POLITECNICO DI TORINO

Master thesis

Corporate Venture Capital

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LIST OF ABBREVIATIONS USED IN THISIS

TC	Total Cost
TVC	Total Variable Cost
TFC	Total Fixed Cost
MC	Marginal Cost
SAC	Short Run Average Cost
SMC	Short Run Marginal Cost
AFC	Average Fixed Cost
AVC	Average Variable Cost
LRAC	Long Run Average Cost
LRMC	Long Run Marginal Cost
RTS	Returns to Scale
IRS	Increasing Returns to scale
CRS	Constant Returns to Scale
DRS	Diminishing Returns to Scale
TR	Total Revenue
AR	Average Revenue
MR	Marginal Revenue
GDP	Gross domestic product
GDPMP	Gross domestic product at market price
GDPFC	Gross domestic product at factor cost
NNPMP	Net national product at market price
NNPFC	Net national product at factor cost
NDPMP	Net domestic product at market price

NDP FC Net domestic product at factor cost

PI Personal Income

PDI Personal disposable Income

GVA Gross value added

NVA Net value added

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Abstract

This thesis consists of important issues in the field of corporate venture capital (CVC). In my first dissertation, I explore the relationship between CVC and real options theory using a formal model-based approach. In the second case, I am conducting a collaborative experiment to investigate the decision-making behavior of entrepreneurs when they receive funding proposals from corporate investors. In the third thesis, I draw on survey data to examine the general factors that influence the attitude of angel investors towards CVC business units. This dissertation is a contribution to the CVC literature and, more generally, to the scientific fields of entrepreneurial finance, entrepreneurship and innovation, and strategic management. First, I show analytically when and why CVC business units differ from independent venture capitalists in their investment behavior, and offer new explanations for previous empirical findings. Second, I demonstrate that entrepreneurs consider access to additional resources to be the most important when considering partnerships with corporate investors and that the basic personal characteristics of entrepreneurs influence their financial decisions. Third, I present evidence that decisive factors, such as perceived social capital of CVC units, influence the attitudes of business angels towards CVC units. In each dissertation, I discuss the various theoretical and managerial implications of my work and provide researchers and business leaders with new insights into the topic of CVC.

Chapter 1 Introduction

1.1 Background

This investment relationship between established corporations and startups often seems counterintuitive at first glance. Why are existing firms investing in outsourced startups that could potentially disrupt their industries by setting new technology standards or completely changing the way they do business in the near future? Why do entrepreneurs partner with industry giants, whom they often see as bureaucratic, non-entrepreneurial players with dubious interests when it comes to investing in start-up companies? This thesis aims to shed light on these and other issues related to the outright minority phenomenon in existing corporations in external start-ups, which usually fall under the term corporate venture capital (CVC) (Gompers & Lerner, 2000). With a global investment of around US $ 30 billion annually (CB Insights, 2017), CVC is now playing an important role in the development of young entrepreneurial firms. The following paragraphs provide a conceptual framework for this thesis and provide an overview of the evolution of CVC over the past decades. In times of rapid technological change associated with the Schumpeter market environment (Schumpeter, 1942), scientists expect that only firms that constantly innovate will achieve economic success and survive in the long term (Arrow, 1962; Schumpeter, 1942). New technologies such as artificial intelligence and blockchain, as well as ongoing digitalization (KPMG, 2017) require existing corporations to constantly update their capabilities and adjust their business models to keep pace with the ever-changing market environment (Teece, Pisano and Shuen, 1997). Faced with this external pressure, established corporations take various actions to remain innovative and thus maintain their position in the marketplace (Sharma & Chrisman, 1999). Some of these activities are internal, such as investments in research and development programs (Dushnitsky & Lenox, 2005a). Another internally oriented attempt to stimulate innovation is the creation of entirely new corporate entities within the existing organizational

domain, where corporate employees innovate (Maine, 2008). Scholars refer to these initiatives as internal corporate enterprises (Sharma & Chrisman, 1999). However, large corporations usually do not provide an ideal environment for innovation, as they are often characterized by rigid organizational structures and processes (Hannan & Freeman, 1984), low appetite for risk (Benner & Tushman, 2002), and lack of incentives. so that corporate employees use truly innovative behavior. (Tees, 2007). Because of these organizational weaknesses and because critical knowledge is often outside corporate boundaries, established corporations have opened their innovation processes to outside ideas (Chesbrough, 2006). Much of the external innovation potential that existing firms seek to access is accumulated in start-ups (Weiblen & Chesbrough, 2015), that is, in young entrepreneurial firms that have been created by individuals or groups of entrepreneurs to take advantage of the opportunity. this is usually based on a new technology or business model (Arthurs & Busenitz, 2006). One way to engage with startups is to support them financially in the form of a CVC and in return get an opportunity to learn about their innovations. Such externally oriented venture capital activities of existing corporations are commonly referred to as external corporate entrepreneurship (Sharma & Chrisman, 1999). Other ways of external corporate entrepreneurship include joint ventures, licensing agreements, and strategic alliances (Ceccagnoli, Higgins, & Kang, 2018; Keil, Maula, Schildt, & Zahra, 2008). Traditional corporations increasingly rely on CVC to identify, monitor and leverage innovative technologies and business models developed by young entrepreneurial firms (eg, Dushnitsky, 2012). Before presenting the current state of research in the next section, I will briefly review the historical development of CVC and its current role in the development of entrepreneurial firms. There is a consensus in the literature that corporate investors became an integral part of the predominantly American venture capital industry in the 1960s (Chemmaur et al., 2014;Gompers & Lerner, 2000; Sykes, 1986). Over the next decades, CVC investment volumes showed significant

fluctuations that strongly correlated with the investment volumes of IVC investors (Gompers & Lerner, 2000). Specifically, the researchers identified three major waves of CVC investment activity in the past, peaking in the 1970s, 1980s, and early 2000s, respectively.

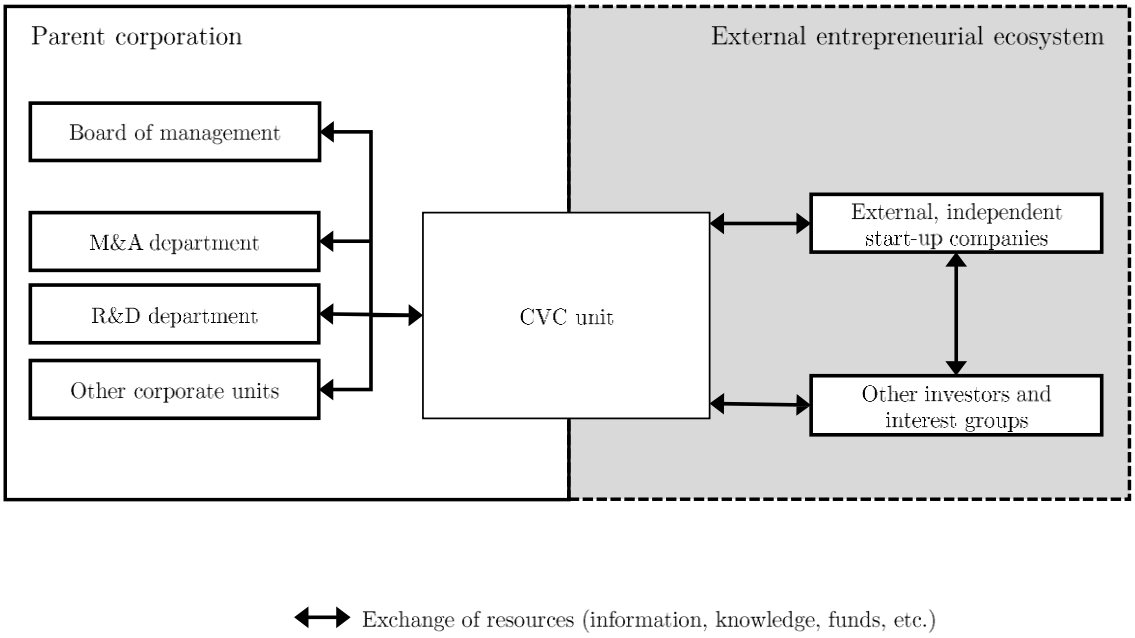


Figure 1.1: The resource-brokering function of CVC units.

While accurate investment data are often not available due to the private nature of the venture capital industry, researchers estimated that CVC investment volumes accounted for approximately 10.0% of total venture capital investment in an Internet search I did for this dissertation, I found that 30 large corporations listed in the German stock index (DAX 30) already use special CVC programs. Several German firms were even ranked among the most active corporate investors in the world in 2017, including Robert Bosch, BMW and Bertelsmann (CB Insights, 2018). Due to the relatively young stage of CVC in Germany and the attention it is starting to attract among German practitioners and researchers, I find this region an ideal place to further explore this topic. The CVC topic has not only become an important component of the external venture capital activities of existing corporations over the past decades, but also developed into an independent

scientific field (Basu, Wadhwa, & Kotha, 2016; Drover et al., 2017; Dushnitsky, 2012). The next section provides an overview of recent academic work on CVC.

