THE PHENOMENON OF CORPORATE VENTURE CAPITAL FROM AN ENTREPRENEURIAL FINANCE PERSPECTIVE

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BIC	-	Bayesian Information Criterion
CE	-	Corporate Entrepreneurship
CV	-	Corporate Venturing
CVC	-	Corporate Venture Capital
E/E	-	Exploration and Exploitation
ECV	-	External Corporate Venturing
GP	-	General Partner
HLM	-	Hierarchical Linear Modeling
ICV	-	Internal Corporate Venturing
IPO	-	Initial Public Offering
IVC	-	Independent Venture Capitalist
LP	-	Limited Partner
M&A	-	Mergers & Acquisitions
NVCA	-	National Venture Capital Association
PE	-	Private Equity
PwC	-	PricewaterhouseCoopers
QCA	-	Qualitative Comparative Analysis
R&D	-	Research & Development
ROE	-	Return on Equity
VC	-	Venture Capital
VIF	-	Variance Inflation Factor
VOS	-	Visualization of Similarities
WoS	-	Web of Science

1 Introduction

Driven by the rise of digital business models (Teece, 2018) and other megatrends, many established corporations find themselves confronted with the need to renew their existing innovation strategies (Ernst, Witt, & Brachtendorf, 2005; Gaba & Bhattacharya, 2012). The utilization of corporate venture capital (CVC) units is considered a promising approach to combine internal research and development (R&D) resources with external knowledge (Cassiman & Veugelers, 2006). Such CVC units acquire minority equity stakes of young and innovative startups (Dushnitsky & Lenox, 2006), thus forming a triad encompassing the CVC unit itself, the corporate mother, and the startup (Weber & Weber, 2011). Today, numerous corporations are following the example of the early adaptors such as *Lucent*, *Panasonic*, *Intel* or *Cisco* in using CVC units to renew their innovation strategies (Chesbrough, 2002; CB Insights, 2018a).

The phenomenon of CVC has already attracted considerable attention from researchers and the extant literature sheds light on several ways in which CVC units are important for the startup ecosystem. Depending on their type (Zu Knyphausen-Aufsess, 2005; Dushnitsky, 2006), CVC units can provide crucial value-added activities to support the sustainable development of their portfolio companies. Startups receive not only financial support but also assistance in recruiting employees and convincing customers and new partners, and also acquire new insights about competitors and technologies (e.g., Maula, Autio, & Murray, 2005). This also leads to other benefits relating to their innovation output (e.g., Park & Steensma, 2013; Alvarez-Garrido & Dushnitsky, 2016) or financial metrics (e.g., Park & Steensma, 2012) that help CVC-backed startups to outperform their competitors backed by independent venture capitalists (IVCs).

The use of CVC is strongly associated with taking risks, yet large corporations are as a whole considered rather risk averse. The adoption of CVC practices by large corporations carries the risk of a conflict between their core business and the risks associated with startup investments. This inner conflict contributes to the popularity of the CVC from an academic point of view. Additionally, the versatility of observable phenomena within the CVC context, provides the academic community with a unique research setting. Therefore, several perspectives can be observed in published articles. In this regard, many authors base their argumentation on real options (e.g., Van de Vrande & Vanhaverbeke, 2013), signaling (e.g.,

Wang & Wan, 2013) or property rights (Dimov & Gedajlovic, 2010) alongside network theory (e.g., Noyes, Brush, Hatten, & Smith-Doerr, 2014). However, due to its complexity and the diverse range of theoretical perspectives being applied to it, the CVC phenomenon encapsulates many unanswered questions. In particular the investment motivation of CVCs or the interplay of CVC investments and subsequent acquisition of the supported startups demand academic scrutiny, and accordingly constitute the research focus of this dissertation.

The remainder of the dissertation's introduction is structured as follows: Section 1.1 highlights the CVC phenomenon's relevance to and relationship with other entrepreneurial activities of established corporations, thereby providing a theoretical anchor for the articles presented in this dissertation. Subsequently, Section 1.2 outlines the dissertation's scope and motivation, while Section 1.3 summarizes the dissertation's articles by outlining their underlying structure.

1.1 Disentangling the entrepreneurial activities of large corporations

Since the early 1980s, the academic world has investigated and tried to explain the adaption of entrepreneurial activities of large and established corporations (e.g., Von Hippel, 1977; Rind, 1981; Burgelman, 1983; Ellis & Taylor, 1987). Consequently, in recent decades, a vast body of labels and typologies for CVCs has emerged, all of which share the idea that established corporations can benefit from the use of entrepreneurship (for an overview of definitions see, Sharma & Chrisman, 1999). Grounded in the corporate entrepreneurship (CE) literature, corporate venturing (CV) is seen as a bundle of actions to stimulate the creation of new business organizations either within the existing boundaries (known as internal corporate venturing, ICV) or outside of them (known as external corporate venturing, ECV) (Sharma & Chrisman, 1999; Narayanan, Yang, & Zahra, 2009). Accordingly, the current literature (e.g., Keil, 2000) considers non-equity alliances, joint ventures, acquisitions, and spin-offs to be instruments of ECV. Likewise, CVC is embedded in the ECV context, and the phenomenon of CVC is particularly used to highlight the benefits for established corporations.

