]	[0.46]	[0.50]	[0.42]	[0.43]
alpha constant	1.60***	1.62***	1.61***	1.61***	1.60***	1.45***	1.45***
	[0.08]	[0.08]	[0.08]	[0.08]	[0.08]	[0.07]	[0.07]
Observations	1267	1267	1267	1267	1267	1279	1279
Log Likelihood	-5747	-5758	-5756	-5752	-5748	-5574	-5574
Pseudo R-Square	.029	.027	.028	.028	.029	.051	.051
Year fixed effects	Includes	Includes	Includes	Includes	Includes	Includes	Includes

All continues variables in log

t statistics in parentheses *p<0.05 **p<0.01 **p<0.001

In model 9 table 4 we investigate the effect of the geographical proximity on the transfer of knowledge using the weighted patent citations index. The results indicate a robust significant impact for the geographic proximity on the knowledge flow from the firm to the company.

H3 argues that higher CVC investments lead to higher knowledge transfer from the firm to its company. In model 10 table 4, the correlation coefficients shows that the amount of CVC investments is positively and strongly correlated with the weighted patent citations. Thus H3 is supported. Table 4 includes four regression models 11 through 14 to test the effect of the CVC investment on the transfer of knowledge using weighted patent citations index. In model 11, we control for the CVC investments but not for

the other independent variables. In model 12, we control for the time to exit and age at financing in addition to the CVC investments, and we find that they have a negative impact on the weighted patent citations index.

In model 13, we add the control on the valuation and patent stock in addition to the CVC investments. As mentioned in the previous results, we find that the absorptive capacity increases levels of knowledge transfer between the firm and the company after receiving the CVC investments. Thus H4 is supported.

In model 14, we control for Tobin's Q in addition to all the independent variable that has been controlled for in model 13. The coefficient of Tobin's Q has no impact on the weighted patent citations index. The post-money valuation which is our second index for financial valuation shows a strong effect on the level of the knowledge transfer, so we accept our hypothesis that the knowledge transferred from the firm to the company increases the value creation of this company. Thus H5 is supported. As for the control variable, R&D expenses displayed significant correlations with the dependent variable in expected directions. The higher research expenditure is found to be positively associated with the degree of learning and knowledge flow between the partners in all of the models from 1 to 14.

Table 5: Absorptive Capacity as a Moderator

	Patent count				Citation-weighted patent count			
	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Strategic fit	1.16***	1.08***	0.74***	0.59**	2.11***	1.70***	1.87***	1.08***
	[0.30]	[0.30]	[0.24]	[0.23]	[0.45]	[0.38]	[0.46]	[0.38]
Geographical proximity	0.15***	0.18***	0.08***	0.09***	0.53**	0.13**	0.52**	0.20**
	[0.20]	[0.20]	[0.14]	[0.13]	[0.40]	[0.30]	[0.34]	[0.24]
CVC investment in Millions	0.10***	0.08***	0.17***	0.20**	0.17**	0.14**	0.16**	0.06**
	[0.15]	[0.16]	[0.09]	[0.08]	[0.27]	[0.28]	[0.19]	[0.19]
Moderators								
R&D intensity	0.55***	0.64***			0.36***	0.84***		
	[0.13]	[0.14]			[0.20]	[0.17]		
Patent stock			0.60***	0.73***			0.43***	0.73***
			[0.08]	[0.08]			[0.13]	[0.11]
Year fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Constant	2.04***	1.79***	1.20**	0.70	3.81***	2.75**	4.89***	4.26***
	[0.55]	[0.57]	[0.49]	[0.54]	[0.86]	[1.08]	[0.81]	[1.08]
lnalpha constant	0.42***	0.36***	0.16	0.03	1.61***	1.44***	1.58***	1.39***
	[0.13]	[0.13]	[0.12]	[0.12]	[0.11]	[0.10]	[0.11]	[0.10]
Observations	1178	1178	1229	1229	1178	1178	1229	1229
Log Likelihood	2989	2964	2967	2919	5479	5373	5614	5496
Pseudo R-Square	.06	.068	.094	.11	.011	.031	.018	.038

All variables are logged except Strategic fit and Geographical proximity

Negative binomial model of yearly patent count and citation-weighted patent count.

Robust standard errors in brackets clustered at the applicant level.

*0.10 ** 0.05 ***0.01 lnalpha is the dispersion parameter

In table 5 we test the impact of the absorptive capacity as a moderator between the independent variables (strategic fit, geographical proximity, CVC investment) and the flow of knowledge. The company's ability to grasp new technology depends on a great extent to its stock of knowledge. The absorptive capacity can explain this stock of knowledge. This ability is tested regarding two proxies the R&D intensity and the patent stock. The models from 15 to 22 strongly support the role of the absorptive capacity as a moderator in the transfer of knowledge between the partners. The company's absorptive capacity testing both the R&D intensity and the patent stock on all the independent variable is strongly significant. This is in line

with our prediction that absorptive capacity enhances the process of knowledge flow from firm to company.