1.2 Methodologies

To address the various research questions, I used several different methodologies that I found most appropriate for the nature and scope of the research question involved, and for the current state of theory and empirical evidence (Edmondson & McManus, 2007; Smith, Gannon & Sapienza, 1989). The following paragraphs summarize the methodological approaches of the thesis. In thesis I, I used a combination of real option analysis (ROA) and decision tree analysis to holistically approximate the decision-making process of CVC units when making incremental investments in entrepreneurial firms. I have developed a decision tree based on previous work on the investment behavior of institutional venture capital investors (e.g. Bergemann, Hege, & Peng, 2011; Gompers, 1995). This entails the initial decision of the CVC division whether to invest in the main startup company or not (Tong & Li, 2011). After this initial decision, CVC has the option to either expand, postpone, or abandon the investment project at the start of each of the subsequent periods (Tong & Li, 2011). Moreover, after four periods, the corporate investor has the opportunity to acquire a startup (Benson & Ziedonis, 2009, 2010). In my decision analysis, I used ROA to take into account the market risk associated with financing young entrepreneurial firms and its impact on the value of the various real options described above (Smith & Nau, 1995). ROA also allows various strategic considerations of corporate investors to be seamlessly integrated into the analysis, such as the effects of corporate learning (Schildt et al., 2005) and the effects of business theft (Hellmann, 2002), as well as the expected synergies. from a possible acquisition at a later point in time (Benson & Ziedonis, 2009, 2010). Decision tree analysis facilitates the integration of private risks faced by startups, with the term private risk referring to risk that is specific to assets and cannot be hedged with tradable securities (Smith & Nau, 1995). The type of private risk covered by the thesis is technology risk, as it is one of the most common types of risk posed by entrepreneurial firms (Alvarez-

Garrido & Dushnitsky, 2016). Following previous studies that examined real-world investment scenarios using ROA analysis and decision trees (eg Brand˜ao & Dyer, 2005), I have performed several numerical analyzes that illustrate the different implications of the model. In the numerical analysis, I compared the decision-making results of the CVC unit in question with the results of the hypothetical IVC investor, which has only financial goals. In Thesis II, I used a metric collaborative experiment combined with a post-experimental survey to examine how proposed factors alter the willingness of entrepreneurs to collaborate with CVC units. Collaborative experimentation has gained popularity in entrepreneurship research and related research areas (Lohrke, Holloway, & Woolley, 2010). They enable scientists to observe entrepreneurial decision-making behavior as they are being made, and thus are not subject to a posteriori rationalization and related issues arising from other methodological approaches (e.g. Behrens & Patzelt, 2016; Dawson, 2011). In a metric collaborative experiment conducted as part of this thesis, participants evaluated the sequence of submitted CVC units that showed different investor profiles. The assessment was carried out on a two-point Likert scale, which assessed the willingness of entrepreneurs to cooperate with the relevant CVC division. I have decomposed the various investor profiles into six attributes representing the main research variables. The attribute variables were consistent with (1) CVC operational autonomy, (2) strategic autonomy, and (3) venture capital expertise, as well as (4) market-related support, (5) R&D support, and (6) exit option provided by CVC divisions and their parent corporations. Each attribute had two possible levels ("high" and "low" for the venture capital experience and "yes" and "no" for other attributes). These attribute variables were modified in a collaborative experiment, resulting in a set of different investor profiles that were presented to participants. In particular, I used a fractional-factor orthogonal design with 16 investor profiles that differed in the exact combination of attribute levels. Each of the 62 participating entrepreneurs conducted 16 investor evaluations, resulting in 992 investor evaluations. In a post-trial survey, I assessed the participants' ESE level and risk appetite and asked them to provide background information about themselves

and their start-ups. Because each participant performed multiple investor evaluations in a collaborative experiment, the individual evaluations were not independent of each other, i.e., the evaluations were invested in each participating entrepreneur (Behrens & Patzelt, 2016; Wood, McKelvie, & Haynie, 2014). To deal with the potential autocorrelation that occurs, I applied hierarchical linear modeling (HLM) analysis, a common methodology used to analyze nested data (Aguinis, Gottfredson, & Culpepper, 2013). The HLM also examined the effect of participants' ESE level and risk appetite on their willingness to partner with CVC units, along with the effects of experimental variables (attributes 1-6, presented above). In Thesis III, I touched on an under-explored area of CVC research by examining the relationship between CVC divisions and business angels. A growing but independent stream of angel and CVC literature has brought out various factors that I have assumed are influencing angel attitudes toward CVC. However, my research is preliminary with respect to the measures I have used to empirically test the effect of various factors on the attractiveness of CVC units as potential (co-)investors, from the perspective of individual angel investors. I used a survey in- strument that questioned the N 111 participating angel investors on various aspects of CVC. The survey comprised eight sections on the topic of CVC, as well as a general section in which the angel investors provided information on their personal background and their investment activity and experience. The first step of the quantitative analysis was to explore the data set using principal component analysis (PCA). PCA is an effective method to structure and analyze data from survey instruments and has been applied in various previous studies in this field (e.g., Sieger, Gruber, Fauchart, & Zellweger, 2016). In this thesis, I used PCA to explore which items could be condensed into single scales that measured the different factors of interest. In the second step of the quantitative analysis, I set up an exploratory regression model in which one scale measured the independent variable, i.e. the attrac- tiveness of CVC units as perceived by individual angel investors. The other factors, which I derived mainly from the PCA as described above, represented the independent variables. The results of this thesis add to the rich body of research on CVC and may guide future scholarly

work in this field. The next section outlines the main research results and contributions.

1.3 Research results and contributions

Various model and empirical studies that I have undertaken as part of this dissertation have produced important results that expand our knowledge of the subject of CVC and may serve as a basis for future research. Below I give an overview of the main results of the study and the abstracts of the articles. Thesis I expands on our understanding of the relationship between CVC and real options theory. Research linking these two concepts is currently shaped by empirical research that draws general conclusions from real options theory. The CVC literature lacks a more sophisticated formal approach that takes into account the various strategic considerations of existing corporations as well as the various risk factors underlying investment in start-ups. To fill this research gap, I developed a model framework that combines ROA and decision tree analysis. Based on this model, I investigated how financial and strategic incentives, as well as different types of risks, influence the behavior of CVC business units when making phased financial decisions. The key advantage of the model is that it provides a detailed analysis of how different combinations of parameters affect the investment decisions of the CVC unit in question, in direct comparison with the decisions made by the hypothetical IVC investor. The findings shed new light on previous findings from the CVC study, including why corporate investors pay premiums on corporate stocks. The dissertation offers a variety of empirically testable predictions that can serve as a basis for future empirical research. In addition to various theoretical papers, the dissertation provides business leaders with a decision-making framework that allows them to properly separate the financial and strategic aspects of CVC investments, as well as the different types of risks associated with financing startups. In addition, the dissertation provides entrepreneurs with important insights to understand the various aspects of

obtaining CVC funding. In particular, the decision system not only shows situations in which a corporate investor has an advantage, but also indicates situations in which a corporate investor can harm the development of a young entrepreneurial firm. Hence, the consequences also help entrepreneurs in choosing institutional venture capital investors. Thesis II complements the CVC literature from the standpoint of an individual entrepreneur. To date, the study focuses heavily on industry and company performance when looking at startups targeting corporate investors (Basu, Wadhwa, & Kotha, 2016; Drover et al., 2017; Dushnitsky, 2012). The literature in this area benefits significantly from a closer focus on actual financial decision makers, namely individual entrepreneurs or groups of entrepreneurs (Basu, Wadhwa, & Kotha, 2016). Thus, this thesis was aimed at identifying factors that stimulate the desire of individual entrepreneurs to cooperate with CVC units in specific financing scenarios. The results of the joint experiment with the metric and the subsequent analysis of the HLM revealed various aspects of the dynamics associated with the financial decisions of entrepreneurs. Regarding the impact of the various attributes of CVC units, I have found that entrepreneurs place a lot of emphasis on whether corporate investors can provide their investees with additional resources for market and research and development. Their willingness to partner is also enhanced when the CVC divisions are operatively and strategically independent from their parent corporation. Moreover, their propensity to receive funding from CVC units depends on the experience gained by CVC units in the venture capital space, as well as whether their parent corporations are willing to acquire their start-up companies at a later point in time.

Chapter 2

The Survival Rate of Corporate Venture Capital-Backed Start-Up Companies: A Real Options View

2.1 Introduction

The prevailing opinion in economics and business research is that established corporations must remain innovative in order to maintain their market position and profitability over time (Arrow, 1962; Schumpeter, 1942). However, established corporations usually do not offer ideal conditions for entrepreneurial spirit and innovative ideas (Hill & Rothaermel, 2003). CVC refers to direct minority equity investments in existing corporations in independent outside start-ups (Gompers & Lerner, 2000). These investments are mainly made by wholly owned dedicated business units or subsidiaries, where the parent corporation is the sole source of funding (Gompers & Lerner, 2000; Ivanov & Xie, 2010). Today, CVC accounts for about 20.0% of total venture capital investment (VC) worldwide (CB Insights, 2017). Corporate investors play a significant role not only in initial financing (Chemmanur et al., 2014), but also in subsequent acquisitions (Benson & Ziedonis, 2009, 2010). Previous research has shown that both existing corporations and startups can benefit from CVC investments in terms of increased rates of innovation (Chemmanur et al., 2014; Dushnitsky & Lenox, 2005a) and corporate values (Dushnitsky & Lenox, 2006; Ivanov et al. Se, 2010; Park, Stinsma, 2012).