For instance, scholars observed greater innovational output (e.g., Dushnitsky & Lenox, 2005a), a higher valuation (Dushnitsky & Lenox, 2006), and leverage effects on other financial outcomes (Zahra & Hayton, 2008) through the use of CVC. In addition to specific investigations of the effect of CVC, several authors investigate the comparative use of CVC

and other ECV instruments such as acquisitions (Schildt, Maula, & Keil, 2005; Keil, Maula, Schildt, & Zahra, 2008; Benson & Ziedonis, 2009; Benson & Ziedonis, 2010; Tong & Li, 2011; Van de Vrande, Vanhaverbeke, & Duysters, 2011; Masulis & Nahata, 2011), joint ventures (Schildt et al., 2005; Keil et al., 2008), and alliances (Schildt et al., 2005; Keil et al., 2008; Dushnitsky & Lavie, 2010; Van de Vrande et al., 2011; Van de Vrande & Vanhaverbeke, 2013). In a broader sense, CVCs are formed to transform the idea of independently acting VCs to suit the corporate context. As a consequence, CVC vehicles compete with other players from the VC ecosystem to invest in young and innovative startups. It is therefore unsurprising that the comparison of CVC and IVCs features in answers to research questions (e.g., Maula et al., 2005; Alvarez-Garrido & Dushnitsky, 2016) or in describing underlying research objects (e.g., Bengtsson & Wang, 2010; Dimov & Gedajlovic, 2010).

1.2 Purpose of this dissertation

As mentioned above, the adaption of entrepreneurial structures within established corporations is important to the academic and practical discourse. Therefore, this dissertation sheds further light on several aspects of the CVC phenomenon, thereby contributing to the ongoing development of the research field as such. The studies presented in this dissertation do so by scrutinizing empirical issues and also by enhancing the foundational CVC research front through the introduction of a data-driven CVC definition and a computer-aided text analysis (CATA) based measure of a CVC's isomorphic tendencies.

Accordingly, in addition to the structural literature review (Section 2) the following two studies focus on the motivational drivers within the CVC dyad. First, the investment motivation is observed at the CVC level, investigating how CVC units interpret their mission as delegated by the corporate mother. Second, the underlying innovation strategy of the corporate mother itself is examined by drawing on the concept of exploration and exploitation. My co-authors and I seek to go beyond the well-established either-or approach of previously-published articles (e.g., Dushnitsky & Lenox, 2006) by focusing on the continuum between the financial and strategic investment motivation of CVC units. Due to the fact that the investment motivation is derived from the CVCs mission statement, they are an expression of how CVC units interpret their existence. In addition, Section 4 focuses on the general innovation strategy of the corporate mother. Therefore, the relevant study applies

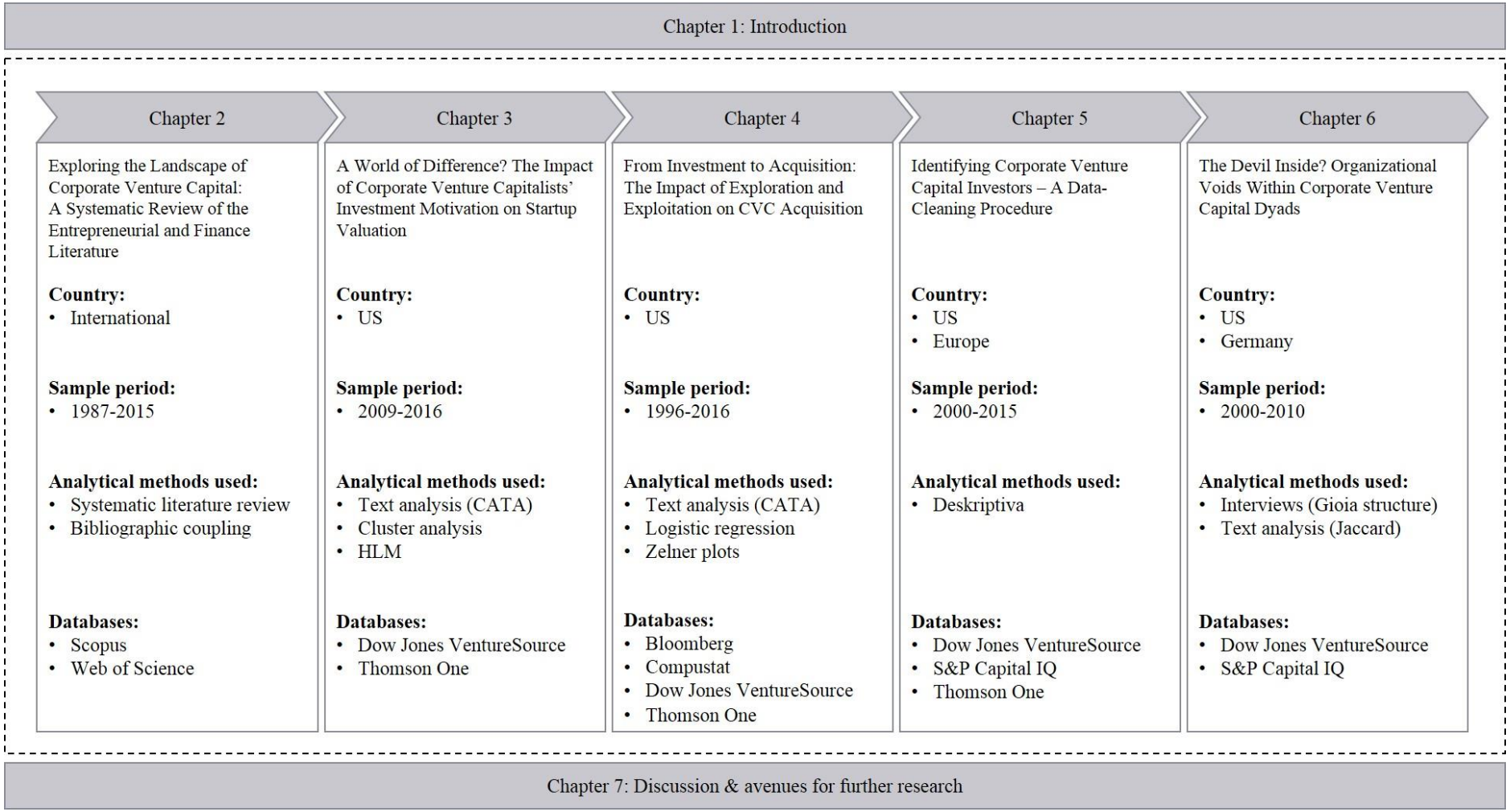
the degree of exploration and exploitation (March, 1991; Gupta, Smith, & Shalley, 2006; Lavie, Stettner, & Tushman, 2010; Phene, Tallman, & Almeida, 2012) to the relationship of two instruments found in the CV context—CVC investments and acquisitions—that have thus far largely been analyzed in a comparative setting. The final two articles then address the development of new approaches; one to stimulate the use of isomorphic tendencies in the CVC context, and the second to develop a data-cleaning procedure to enable future scholars to achieve academic rigor by identifying CVC units among the data records of information providers. The new data-cleaning approach is suggested because authors observing CVCs base their analysis mainly on secondary data from two powerful information providers, *Dow Jones VentureSource* and *Eikon* from *Thomson*. However, those data providers largely disregard the underlying definition of a CVC, which leads them to exclude what should be defined as CVCs but are labeled as other investment vehicles and vice versa. The study thus extends the findings of other articles (Lerner, 1994, 1995; Kaplan, Strömberg, & Sensoy, 2002; Maats, Metrick, Yasuda, Hinkes, & Vershovski, 2011) that help researchers with the selection of secondary data sources. Finally, this dissertation also proposes a unique measurement of isomorphic tendencies using the Jaccard index. By explaining how and why such tendencies vary over time, the study presented in Section 6 directly follows the work of Souitaris, Zerbinati, and Liu (2012). Research based on the isomorphism of CVC units is rare, and therefore I am confident the study contributes to the ongoing discussion.