5. Conclusion

In our paper, we examine the importance of strategic fit in supporting the knowledge transfer from firms to companies (measured by patenting) after receiving the CVC investment. In this study, we have analyzed the strategic fit in the specific context of CVC investments. One of the most critical factors that affect knowledge transfer across organizations is whether or not there exist strategic fit between the involved organizations. We have presented in this study that strategic fit which is the alignment of the company to the business strategy of the firm is the prime objective of investing in the rate of transfer to the companies in the process of enhancing the transfer of knowledge. Earlier researchers shed the importance of portfolio management and alignment of business strategy Srivannaboon & Z. Milosevic (2006). This is consistent with our findings that the firm that seeks for implementing strategy via portfolios need to follow the strategic fit in their investments and this is considered of vital importance for their prosperity (Herfert & Arbige, 2008).

The proximity in the geographical sense is considered in this study as the similar area between the firm and the company. We find that geographic proximity influences the propensity to learn between firms and their companies and this is in line with (Simmie, 2003) who found that when the partners in an appropriate area for each other, the tacit knowledge can be shared easier between them which increases by turn the innovation process.

Previous research found that the intention for firms to invest in companies is for the goal of identifying possible acquisition targets that is more strategic motivations and gaining access to a new window on new technologies in addition to the financial returns (Yi Yang, 2012). For breakthrough innovations, unique opportunities are provided by CVC investment for established firms to learn new technologies of entrepreneurial ventures (Ahuja & Morris Lampert, 2001). We find that to give the established companies with the access to get a collection of external knowledge is the avenue of CVC investments.

We find that the impact of knowledge transfer in CVC investments will

be more significant on companies who have a strong stock in innovation. To enhance the process of knowledge transferred from the firm to the company, it should have a sufficient technical understanding of that knowledge. Our finding that the absorptive capacity of companies leads to higher levels of knowledge transferred from the firm to the company after receiving the CVC investments is consistent with Kleinknecht and Reijnen (1992). Also, researchers have reported that companies who own experience in a specific domain can improve higher levels of knowledge transfer from external sources due to its ability of absorption (Veugelers, 1997) and this is in line with our hypothesis. We found that the absorptive capacity plays a significant positive moderator role in enhancing the flow of knowledge from the firm to the company after receiving the CVC investments. It moderates the relationship between each of the strategic fit, geographic proximity and CVC amount with the flow of knowledge from the firm to the company.

To capture the company value creation, we use the post-money valuation variable beside Tobin's Q to achieve the financial valuation of the company regardless of the sectoral factors. Gompers and Lerner (1998) conjecture in their paper that investors receive indirect benefits that offset the potential loss due to the structural deficiencies implicit in CVC program. We test the impact of the valuation on the transfer of knowledge, to find that there is a strong correlation between the valuation of the company and the flow knowledge from the firm to the company.

The findings in this study should be of interest for corporate investors who need to source external knowledge through CVC investments successfully, and to do so, they need to recognize the factors which effectively facilitate the knowledge flow from the firm and limits the CVC investment activities. Also, the study is of interest for managers of CVC programs and companies since the results provide important issues to the management of this CVC investment. It is also critical to comprehend the level of strategic relations and relatedness between the company and the firm and the level of knowledge transfer. In sum, after the understanding of these moderating factors in the CVC program, entrepreneurial ventures would provide more effective knowledge sourcing (Wadhwa, Phelps, & Kotha, 2016). The tie strength of the strategic fit is an important issue that may be taken into consideration to study to which extent the strategic fit

may influence the CVC investments and the decision of the funding as a future research work.

Appendix I: Description of variables

Variables	Measurements	Databases
Amount of knowledge transferred through CVC investments (Patents)	No. of patents cited by Company	OECD
Forward citations	The total number of citations to patents counts	OECD
C's stock of patents (Patent Stock)	No. of patents of as a stock before the investment date	OECD
Ln (CVC)	Log of CVC invested ($M)	VentureXpert
Tobin's Q	C's market valuation over the value of its tangible assets	Compustat
strategic fit	Strategic fit (1) No Strategic fit (0)	VentureXpert/Bloomberg/Compustat
Age at financing	(CVC investment year-1)-founded year	VentureXpert
Valuation	The post-money valuation is the equity value of a company including the round of financing performance	VentureXpert
Round Number	The number of investments made into the company	VentureXpert
Time to Exit	The time from the first financing Date to the exit date	VentureXpert
Ln (Research)	Log of R&D expenses ($M)	Compustat
Geographic proximity	Geographic proximity between a firm and its company	VentureXpert
C size	logarithmic transformation of assets	Compustat

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