In this dissertation, I will focus on the goals behind investing in CVC. Early CVC research has shown that they differ from those pursued by other players in the venture capital industry (eg, Rind, 1981; Siegel et al., 1988). Unlike independent venture capitalists (VCs), which are traditional venture capital firms that are organized as limited partnerships with the sole purpose of generating high financial returns (Chemmanur et al., 2014; Dushnitsky & Shapira, 2010; Park & Steensma, 2012)), CVC units of existing corporations

also have strategic goals (e.g., Chesbrough, 2002). Hellmann (2002) defined a strategic venture investor “as an investor who owns some assets whose value depends on a new venture,” and emphasized that an IVC investor “has only financial goals, while a strategic investor also cares about the strategic impact of the project. new enterprise "(p. 287). One of the most frequently cited strategic goals is to leverage the innovation potential of existing corporations through investment in startups (e.g. Anokhin et al., 2016; Dushnitsky & Lenox, 2005b). According to Ivanov and Xie (2010), CVC units “can serve as the eyes and ears of their corporations to find promising technologies and innovations” (p. 132). Although established corporations often strive for minimal financial returns (MacMillan et al., 2008), various studies have identified strategic goals, such as gaining insight into new technologies and business models, as the primary engine of CVC's investment activities (e.g. MacMillan et al. , 2008; Siegel et al., 1988). Numerical analysis shows that strategic considerations significantly influence investment decisions made by CVC divisions, and that they represent a major source of divergence between CVC divisions and IVC investors. For example, I show scenarios in which an IVC investor exits an investment project as a result of poor financial performance, while CVC continues to fund the main startup for strategic gains. Numerical analysis provides additional or alternative explanations for various real-world phenomena observed in the CVC context. These include (1) why corporations often purchase premium stocks in startups (Gompers & Lerner, 2000), (2) why startups supported by CVC are more risky (Chemmanur et al., 2014), and (3) why startups CVC-backed companies are more likely to go public and less likely to be liquidated than IVC-backed start-ups (Gompers & Lerner, 2000; Ivanov & Xie, 2010). The thesis follows the call for more formal CVC research (Dushnitsky, 2012) and provides a variety of testable findings that can be used in future empirical research in this area. This expands our knowledge of interconnection between CVC and the real options theory by showing that ROA is capable of integrating the financial and strategic

considerations that drive CVC investments. The thesis also yields various practical implications. It provides corporate executives with a decision framework that helps to disentangle financial and strategic objectives as well as the different risk drivers involved in the financing of young, entrepreneurial businesses. The implications may also assist en- trepreneurs in their investor choice when they experience a trade-off between receiving CVC or IVC financing.

2.2 Numerical analysis

In this section, I do some numerical analyzes, which is a common way to demonstrate the implications of ROA frameworks. In the numerical analysis, I combine the results of previous studies of CVC, phased funding, and ROA. The general parameter assumptions made in the following paragraph are assumed to be ideal for a particular start-up company or sector. The emphasis is on basic relationships and comparative statics rather than accurate predictions for specific investment scenarios. I assume that the total cost of implementation will amount to 100.0 thousand tenge. Thus, each number in the numerical analysis can easily be converted to a percentage of K. The total cost of implementation is divided into four conditional capital injections with k1 10.0, k2 20.0, k3 30.0 and k4 40.0, if not otherwise indicated. Because CVC investments are usually minority investments. I assume that the CVC unit receives a share of s 0.2 in the start-up company if it decides to invest in t 0. The liquidation parameter is δ 0.3, i.e. each injection of capital kφt increases the liquidation value of the startup company by 30.0% of the newly invested capital. This value determines the specificity of the asset (Gompers, 1995) or, similarly, the irreversibility of the investment (Tong & Li, 2011). The potential market value of the start-up company is 300.0 M0 per tonne 0. The market volatility in the start-up company industry is σ 0.8, and the time interval between the two periods is one year. Hence u 2.23 and d 0.45. When applying the annual risk-free rate of return r 0.03, the risk-neutral probabilities are p 0.33 and p1 0.67,

respectively. Note that I am using an annualized risk-free rate of return to discount option values as described in the previous section. The actual probabilities of up and down movements that would be required to compute the probability density functions in a later analysis are q 0.50 and p1 0.50, respectively. The learning curve for the parent corporation of the CVC division is assumed to be flat throughout; that is, at each stage, the parent corporation realizes a permanent benefit from training in the amount of lφ 5.0. The parameters describing the effects of business theft and expected post-acquisition synergies, c and λ, are zero, and the probability of technological success χ is one, unless otherwise noted.

2.2.1 Overall value of the option to invest

In their empirical work on the implications of CVC financing for entrepreneurial firms, Gompers and Lerner (2000) found that CVC units invest at a premium compared to IVC investors. The authors stated two potential reasons for this phenomenon. First, the premium paid by CVC units may arise from the relative inexperience of corporate investment managers and the resulting tendency to overpay for equity shares. Second, the premium may stem from indirect, strategic benefits for the parent corporation that induce them to pay higher prices for equity shares in entrepreneurial firms. In this thesis, the strategic benefits expected by the CVC unit's parent corporation are represented by learning benefits and expected post-acquisition synergies. In the following numerical analysis, I examine the conditions under which the valuations of CVC units and IVC investors diverge from each other and thereby deliver additional explanations for the findings. To begin with, Figure 2.2 shows how the market volatility σ and the liquidation pa- rameter δ affect the value of the option to invest in t 0. Next to the IVC investor described in Section 2.3.4, two different types of CVC units are considered. The type 1 CVC unit represents a corporate investor with the general parameter assumptions made in the previous section. The same assumptions apply for the type 2 CVC unit, except for the post-

acquisition synergies, which this investor type expects to be positive with λ 0.05. In accordance with the general implications of the real options theory, the value of the option to invest in t 0 increases with increasing market volatility. Based on theoretical predictions drawn from the real options theory, the authors found empirical evidence for their hypothesis that corporations choose flexible investment modes, such as CVC, over acquisitions in environments involving high uncertainty. Given the parameter assump- tions above, the IVC investor assigns a lower valuation to the option to invest in t 0 than the CVC units. The difference between the valuations of the type 1 CVC unit and the type 2 CVC unit demonstrates the substantial impact of the expected post- acquisition synergies on the overall valuation of the option to invest in t 0.

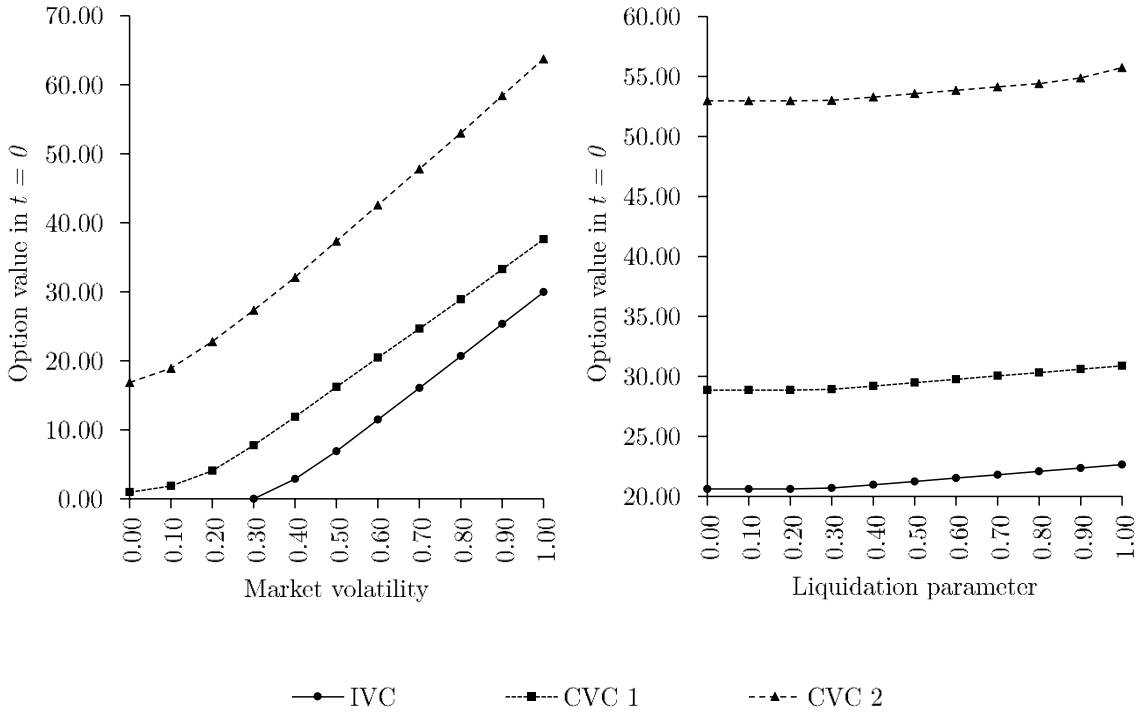


Figure 2.2: Market volatility and downside protection.