As a whole the dissertation aims to shed light on several research questions grounded in the CVC context. The dissertation also contributes to the general development and academic rigor of the whole research front by introducing new procedures and measurements that pave the way for future research.

1.3 Underlying structure of the dissertation

This dissertation comprises a literature review and four empirical articles that shed light on various aspects of the CVC phenomenon. To provide an overview, Figure 1 summarizes the dissertation's structure and collates further information about each study highlighting the applied analytical methods and information regarding the data set. The following paragraphs outline the studies incorporated in this dissertation by briefly introducing each article's purpose and scope.

Figure 1: Overview of the studies included in this dissertation



The first study, *Exploring the Landscape of Corporate Venture Capital: A Systematic Review of the Entrepreneurial and Finance Literature* is presented in Section 2 and provides a holistic overview of empirical articles published in the field of CVC. The article follows a structured literature review approach as described by Transfield, Denyer, and Smart (2003) and Paré, Trudel, Jaana, and Kitsiou (2015). The study is based on a total sample of 65 articles, all published between 1987 and 2015 and sourced from the dominant databases for peer-reviewed literature, such as *Scopus* and *Web of Science* (WoS). To visualize the development of the research front, the literature review introduces bibliographic coupling—a bibliometric method in which two articles are seen as related if they cite the same source—into the field of CVC. In doing so, the derived networks revealed that the domain is dominated by two different research domains, management and finance, which interestingly tend to avoid cross citation. The network perspective also provides visual information on the development of the CVC research front over time by separating older from more-recently published articles. Consequently, the literature review serves as a profound basis for the studies comprising this dissertation.

Section 3 presents a study called, *A World of Difference? The Impact of Corporate Venture Capitalists' Investment Motivation on Startup Valuation*. The study examines the relationship between a CVC's investment motivation and a startup's valuation using a unique sample of US-based investment rounds. By drawing on several data collection procedures (text analysis and secondary data) and statistical methods (cluster analysis and hierarchical linear modeling, HLM) the article postulates a fine-grained view of a CVC's investment motivation. To date, the majority of authors have focused on an either-or approach (i.e., strategic or financial) when addressing the two dominant investment motivations (e.g., Dushnitsky & Lenox, 2006). Using word lists and hierarchical clustering, the article draws a multifaceted picture by identifying a set of four investment motivations applicable to CVCs. Subsequently, the identified investment motivations (strategic, financial, analytic, and unfocused) were used to explore the relationship with a startup's valuation relying on a sample comprising 52 CVC vehicles and 147 startup valuations logged on *Dow Jones VentureSource* between January 2009 and January 2016.

Section 4 is titled *From Investment to Acquisition: The Impact of Exploration and Exploitation on CVC Acquisition*. The study examines the relationship between a corporate mother's degree of explorative and exploitative orientation and the likelihood of its acquiring

startups previously backed by its own CVC. The study answers the call of Dushnitsky and Lavie (2010) by addressing different corporate venturing activities undertaken to foster external knowledge as collaboratively managed mechanisms. By focusing on acquisitions within a CVC setting, the study contributes to a widely under-researched area (Masulis & Nahata, 2011; Dimitrova, 2015). To answer the research question, we build a data sample consisting of 901 US-based startup acquisitions undertaken between 1996 and 2016; of that number, 124 transactions (14 %) were CVC acquisitions. The study draws on textual analysis and logistic regression to address its research question and also takes the relationship between the product market relatedness of a startup and that of its acquirer into account. Owing to the non-linear nature of the logistic model, the study uses a simulation-based method (Zelner, 2009) to evaluate and visualize the statistical significance and directions of the interacting variables.

The next study, *Identifying Corporate Venture Capital Investors – A Data-Cleaning Procedure* is presented in Section 5. It reports on the data-cleaning issues my co-authors and I faced when conducting the previously mentioned research and offers a potential remedy. We examine the scope and consistency of the two most popular databases among CVC researchers, namely *Dow Jones VentureSource* and *Eikon* from *Thomson Reuters*. Based on four extensive data samples ranging from January 2000 to December 2015, the article introduces a data-cleaning procedure to identify CVC investors from those databases, even if they are defined as other types of investment vehicle. In doing so, several criteria derived from the literature were discussed and applied. The article itself serves as a reference for researchers within the field of CVC to focus more acutely on the technical definition of their samples and thereby increase the replicability, comparability, and validity of their results.

Section 6 presents the final study titled, *The Devil Inside? Organizational Voids Within Corporate Venture Capital Dyads*. The study is based on the phenomenon of isomorphic tendencies, and follows the argumentation of Souitaris et al. (2012) that CVC units are influenced by two entirely different environments simultaneously—the startup ecosystem and the corporate environment. The purpose of the study is to answer the question of how isomorphic tendencies can be measured and to investigate the influence of those tendencies over time. To achieve its purpose, the study draws on the Jaccard index to automatically compare the overlap between two organizational written mission statements. The isomorphic distances between the CVCs and their corporate mothers serve as indicators

for the direction and magnitude of the isomorphic tendencies. The study applies a qualitative approach to investigate potential drivers of those tendencies over time based on interviews with reputable CVC investors from Germany.

Section 7 closes the dissertation with a short summary of the articles' findings and of the overarching contribution of the dissertation to the field of CVC.

2 Exploring the Landscape of Corporate Venture Capital: A Systematic Review of the Entrepreneurial and Finance Literature[1]

Abstract

The influence of corporate venture capital investments within the venture capital industry, that is, equity stakes in high technology ventures, has stimulated the academic literature on this specific research area. Generally, CVC is strongly associated with the concept of corporate venturing and plays a vital role in the strategic renewal of established companies. Owing to the multifaceted nature of the CVC phenomenon, the existing literature is rather fragmented. Therefore, the purpose of this article is twofold: first, bibliographic coupling is introduced to the field of CVC to reveal the underlying structure of the current research front. Second, a content-related review is conducted to shed light on nascent research streams and shortcomings within the CVC literature that indicate promising avenues for future research. The systematic review of a comprehensive set of 65 articles reveals that the prevailing CVC literature is mainly driven by two dominant logics, management and finance, that tend to separate themselves from one another. Moreover, nascent research streams are identified that will broaden and enrich the academic discussion.

2.1 Introduction

CVC, that is, direct minority investments from established firms in high technology small ventures, plays a central role in the venture capital (VC) ecosystem (Dushnitsky, 2006). The formation of a CVC triad through the interaction between a corporate mother firm, the CVC unit, and a venture, can deliver some key benefits for all parties concerned. Acting as an intermediary, CVC units provide ventures with access to complementary assets (Chesbrough, 2002). Ventures, which primarily operate in dynamic environments, can benefit from the technical support associated with CVC investments and can often overcome financial restraints (Maula et al., 2005). CVC investments provide a vital instrument through which corporate mothers can foster the innovation behavior of a venture (Dushnitsky & Lenox,

[1] This study is published with the kind permission of Springer Nature. The original publication Röhm (2018) appeared in: Management Review Quarterly, Vol. 68, Issue 3, pp. 279-319, which can be found at the following address https://link.springer.com/article/10.1007%2Fs11301-018-0140-z.

2005a). Hence, a growing number of corporations are extending their existing innovation portfolios through the adoption of CVC practices. In 2014 alone, the total number of transactions with a CVC involvement in the US increased by 11% (792 deals), according to the MoneyTree Report provided by the *National Venture Capital Association* (NVCA) and *PricewaterhouseCoopers* (PwC) (NVCA, 2015). Besides the most influential and active CVC programs of Google, Intel, Salesforce, and Qualcomm (CB Insights, 2015), 183 further investment vehicles of US-based companies supported ventures.

Such peaks in the investment behavior of corporations are recurrent. Several articles (Gompers & Lerner, 2000; Dushnitsky & Lenox, 2006; Boston Consulting Group, 2012) have described the cyclical nature of CVC investments since the 1960s. As Gompers and Lerner (2000) reported, the instigation and abandoning of CVC programs are strongly influenced by exogenous shocks such as the disruption of initial public offerings (IPOs) in the early 1970s, or the stock market crash in 1987.