The right-hand diagram in Figure 2.2 shows that the impact of the liquidation param- eter and the associated downside protection on the value of the option to invest in t 0 is less pronounced than the impact of the market volatility under the current parameter assumptions. Even if δ 1.0, which implies that the

invested capital can be fully recovered if the start-up company is liquidated, the overall value of the option to invest in t 0 is only slightly higher as compared to the base case with δ 0.3. This result holds true for all considered investor types. Note that the effect of the liq- uidation parameter increases when the model parameters s or M_0 decrease, i.e., when it becomes more likely that the value of the investors' holdings will fall below their liquidation value. Furthermore, the parameter assumptions can be changed in order to identify situations in which the corporate investors under consideration finance the focal start-up company, but the IVC investor refrains from investing due to a lack of downside protection. This suggests that CVC units are more likely to invest in start-up companies, whose assets show a low liquidation value, than IVC investors (Tong & Li, 2011). Figure 2.3 demonstrates how learning benefits and expected post-acquisition syner- gies influence the value of the option to invest in t 0. Three kinds of investors are considered: the IVC investor, the type 1 CVC unit for whom the general parameter assumptions from Section 2.4.1 apply, and the type 2 CVC unit whose parent corpo- ration experiences a business stealing effect with a cannibalization rate of c 0.05. The left-hand diagram in Figure 2.3 shows the effect of increasing learning benefits. Note that the learning curve is still assumed to be flat across all stages. For example, a value of 1.00 on the abscissa implies a flat learning curve of l_φ 1.0 for all stages reached. The fact that an increasing level of the learning benefits leads to an increasing value of the option to invest in t 0 meets the general expectation that CVC units are willing to pay a higher equity price when the learning benefits are greater. In this vein, Gompers and Lerner (2000) conjecture that the premium paid by CVC units decreases when the "understanding of the market" (p. 42) improves, which is the case when the learning benefits decrease in the present model framework. The left-hand diagram also reveals that the valuation of the option to invest in t 0 strongly depends on the cannibalization rate c. Intuitively, corporate investors assign a lower value to start-up companies that destroy a fraction of their own value. For

low learning benefits, the valuation of the type 2 CVC unit is even lower than that of the IVC investor. The right-hand diagram in Figure 2.3 shows the effect of ex- pected post-acquisition synergies, which is more pronounced than the effect of learning benefits. Under the given parameter assumptions, a relatively low level of expected post-acquisition synergies of approximately λ 0.01 suffices to compensate the busi- ness stealing effect and to lift the valuation of the type 2 CVC unit up to the level of the IVC investor.

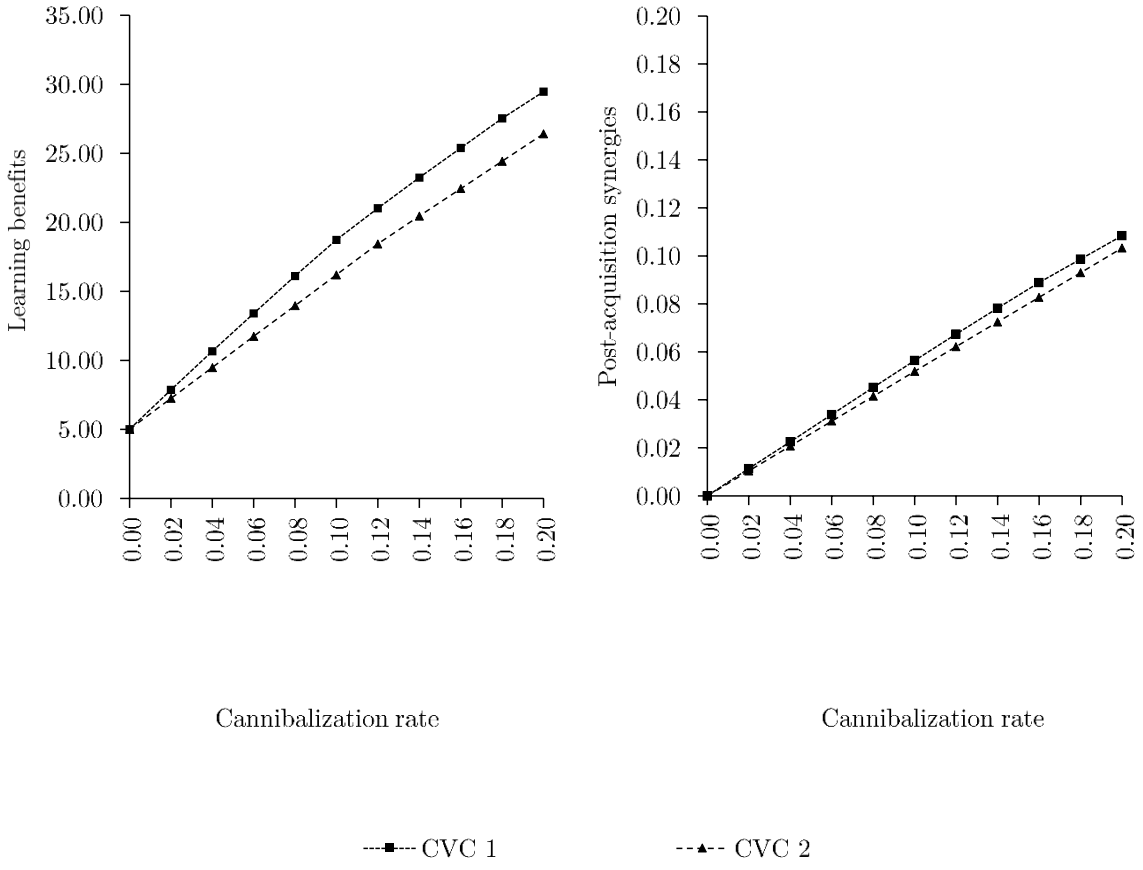


Figure 2.4: Parameter combinations that yield the same option value in *t* 0.

Parameter combinations that give the same option values at t 0 are shown schematically in the diagrams in Figure 2.4. Since the business theft effect applies only to corporate investors, I am omitting the hypothetical IVC investor in this analysis. For a CVC type 1 block, general parameter assumptions apply. A Type 2 CVC unit expects post-acquisition synergy with λ 0.05 in the left chart and high learning outcomes of lφt 20.0 in the right chart. Figure 2.4 shows that a higher level

of cannibalization is associated with a significant increase in learning benefits and expected post-acquisition synergies to keep the value of the opportunity to invest at t 0 constant. For this set of parameters, the high level of learning benefit assigned to the CVC Type 2 block in the right-hand diagram only marginally reduces the level of post-acquisition synergy required to maintain a constant option cost. The following numerical analysis addresses the empirical finding of Gompers and Lerner (2000) that the bonuses paid by CVC units remain roughly constant when there is a stronger strategic alignment between the parent corporation and the start-up company. This is a surprising result, as a higher strategic fit is intuitively associated with a higher premium paid by CVC units. Gompers and Lernerconcluded that as strategic suitability increases, a corporation may receive higher strategic benefits, but its willingness to pay more decreases due to better market knowledge. The proposed model allows for a different interpretation of this conclusion. Higher strategic suitability can also be attributed to greater market overlap between the parent company of the CVC division and the start-up company. This can lead to an increase in the effect of business theft. This is where CVC must anticipate higher strategic gains if the business theft increases in order to maintain a constant value of the investment option at t 0. The structure of the model provides some additional insight into the value that corporate investors attach to new investment opportunities, which I am not showing here. due to limited space. Some of these consequences deserve special attention. Compared to investor IVC, CVC, which expects strategic benefits in the form of post-acquisition learning and synergy benefits, may be “satisfied” with a lower equity stake in the start-up company. CVC that expects strategic gains may also be willing to sponsor a startup that incurs higher implementation costs K. Note that if the opposite is true, CVC expects strategic investment disadvantages, such as significant theft of the software business. in fact, it requires a higher share of capital s in the start-up company and lower implementation costs K than an IVC investor. Another finding that can be easily inferred from the structure of the model is that differences in the value that

CVC units and IVC investors attribute to new investment opportunities may be due to variances in the expected cost of implementing K. In previous analyzes, CVC units bear and IVC investors. the same implementation costs. However, CVC units can leverage additional resources from their parent corporations, such as technical capabilities, as well as existing sales and marketing and thus be able to reduce the costs that the startup company incurs. different stages of development. This increases the value of investment opportunities for corporate investors at t 0 and may explain why CVC divisions fund certain start-up companies that IVC investors will not want to fund (eg, Gompers & Lerner, 2000).