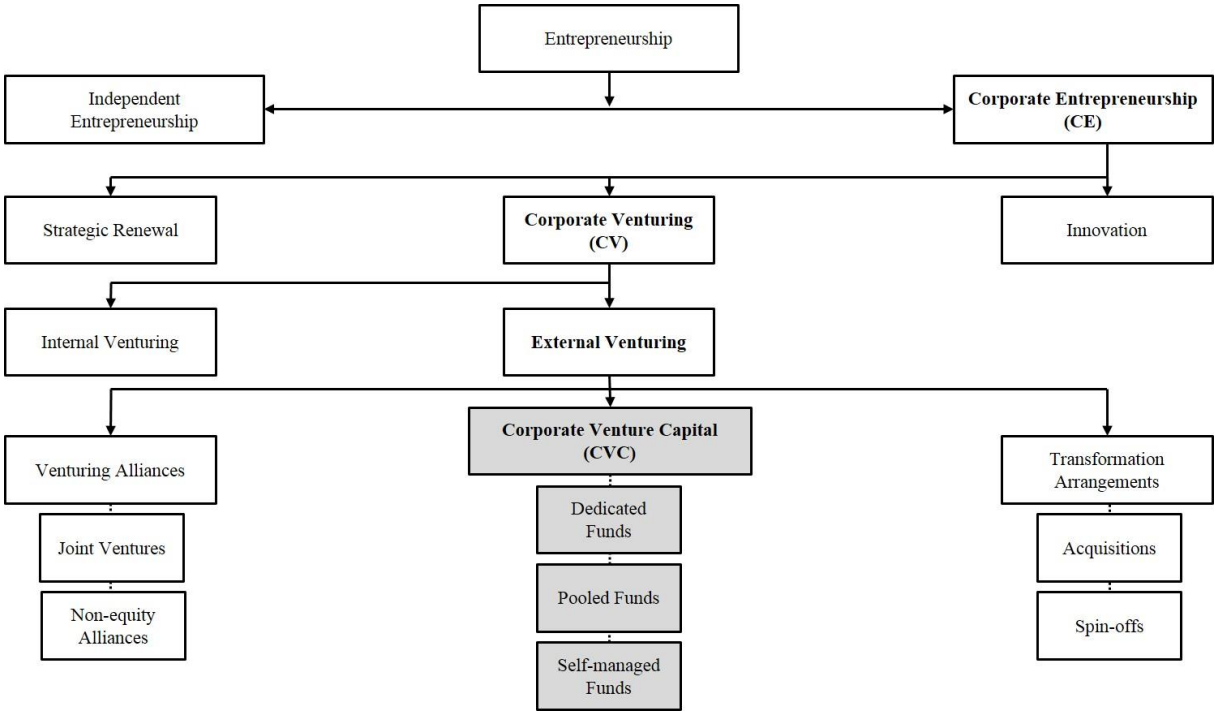
However, from an academic point of view, the interest in CVC continues unabated. During the past two decades, the phenomenon of CVC has captivated scholars and led to a rapid growth in the number of articles on the subject. To gain a fundamental understanding of the ongoing academic discussion, some previously published literature reviews limit their search results to specific journals and time frames (Narayanan et al., 2009) or particular aspects of the CVC phenomenon (Leten & van Dyck, 2012). In consequence, the objectives of the following article are twofold: first, the underlying research front of the CVC literature is revealed using an explorative bibliographical approach, thereby extending the status quo by introducing bibliographic methods into the field of CVC. Second, the prevailing literature within this particular branch of research is thoroughly examined and upcoming research streams and shortcomings are discussed to identify issues that merit future research.

To meet these objectives, the remainder of the study is organized as follows: First, an overview of both the underlying objectives of CVC vehicles and the corresponding theoretical phenomenon of corporate venturing is provided. Second, building on that overview, the data collection method is described. Third, the current research front within the field of CVC is revealed, applying bibliographic techniques. Fourth, major research streams and shortcomings are summarized and discussed. The paper closes with a conclusion.

2.2 Corporate venture capital as an external venturing mode

Since the early 1980s, an increasing number of articles has targeted the entrepreneurial activities within organizations (Burgelmann, 1983; Miller, 1983; Sharma & Chrisman, 1999). As a branch of corporate entrepreneurship, corporate venturing can be described as a set of processes and practices to explore and exploit new markets and industries by creating new businesses (Narayanan et al., 2009). Literature on the subject further distinguishes between internal and external modes of CV (Sharma & Chrisman, 1999; Keil, 2000; Miles & Covin, 2002). While Ellis and Taylor (1987, p. 528) define CV as the adoption of the "structure of an independent unit […] to involve a process of assembling and configuring novel resources". Keil (2000) introduced a more fine-grained taxonomy to explain how CV activities can be used to transfer the entrepreneurial spirit to established companies. Figure 2 illustrates this relationship between CE, CV, and CVC.

Figure 2: Corporate venture capital taxonomy[2]



However, while internal CV activities focus on creating new businesses within existing organizational boundaries, external modes such as venturing alliances, transformational arrangements, and CVC foster innovation across organizational boundaries through semi-

[2] The taxonomy is adopted from Keil (2000) and Sharma and Chrisman (1999).

autonomous or autonomous entities (Sharma & Chrisman, 1999; Keil, 2000; Narayanan et al., 2009). A further distinction is evident regarding the underlying structure and organization of CVC programs. CVC units that provide ventures with equity can be organized as self-managed funds within the corporation's structure or operate as a limited partner (LP) in pooled and dedicated funds, typically managed by third party investors such as IVCs (McNally, 1995; Keil, 2000). Acting as an intermediary between the corporate mother and the ventures, the fundamental perception of the CVC therefore determines the governance of these programs. Thereby the use of CVC is associated with the idea of accruing both financial and strategic benefits from the supported ventures (Ernst et al., 2005); hence, the difference between those investment objectives is well documented (Winters & Murfin, 1988; Chesbrough, 2002; EY, 2002; Ernst et al., 2005; Weber & Weber, 2005; Dushnitsky & Lenox, 2006; Röhm, Köhn, Kuckertz, & Dehnen, 2018).

2.3 Method of review

This literature review aims to provide deep insights into the phenomenon of CVC and to specify the current research front. Hence, the design of the study follows a systematic scoping approach (Paré et al., 2015). In line with previously published literature reviews (Crossan & Apaydin, 2010; Nijmeijer, Fabbricotti, & Huijsman, 2014; Hu, Mason, Williams, & Found, 2015), structured literature reviews are mainly based on two dominant databases, *Thomson Reuter's WoS* (formerly *ISI Web of Knowledge*) and *Scopus* from *Elsevier*. Because journal coverage varies (Mongeon & Paul-Hus, 2016),[3] both databases were used to identify CVC-related articles. To ensure a decent quality of the academic work, only peer-reviewed journal articles written in English were considered. Hence, monographs, Ph.D. theses, working papers, editorial notes, symposia, presentation slides, and book reviews were excluded from the search. However, in contrast to other literature reviews in the field of CVC, this study does not limit the search results to specific journals and timeframes (Narayanan et al., 2009) or specific aspects of the CVC phenomenon (Leten & van Dyck, 2012).

[3] During the data collection process, the following differences were identified: While the *Strategic Management Journal* is only available on *Scopus* for issues from 2011 onwards, *Web of Science* does not cover the following journals: *Venture Capital: An International Journal of Entrepreneurial Finance*, *World Review of Entrepreneurship, Management and Sustainable Development* and the *Management Research Review*.

The first step in the identification process involved searching *Scopus* and *WoS* for the appearance of the term *corporate venture capital* in the title, abstract, or keywords of all articles published up until September 2015. This search generated a total of 98 unique articles. Because the phenomenon of CVC has captivated scholars from various research streams, resulting in a continuous development of the underlying definitions, a supplementary survey was conducted to ensure the inclusion of relevant CVC articles. Therefore, all 98 articles were downloaded and analyzed using *WordStat* by *Provalis Research*, a text analysis software designed to reveal knowledge and trends from an underlying text corpus, to extract synonymous search terms for *corporate venture capital*. Consequently, all phrases with a minimum of two words and at least three appearances were retained for further analysis, resulting in a wordlist comprising 1469 phrases. Each phrase was then reviewed by two researchers acting independently to identify CVC synonyms. The interrater reliability was calculated using Cohen's Kappa (Cohen, 1960) (κ=0.7164) and Krippendorf's Alpha (Krippendorff, 1980) (α=0.7156), which indicated a substantial agreement between the two raters. Discordant opinions were resolved through discussion. This broad set of additional search strings helped to ensure all CVC synonyms and variations were encompassed. As a consequence, the final wordlist comprises 13 search terms, each summarized in Table 1.

In total, 15 further CVC-related articles were added to the 98 articles initially identified. To balance feasibility and comprehensiveness, as suggested by Tranfield et al. (2003) and Paré et al. (2015), the total sample of 113 articles was narrowed down. Four articles were dropped because they did not exclusively address CVC-related topics, and six owing to the fact that they were themselves literature reviews of related research areas, including open innovation (Herskovits, Grijalbo, & Tafur, 2013), technology commercialization (Markman, Siegel, & Wright, 2008) or CE as such (Corbett, Covin, O'Connor, & Tucci, 2013). The largest group of articles were excluded because they were neither theoretical in nature nor applying either a multivariate analysis method or a case-study approach (38 articles). This step includes mainly practically oriented articles (e.g., Reaume, 2003; Dushnitsky, 2011) and academic articles providing bivariate statistics for overview purposes (e.g., Cumming, 2006; Fujiwara & Kimura, 2011).

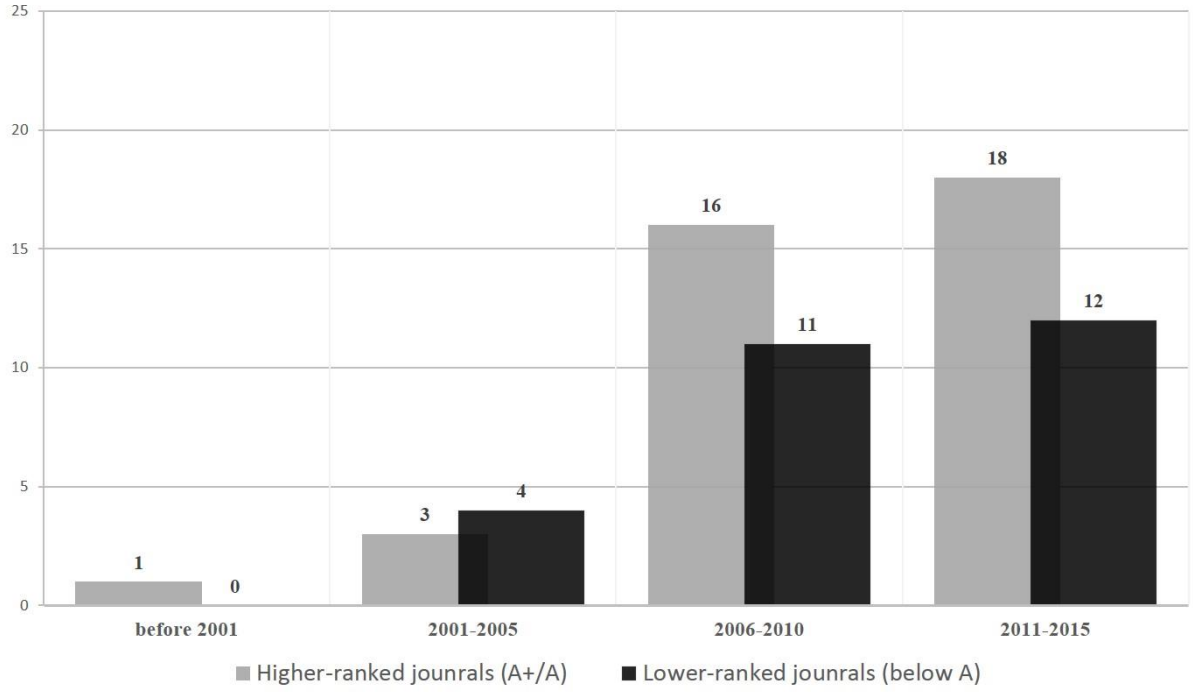
Table 1: Overview of the applied search terms[4]