2.2.2 Technological risk as a barrier to invest

The next numerical analysis comprises an examination of how the technological risk introduced in Section 2.3.3 affects the decisions of the different investor types. In the following analysis, I consider a CVC unit and an IVC investor for whom the general parameter assumptions, as outlined in Section 2.4.1, apply. The left-hand diagram in Figure 2.5 shows the expected value of the strategy to invest in t 0 by taking into account the technological risk, which is sketched on the abscissa. Under the decision rule described in Section 2.3.3, the CVC unit opts to invest at a much lower probability of technological success than the IVC investor, namely at approximately χ 6.7%. From the perspective of the IVC investor, the value of the investment opportunity in t 0 becomes only positive at approximately χ 25.5%. The model framework thus suggests that start-up companies that face higher technological risk may be dependent on CVC financing, because IVC investors may tend to avoid financing them. In this regard, Chemmanur et al. (2014) provided empirical evidence that CVC-backed start-up companies are riskier by comparing industry betas of CVC- and IVC-backed start-up companies. The current model framework demonstrates that CVC units may also invest in start-up companies that bear higher technological risk than those financed by IVC investors. Next, Chemmanur et al. (2014) found that CVC-backed start-up companies are younger at the time they receive VC funding than IVC-backed start- up companies. An explanation derived from the model framework is that CVC units may invest earlier due to strategic benefits that balance the disadvantages that arise from technological risk. IVC investors may prefer to wait for the technological risk to dissolve, which is the case at t 1 in the present model framework, and thus invest later than CVC units. Furthermore, CVC-backed start-up companies are more innovative as compared to IVC-backed start-up companies, measured in terms of patenting rates and patent citations. A possible explanation for this might be that the more innovative start-up companies carry a

higher probability of technological failure. Despite the increased level of technological risk, corporate investors may be willing to support these highly innovative start-up companies due to strategic benefits, whereas IVC investors do not support these firms. However, this result should be interpreted with caution, because it is based on the premise that start-up companies whose technology is particularly innovative face higher technological risk. The right-hand diagram in Figure 2.5 depicts combinations of the probability of techno- logical success and the market volatility that yield an expected payoff of zero in t 0.

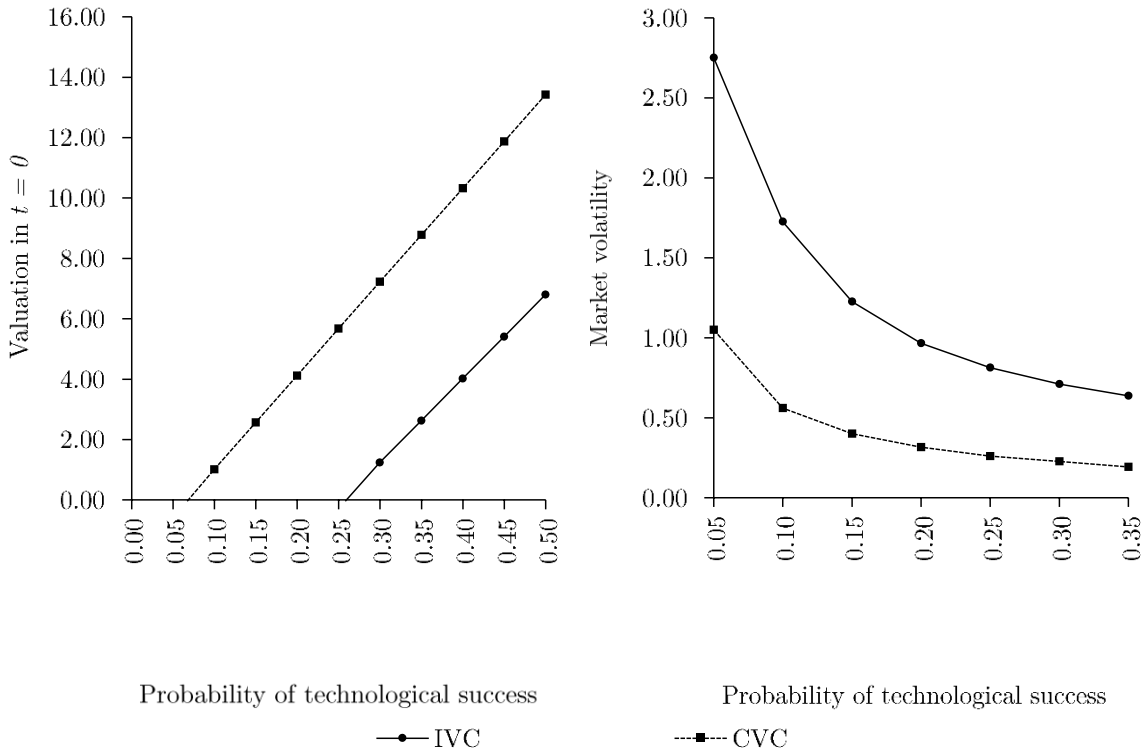


Figure 2.5: The effects arising from technological risk.

Considering that CVC units invest in start-up companies that carry a higher risk of technological failure, the model framework also suggests that they demand a higher market volatility, i.e., a higher upside potential that increases the expected value of the investment opportunity in t 0. For example, the CVC unit is willing to investin a start-up company with a probability of technological success of only χ 5.0% as long as the market volatility is higher than σ 1.05. The IVC investor

may befocusing on start-up companies with a higher probability of technological success of, for example, χ 30.0%, and, thereby, be satisfied with a lower market volatility of σ 0.71. The model framework thus unveils that an increasing market volatility, which implies an increasing upside potential, may balance an increasing technological risk.

2.2.3 Achieved development stage

I now turn to a finding of Gompers and Lerner (2000), which is that CVC-backed start-up companies are more likely to go public and less likely to be liquidated than IVC-backed start-up companies. The authors found this effect to be especially pro- nounced when there is a strong strategic fit between the CVC unit's parent corporation and the start-up company.

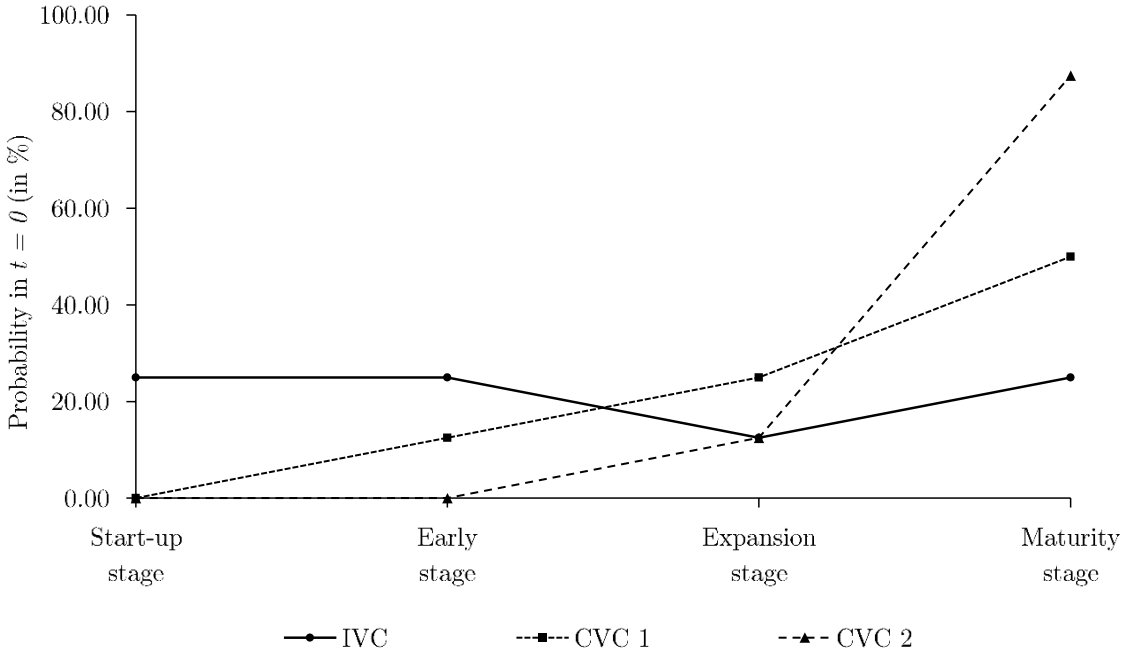
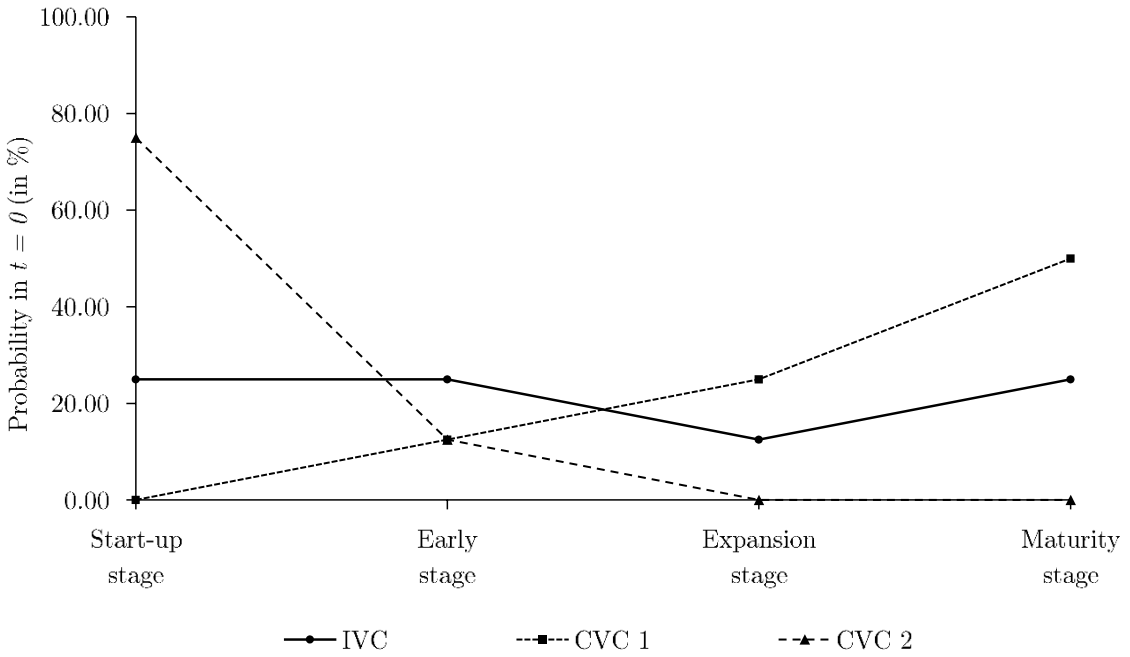