Search term	Search string in context	Author	Additional articles
Corporate venture capital	"The activity is often managed by a **corporate venture capital** program that seeks a mix of financial returns as well as strategic gains"	Alvarez-Garrido & Dushnitsky (2016)	98
Corporate fund	"would not provide the right results on the headquarter[s'] incentives to setup a **corporate fund**"	Riyanto & Schwienbacher (2006)	0
Corporate VC	"similar to private VC firms, **corporate VC** firms are both the agent of their corporate parents and the principal of funded ventures"	Wang & Wan (2013)	7
Corporate ventur*	"external innovation is the most important strategic goal of **corporate venturing** activities"	Ernst, Witt, & Brachtendorf. (2005)	5
CV activit*	"making decisions about using external **CV activities** raises several additional challenges for managers"	Narayanan, Yang, & Zahra (2009)	0
CV fund	"which resulted in major losses to VC and **CV fund** valuations in Europe and the U.S."	Hill, Maula, Birkinshaw, & Murray (2009)	0
CV program	"some corporations consider their **CV program** a key link to the VC community"	Narayanan, Yang, & Zahra (2009)	1
CV unit	"the relational context of the **CV unit** is defined as the set of relationships with the key resource holder"	Hill & Birkinshaw (2014)	0
CVC	"especially successful **CVC** managers will join independent VC companies and therefore leave CVC activities with no future"	Zu Knyphausen-Aufsess (2005)	2
External CV*	"**external CV** can take the form of joint ventures or spinoffs, but the most important and prominent example is corporate venture capital (CVC)"	Reimsbach & Hauschild (2012)	0
External ventur*	"by engaging in **external venture** financing, corporate investors are better able to learn"	Benson & Ziedonis (2009)	0
Firms invest in new ventures	"in particular, some **firms invest in new ventures** to provide a window on new technologies"	Dushnitsky & Lenox (2006)	0
IVC counterparts	"suggest that corporate investors have a stronger preference than their **IVC counterparts** for new venture investees"	Park & Steensma (2013)	0

[4] A wildcard (*) at the end of a search term signals *Scopus* and *WoS* to include all subsequent letters. Consequently, "CV activit*" will also include "CV activities" and "CV activity" in the search process.

Consequently, this process yielded a final sample of 65 articles. Figure 3 depicts the number of CVC-related articles in both higher and lower-ranked journals based on their impact factors. Articles published in the *Journal of Business Venturing* (14%, n=9), the *Strategic Management Journal* (12%, n=8), the *Strategic Entrepreneurship Journal* (11%, n=7), the *Academy of Management Journal* (6%, n=4) and *Entrepreneurship Theory and Practice* (5%, n=3) dominate the sample. The remaining 37 articles are distributed across 26 other journals. Since the seminal publication of Gupta and Sapienza (1992) the number of articles has burgeoned. It is notable, that from 2005 onwards highly ranked journals such as the *Strategic Management Journal* (first publication within the sample in 2005) or *Entrepreneurship Theory and Practice* (first publication within the sample in 2004) are outperforming their lower-ranked counterparts. In this vein, the phenomenon of CVC is now clearly established in the context of rigorous academic discussion, thus cementing the importance of CVC vehicles in the VC industry (NVCA, 2015).

Figure 3: Development of CVC-related articles in higher and lower-ranked journals