Figure 2.6: Probabilities of the development stage reached at t 4 from the viewpoint in t 0 (type 2 CVC unit considers post-acquisition synergies).

The proposed structure of the model includes various stages of development that a start-up company can go through, and leaves the decision to

the investor either to grow a new company, or to postpone its development, or to liquidate his business at an intermediate point in time. Please note that an IPO is only possible if the startup reaches the maturity stage, as described in Section 2.3.1. Figures 2.6 and 2.7 show the expected probabilities of reaching the development stage at t 4 in terms of t 0. The probabilities of reaching the corresponding stages are derived from the actual probabilities of up and down movements at points in time, as well as the results of the ROA-based decision making described in Section 2.3. ... In Figure 2.6, a Type 1 CVC block realizes the benefits of training with a constant lφt of 20.0 for each development stage achieved. The same learning benefits apply for a CVC Type 2 unit. However, this type of investor additionally expects a synergy after the acquisition with λ 0.2. Here, comparatively high values for the parameters of learning benefits and post-acquisition synergy are selected to highlight the different decision-making outcomes of the types of investors under consideration. An IVC-backed start-up company is least likely (25.0%) to reach maturity and go public with these parameter assumptions. A start-up company supported by a Type 2 CVC unit has the highest probability (87.5%) of reaching maturity. This startup company will be acquired by the parent corporation of the CVC division in accordance with the decision rule set out in Section 2.3.2. The highest likelihood (50.0%) of reaching the maturity stage and going public is with a CVC Type 1-sponsored start-up that benefits from training but does not expect any post-acquisition synergies. Note that for startups supported by IVC and the Type 1 CVC division, the charted probabilities do not add up to 100.0% because these firms have a 12.5% chance of liquidating during the time period in question. The probability of liquidation for a start-up company funded by a Type 2 CVC unit is zero. This result shows that strategic considerations such as expected post-acquisition



synergies can significantly affect the likelihood of a start-up surviving.

Figure 2.7: Probabilities of the development stage reached at *t* 4 from the viewpoint in *t* 0 (type 2 CVC unit considers business stealing).

Figure 2.7 shows that CVC funding can also be detrimental to the growth of a start-up company. In this analysis, the parameter assumptions for the Type 2 CVC block are different. This type of investor does not expect post-acquisition synergies, but instead expects a business theft effect of c 0.2. Figure 2.7 demonstrates that CVC Type 2 initially invests, but either does not make an additional investment with a 75.0% probability, or one additional investment with a 12.5% probability up to t 3. These results demonstrate that strategic considerations can induce corporate investors ... prevent startups from realizing their full market value (Hellmann, 2002). More generally, this result suggests that the development of start-up companies receiving CVC funding depends on how their business interacts with the existing operations of corporate investors.

2.5 Discussion

The main purpose of this thesis was to determine what conclusions can be drawn from a real options-based model about the decision-making behavior of CVC units as they make incremental investments in entrepreneurial firms. Research linking CVC investment with real options theory is predominantly empirical and lacks a model approach that contributes to our theoretical understanding of the relationship between these areas of study. In this dissertation, I set out to fill this research gap and developed a formal decision framework in which CVC consistently invests in a startup company. CVC divisions take into account three strategic considerations I've learned from the literature: the benefits of learning. The numerical analysis presented in the previous section sheds new light on previous empirical evidence in the field of cardiovascular disease research. I have demonstrated that the anticipated strategic benefits significantly increase the value that CVC teams attribute to new investment opportunities. In particular, I have identified the conditions under which the valuation of CVC units exceeds the valuation of IVC investors, and provided a possible explanation for Gompers and Lerner's (2000) finding that CVC units invest at a premium. Under the proposed model, learning benefits and anticipated post-acquisition synergies typically increase the value of an investment opportunity from a CVC perspective, while the effect of business theft reduces its value. I also clarified the conditions under which the value assigned by the CVC divisions falls below the valuation of IVC investors, namely when the strategic disadvantages of an investment outweigh the strategic advantages. The model structure provides some additional information about the interaction of the parameters of the central model that deserves further consideration. The numerical results show that CVC units accept smaller equity stakes and are willing to incur higher implementation costs than IVC investors, provided the strategic investment benefits are large enough. In addition, they are willing to invest with lower protection against losses, that is, start-up companies with a lower liquidation value than IVC investors, if they generate large enough

learning benefits and expected post-acquisition synergies. However, if the strategic disadvantages outweigh the advantages, for example, due to the widespread business theft effect, the opposite is true and corporate investors may require larger equity stakes than IVC investors, and only invest in start-up companies with lower implementation costs and higher resale value. Taken together, the framework of the model complements the literature on CVC business unit investment behavior by showing that strategic considerations for CVC units can affect both the terms of the contract, such as required equity stakes, and the characteristics of start-up companies in which they invest, for example, with in terms of costs to sell and residual value. It is widely recognized in the literature that start-ups can benefit from CVC funding as this group of investors can leverage the existing resources of their parent corporations (Drover et al., 2017; Dushnitsky, 2012). Unlike previous studies that have focused on the benefits of these additional resources for start-ups (e.g. Ivanov & Xie, 2010), the proposed model structure suggests that they may also influence the initial assessment and subsequent decision. - Manufacturing behavior of CVC aggregates. In particular, CVC divisions that can leverage existing resources of their parent corporations, such as laboratories and large-scale distribution channels, can expect lower implementation costs than IVC investors. From the structure of the model, it can be inferred that this not only results in a higher initial valuation, but also in an increased likelihood of additional investment in CVC units that IVC investors may not want to make. Numerical analysis also shows that strategic advantages may prompt CVC divisions to invest in start-up companies that carry a higher technology risk that IVC investors will not want to fund. The understanding of this result is that IVC investors can wait for the technological risk to disappear and thus defer the initial investment to a later point in time. This is consistent with the findings of Chemmanur et al. (2014) that CVC units invest earlier than IVC investors. A related technological risk consideration is that CVC divisions can expect this type of risk to be lower than IVC investors. In particular, CVC units may in the event of legal action or the use of the political

influence of their parent corporations to prevent or encourage regulatory change. Differences in the perception of such private risks may cause further divergence between the estimates made by CVC and IVC investors. It is imperative to understand that the technology risk decision rule presented in Section 2.3.3 is based on the assumption that the CVC only takes into account the expected value of the investment, implying risk neutrality. However, established corporations are often characterized by excessive risk and their CVC divisions can also take into account the variance of potential outcomes. When CVC units are no longer risk averse than IVC investors, the argument in the previous paragraph is reversed. In particular, paradoxical situations can arise in which IVC investors will be willing to invest in the main start-up company, while CVC divisions refrain from investing, even if they expect a lower probability of technological disruption and strategic benefits from the investment. The results show that the strategic considerations of established corporations and their CVC divisions also affect the development progress of their investees and the likelihood of their potential liquidation during the periods under consideration. In particular, the strategic benefits to be expected from their investments may prompt CVC divisions to move their portfolio companies towards maturity. Under the model, the CVC unit under consideration could benefit from further development of the start-up company, especially through additional training benefits and higher levels of expected post-acquisition synergies. The opposite is true when strategic weaknesses dominate and corporate investors refrain from further investment. My analysis suggests that CVC-backed start-ups are more likely to go public when corporate investors expect high learning outcomes and low business theft effects, and no post-acquisition synergies.

2.5.1 Theoretical implications

This thesis makes several important theoretical contributions to the field of characteristic research. My work complements the existing literature by developing a formal case-based model to investigate the decision-making behavior of CVC

units in a phased funding scenario. The proposed model structure and subsequent numerical analysis provide additional or alternative explanations for various previously obtained empirical results. In particular, my analysis shows when and why corporate investors, how the main financial and strategic parameters of CVC investments interact, and can provide a theoretical basis for future empirical research. For example, the analysis suggests that the strategic benefits of such an investment may result in CVC businesses agreeing to a smaller share of start-ups than IVC investors. They may also be willing to invest in entrepreneurial firms that have higher implementation costs or lower resale value. The structure of the model assumes that start-ups profit from CVC funding if the learning benefits and post-acquisition synergies encourage corporate investors to provide additional capital and thus expand their portfolio firms. Thus, my analysis contributes to the ongoing scientific debate about how strategic goals influence the decision of corporate investors, when several investors simultaneously invest smaller amounts to reduce their exposure to risk (Gompers & Lerner, 2000; Sahlman, 1990). Participation by CVC units in investment syndicates can add value to an investment opportunity from the perspective of IVC investors, especially when CVC units can lower the cost of selling their portfolio firms through their access to additional resources. their parent corporations. It can also be concluded that the value of a co-investment opportunity can increase from the perspective of IVC investors when corporate investors can mitigate technology risk. This thesis provides a theoretical understanding of non-stock-related forms of collaboration between established corporations and start-ups, such as corporate acceleration programs. In the framework of the proposed model, this is the case when the share in the capital of the start-up company, taken into account by the parameter s, is equal to zero. Analysis shows that established corporations may still be willing to incur the costs of introducing a new company and accelerate its business if the learning benefits, as well as the expected synergies gained from a later acquisition, are high enough to offset these costs. Further, the structure of the model can also be applied to

internal corporate venture activities, where s is equal to one, that is, when the innovative technology is wholly owned by an established corporation. Even in this scenario, the established corporation may not be able to realize the full market potential of the technology due to the cannibalization existing transactions, fixed by the model parameter c, and internal conflicts that may arise.

Chapter 3

What Drives Entrepreneurs' Willingness to Partner With Corporate Venture Capital Units? The Scope of Managerial Action

3.1 Introduction

As an essential component of their innovation strategies, renowned corporations around the world closely follow the activities of young innovative start-ups and often engage in various forms of collaboration with them. Today, corporate venture capital (CVC) is an increasingly used tool for existing firms to partner with entrepreneurial companies and gain insight into their technology innovation and business models. CVC refers to investments in minority capital of existing corporations in independent, external start-up companies, which are usually carried out by specialized divisions or wholly owned subsidiaries. Today, with CVC accounting for more than 20.0% of global venture capital investments (BCG, 2018; CB Insights, 2017), CVC has grown into a multibillion-dollar investment business with many well-known players, including Google, Intel, involved. , and General Electric has been one of the most active investors in recent years. Along with the dramatic increase in CVC's annual investment, a significant amount of scientific research has been published on this topic. Research to date has focused on industry and company-level effects in the context of CVC. For example, previous research has demonstrated the positive impact of such equity-based collaborations on the innovative results of involved existing corporations and start-ups. Surprisingly little attention is paid to entrepreneurs running business ventures with which established corporations seek to do business. The key role of entrepreneurs in shaping their young, growing organizations is a critical object of research. Previous research has not explicitly looked at how entrepreneurs decide whether or not to partner with CVC in specific funding scenarios. The purpose of this study is to deepen understanding of the fine dynamics of individual entrepreneurship decision-making when considering obtaining funding from corporate investors. CVC business units

stand out in the venture capital market due to their unique characteristics due to their affiliation with a recognized corporation (for example, Gompers & Lerner, 2000; Ivanov & Xie, 2010). It is currently poorly understood how these unique characteristics affect entrepreneurs in their decision making (Basu, Wadhwa, & Kotha, 2016). On the one hand, CVC units are often embedded in their parent organizations (Weiblen & Chesbrough, 2015), which can, among other things, lead to a lack of flexibility and unclear resources (Chemmanur et al., 2014), bias in line with the strategic interests of their parent organizations. corporations (Ivanov and Ce, 2010), and the inability to attract experienced investment managers due to the lack of powerful compensation schemes (Gompers & Lerner, 2000). On the other hand, this group of investors can also provide start-up companies with unique opportunities by giving them access to vital resources of their parent corporations, such as large-scale distribution and marketing channels, as well as technical know-how (Chemmanur et al., 2014) that can increase the tendency of entrepreneurs to accept financial offers from them. Moreover, entrepreneurs may perceive CVC funding as an exit opportunity, as existing corporations often acquire former portfolio companies (Benson & Ziedonis, 2009, 2010); an opportunity that other investors, such as independent venture capitalists (IVCs) or business angels, do not offer. Thus, partnering with established corporations through CVCs creates certain risks and opportunities for entrepreneurs (e.g. Ivanov & Xie, 2010), making the precise configuration of CVC units a potentially decisive factor for entrepreneurs' decision-making. So the research question is: What are the factors driving entrepreneurs' willingness to collaborate with CVC? To answer this research question, I distinguish between supply-side factors and demand-side factors for CVCs. On the supply side, I argue that the ability of established corporations to build viable CVC units to meet the specific requirements of the entrepreneurial ecosystem and to leverage their resource and capacity-based advantages in funding startups is context based on their dynamic capabilities (Teece et al., 1997). The concept of a firm's dynamic capabilities derives from a resource-based approach

(RBV) (Wernerfelt, 1984) and discusses how firms maintain competitive advantage in dynamic markets (Eisenhardt & Martin, 2000). Following the original definition by Teece et al. (1997), dynamic capabilities refer to the "ability of a firm to integrate, create, and reconfigure internal and external com cope with external changes. In the context of CVC, I suggest that established corporations should use their dynamic capabilities to optimally customize their CVC divisions, that is, to effectively increase the willingness of entrepreneurs to cooperate with them. Based on a review of the CVC literature and the preliminary survey I conducted for this thesis, I argue that optimal configuration is manifested in: (1) the independence of CVC units from the structures and operating procedures of their parent corporations, (2) the ability to consistently operate at the best the interests of their investees and (3) adequate incentive schemes that allow them to attract experienced investment managers. CVCs should also be able to offer start-up companies access to (4) market-related resources such as marketing and distribution channels, and (5) R&D resources such as technical know-how. Moreover, entrepreneurs are likely to prefer CVC units that are integrated into the mergers and acquisitions (M&A) activities of their parent corporations, i.e., supplying other corporate units with potential takeovers, thus (6) providing entrepreneurs with an exit in the form later acquisition by their respective parent corporation. I assume that all of these characteristics of CVC units (1-6) have a positive effect on the willingness of entrepreneurs to cooperate with them. While the precise configuration of CVC units is expected to significantly alter the willingness of entrepreneurs to partner, it does not take into account internal factors that influence entrepreneurial preferences, that is, demand factors. In particular, little is known to date about how the personal characteristics of entrepreneurs influence their propensity to choose CVC funding, even though previous research has shown that personal characteristics play a vital role in entrepreneurial decision making or more generally in entrepreneurial achievement (e.g. Ciavarella, Buchholtz, Riordan, Gatewood, & Stokes, 2004). This study aims to fill this gap and examine the extent to which the personal characteristics of

entrepreneurs influence their willingness to do business with CVC. Specifically, I test the direct and inhibitory effects of two psychological constructs that are considered important in the context of CVC, namely entrepreneurial self-efficacy (ESE) (McGee et al., 2009; Schmutzler, Andonova, & Diaz-Serrano, 2018) and risk appetite. (Palich & Bagby, 1995; Stewart & Roth, 2001). The risk appetite construct is used in this context to investigate whether risk averse entrepreneurs are more willing to collaborate with CVC units than entrepreneurs with a high risk appetite. Traditional corporations are associated with high levels of predictability and accountability (Hannan & Freeman, 1984) or, as Benner and Tushman (2002) put it, “a bias towards certainty and predictable outcomes” (p. 239). These features may especially appeal to entrepreneurs who are risk averse when considering working with corporate investment units.

3.2 Research method

I ran a collaborative metric experiment to collect data on entrepreneurial decision-making behavior when they receive funding proposals from CVC units. In a collaborative experiment, participants evaluate a sequence of represented stimulus objects (here investor profiles of CVC units) that are represented by a fixed number of predefined attributes (here individual attributes of CVC units). Each of these attributes has at least two specifications (for example, "high" and "low"). Over the past decades, collaborative experimentation has been applied to a wide range of research, including entrepreneurship research. Collaborative experimentation gives researchers the opportunity to examine people's decision-making processes at the time they are made, which has a number of advantages over retrospective methods such as traditional polling. These methods are particularly prone to posterior rationalization and self-concept bias (eg, Brundin, Patzelt, & Shepherd, 2008), which are less likely to occur in collaborative experiments. Various entrepreneurship researchers have identified collaborative experimentation as an effective method of studying entrepreneurial decision

making (Lohrke et al., 2010), including the choice of their investors (eg, Drover et al., 2014). In a collaborative experiment conducted as part of this dissertation, participants were asked to imagine a scenario in which a startup company they worked for, when they participated in the experiment, received funding offers from CVC divisions with different investor profiles. Each attribute had two specifications: “high” and “low” for the venture capital experience and “yes” and “no” for other attributes. This resulted in 2664 possible investor profiles for CVC divisions. Following previous research (e.g. Brundin et al., 2008), I used a fractional-factor orthogonal design to obtain a reduced number of 16 investor profiles that were presented to participants. As Warnick et al. (2018), I added two practice profiles to the experiment to introduce participants to collaborative tasks. In addition, the collaborative experiment included four replication profiles to assess the reliability of respondent ratings, resulting in 22 investor profiles. Two versions of the collaborative experiment were created in which the investor profiles were listed in a different order to prevent potential errors in results arising from ordering effects. For the same reason, the order of the six attributes that represented the individual investor profiles was randomized.

3.3 Discussion

The main research question in this dissertation was to determine whether and how the configuration of CVC units affects the willingness of entrepreneurs to cooperate with them. I used the concept of dynamic capability and explained why customizing CVC modules requires the capabilities of "higher order" firms, namely their ability to change their operating procedures and resources. Specifically, I explained how their dynamic capabilities enable them to adapt parts of their organization to the entrepreneurial ecosystem (e.g. Teece, 2012) and thus create the appropriate organizational environment for CVC units (H1a-H1c). Moreover, I have described how their dynamic abilities affect their ability to use additional resources, as well as organizational capabilities such as their M&A ability, in the context of

funding startups (H2a-H2c). Whether or not CVC divisions provide their start-ups with market (H2a) and research and development (H2b) resources is the most important factor in entrepreneurial willingness to partner. The fact that entrepreneurs are highly attracted to the resources they access through CVCs suggests that entrepreneurs and their businesses not only rely on "building" their resources themselves (eg Arthurs & Busenitz, 2006), but also tend to do so. to gain access to external resources, for example by partnering with existing firms. In this vein, Park and Stinsma (2012) have argued that accessing start-ups to the additional resources of established corporations "can make their technology commercialization process more efficient and ultimately improve their productivity" (p. 4), and their results show a positive effect on company level for start-up companies that gain access to additional assets through CVC funding. My findings are also consistent with previous work on strategic alliances. For example, Eisenhardt and Schoonhoven (1996) have shown that entrepreneurial firms tend to forge alliances to access the resources of their partners, especially when they are strategically vulnerable, such as when they face high uncertainty and high costs at the same time. The results presented in this dissertation complement the literature by highlighting the important role of such complementary assets in specific decision-making scenarios.

The operational (H1a) and strategic (H1b) autonomy of CVC units showed the second largest effect on the willingness of entrepreneurs to partner. The result that the strategic autonomy of CVC units has a relatively small effect, especially when compared to the strong market and research support provided by CVC units, was unexpected. Strategic conflicts between CVC portfolio companies and parent corporations have been extensively discussed in the literature (e.g. Basu, Phelps, & Kotha, 2016; Ivanov & Xie, 2010; Park & Steensma, 2012). Thus, the strategic autonomy of CVC's divisions was expected to have a strong influence on business decision-making with respect to this group of investors. A possible explanation for this result might be that entrepreneurs are not aware of all the disadvantages that

strategic conflicts may have for their entrepreneurial firms. Another explanation for this finding may be that entrepreneurs expect disadvantageous results not only from the strategic interests of the parent corporations of the CVC divisions. In particular, when technology innovation and start-up business models complement those of parent corporations, corporate executives may want to promote these entrepreneurial firms rather than jeopardize their businesses (eg, Hellmann, 2002). Intel's investment in entrepreneurial firms using the Pentium processor is one example of this scenario (Chesbrough, 2002).

The impact of the exit opportunity (H2c) that CVC divisions can offer to entrepreneurs has a moderate impact on their willingness to partner. Entrepreneurs seem to appreciate this option, as the participants in the joint experiment were significantly more inclined to partner with the CVC divisions, whose parent corporations provided them with the option of a later acquisition. Thus, my results demonstrate that the intentions of entrepreneurs to leave their company, i.e., their intentions to leave their firms, cash out and start a new venture, or reduce their responsibility in an existing venture (e.g. Wennberg & DeTienne, 2014), affect their decision making when they are considering getting CVC funding. One of the unexpected discoveries is the only one in y & Shaver, 2009). More recent research suggests that CVC units are better able to attract qualified staff with relevant experience in the venture capital industry (Battistini et al., 2013). While this thesis showed that the experience with venture capital has a significant impact on the willingness of entrepreneurs to partner, the effect was expected to be higher due to the considerable attention given to this topic in the literature. The question remains why this effect was moderate. Discussions with entrepreneurs of this result argued that some participants might have expected investment managers with corporate experience rather than venture capital experience to have higher social capital within their respective firms (Simsek et al., 2003). ; that is, these investment managers can be better connected to parent corporations and thus have better access to information and resources within these organizations. While much of the

previous CVC literature has focused on effects at the industry and firm this thesis has focused on sole proprietors by assessing the effects arising from - for differences in their personal characteristics on their willingness to cooperate with corporate investors. I have found significant negative effects of both the level of ESE entrepreneurs (H3a) and their risk appetite (H3d) on the willingness to do business with CVC. These results are interesting because there is very little knowledge about the impact of such latent factors on entrepreneurial decisions in the context of CVC. Note that I could confirm the effect of ESE in additional, non-experimental analyzes, while the effect of risk appetite did not show significant results in these additional analyzes. This thesis also contributes to a growing literature stream on the moderating role of ESE in antecedents and outcomes of entrepreneurial behavior (e.g. Ahlin et al., 2014; Newman et al., 2019). For example, previous research has shown that ESE has a chilling effect on the relationship between entrepreneurial creativity and firm innovation (Ahlin et al., 2014). In this thesis, ESE was found to soften the relationship between the strategic and operational autonomy of CVC (H3b) units and the willingness of entrepreneurs to do business with them; that is, entrepreneurs with a high level of ESE pay more attention to the strategic and operational autonomy of CVC units. While the positive relationship between the drive for independence and the drive for entrepreneurial activity is well known in the literature (Douglas & Shepherd, 2002), this study found that ESE diminishes the importance that entrepreneurs attach to investor independence when considering partnering with them. I found no evidence of ESE mitigating effects on the impact of CVC venture capital expertise, market support and R&D, and exit opportunities (H3c). Therefore, whether entrepreneurs demonstrate high or low ESE does not affect their assessment of these characteristics of CVC units. It is reasonable to assume that other psychological constructs, such as recognition of entrepreneurial opportunities are more appropriate for testing mitigating effects in this context.

Chapter 4

Conclusion

4.1 Summary of research findings

In this dissertation, I highlighted three important gaps in the CVC literature. In thesis I, I improved my understanding of the relationship between CVC and real options theory. Previous research linking these areas is largely empirical and based on general findings from real options theory in predicting the investment behavior of corporate investors (e.g. Basu et al., 2011; Tong & Li, 2011). I have supplemented the existing literature by providing a formal framework for a real options model that is tailored to the specific characteristics of CVC as it incorporates the main strategic considerations of corporate investors (Chesbrough, 2002; Hellmann, 2002). I have found that my model has significant explanatory power. In particular, he is able to explain (1) why corporations often acquire shares in startups at a premium, (2) why CVC-backed start-ups are more risky, and (3) why CVC-backed start-ups are more likely to go public and less likely to be liquidated, than startups supported by IVC. In Dissertation II, I explored the decision-making behavior of entrepreneurs, considering the possibility of cooperation with corporate investors. Previous CVC research focuses on company-level metrics and does not explicitly analyze the individuals who run the startups in question. Using data collected from a collaborative metric experiment and applying hierarchical linear modeling, I have found that the ability of corporate investors to provide their investees with access to market resources (such as marketing channels and customers) has a profound effect on entrepreneurial propensity. cooperate with them. Surprisingly, whether the CVC divisions employ experienced investment managers or not, it matters far less for entrepreneurs. My results also show that two personality traits of entrepreneurs, entrepreneurial self-efficacy (ESE) and risk appetite, influence their willingness to work with CVC. In particular,

entrepreneurs with higher ESE or higher risk appetite are significantly less willing to work with CVC. Moreover, I have found that entrepreneurs with higher ESEs place a markedly greater emphasis on the autonomy of CVC units from the operations and strategic interests of their parent corporations, thus demonstrating the deterrent effect of ESE. This thesis gives us a better understanding of the decision-making dynamics of entrepreneurs when they view CVC units as potential investors. My job is helping business leaders successfully install and manage CVC activities in their organizations.

In Thesis III, I explored the relationship between CVC units and business angels. Specifically, I relied on survey data to identify factors that influence the overall attitude of individual angel investors towards corporate investors. I have found that the level of social capital that business angels assign to CVC business units strongly influences their attitude towards this group of investors. In addition, the fears of imitation and certain organizational issues that business angels associate with corporate investors significantly affect the attractiveness of CVC units from the point of view of business angels. I have also found that angels targeting a wide range of sectors are more attracted to the CVC divisions. Business angels are less attracted by CVC units when they perceive the funding needs of CVC units as particularly high. The dissertation provides academics and business leaders with a better understanding of the specific factors that determine the attitudes of other investor groups towards CVC units. The results show that CVC divisions must overcome common challenges associated with them when interacting with other key players in the entrepreneurial ecosystem.

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