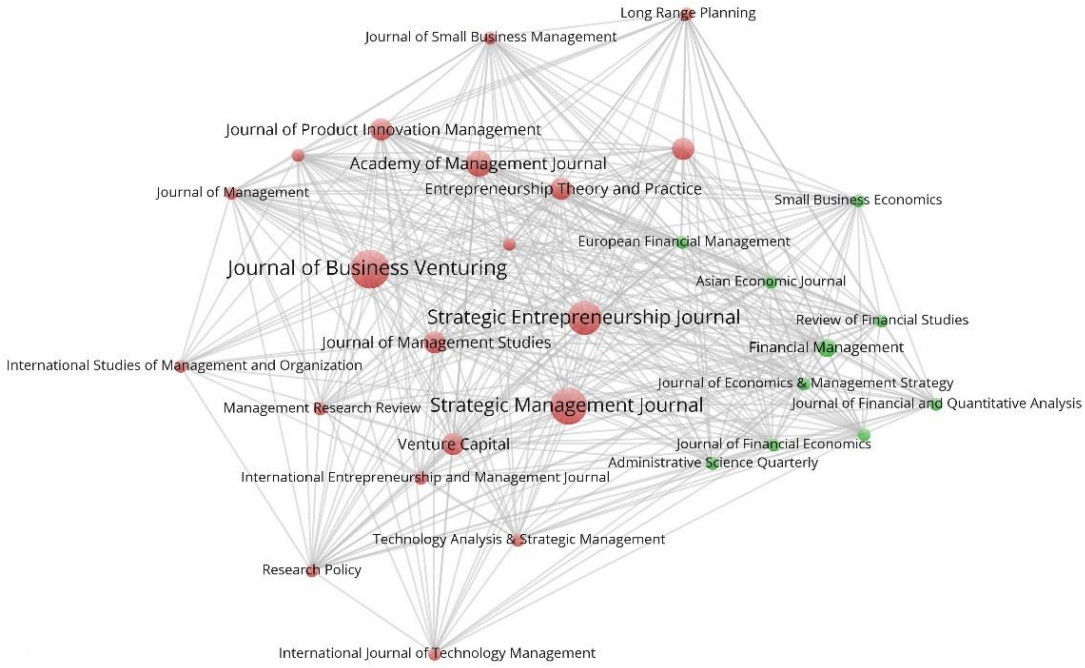


2.4 Revealing the structure of the CVC landscape using bibliographic coupling

In accordance with its explorative approach, this study applies a bibliographical method to reveal the current status of the CVC-related literature. The idea behind all bibliographic methods is that frequently cited articles tend to shape a given research stream through the association of ideas (Garfield, 1955). The aim of these particular methods, bibliographic coupling, co-occurrence, co-citation, and co-authorship, is to capture the underlying structures within a particular line of research, and accordingly the methods are commonly used by scholars of management and organizations (Zupic & Cater, 2015). In contrast to the co-citation approach, where two articles are related if they are cited together (Small, 1973), bibliographic coupling is a measure of relatedness based on the total number of references articles have in common (Kessler, 1963). Therefore, the connection between two articles is static over time (Jarneving, 2005). Consequently, this article builds a bibliographic coupling network by applying the *Visualization of Similarities* (VOS) approach introduced by Van Eck and Waltman (2009a). The corresponding software tool, *VOSviewer*, has already been used in a vast number of research articles (e.g., Rafols, Leydesdorff, O'Hare, Nightingale, & Stirling, 2012; Wikhamn & Wikhamn, 2013). This tool provides a reliable code to visualize all forms of bibliometric networks using a distance-based approach. After conducting a normalization process, called association strength normalization (Van Eck & Waltman, 2009b), *VOSviewer* optimizes the position of the observed items in a two-dimensional space. By minimizing the weighted sum of the squared Euclidean distances, an algorithm arranges all items in such a way that strongly-connected items are located close to each other, and less-strongly connected ones are placed far away from each other. An optimization process ensures that strongly-connected items are centered in the network, while nodes with a weaker connection will appear at the edges of the network depiction (Van Eck & Waltman, 2009a; Waltman, Van Eck, & Noyons, 2010). Because several databases were used, a standardization process was applied. Articles exclusively available on *Scopus* were transformed to a *Web of Science* standard using the *Scop2WOS* tool, provided by Loet Leydesdorff (for a similar approach see Leydesdorff, Moya-Anegón, & Guerrero-Bote, 2015). Furthermore, I used an additional standardization macro to detect inconsistencies within the downloaded references to improve the data quality. For instance, different forms of journal title were adjusted (e.g., from VENTURE CAPITAL to Venture Capital) as were forms of authors' names (e.g., from M.V.J. Maula to MVJ Maula).

To provide deep insights into the rapidly growing CVC literature, bibliographic coupling networks with different units of analysis were constructed based on the bibliographic information of the sample (65 articles). The first step involved producing a general bibliographic coupling network based on the journal information (Figure 4).

Figure 4: Journal map based on bibliographic coupling linkages

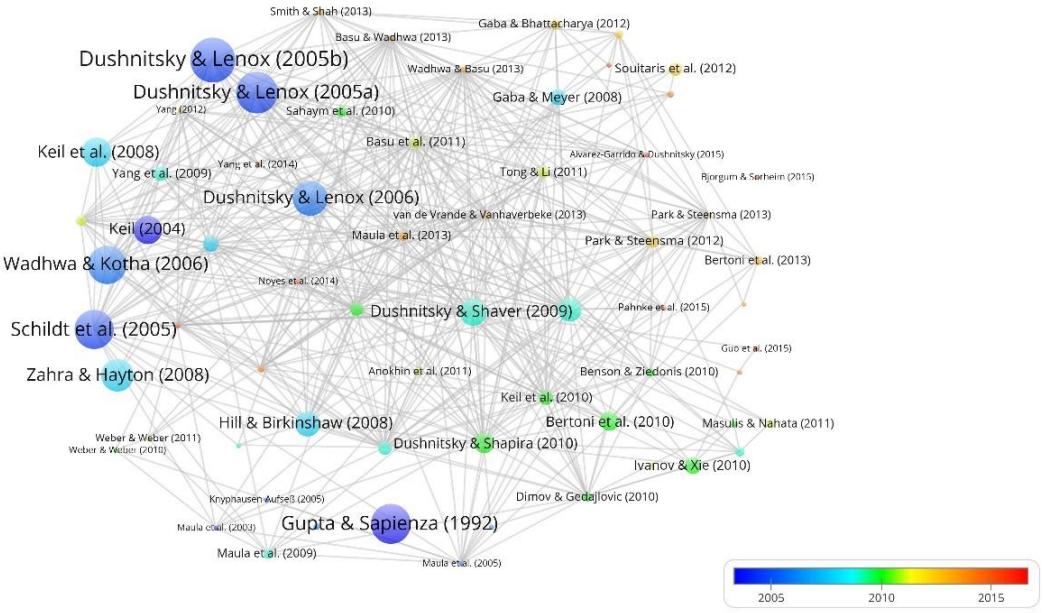


Accordingly, each circle represents a journal. The size of the circle is influenced by the total number of studies a journal published in the field of CVC. For instance, the *Journal of Business Venturing* published nine articles between 1992 and 2011, whereas the *International Journal of Technology Management* (bottom center) published only the work of Bassen, Blasel, Faisst, and Hagenmuller (2006). Related journals, based on bibliographic coupling, are placed close to each other, thus indicating that articles published in those journals tend to cite the same references. Not surprisingly the visualization of the journal-based network paints a clear picture. Prestigious journals like the *Journal of Business Venturing*, the *Strategic Entrepreneurship Journal*, the *Academy of Management Journal*, the *Strategic Management Journal*, and *Entrepreneurship Theory and Practice* are centered in the network and therefore tend to cite the same management-related articles. The distinction between management and finance-related journals also becomes obvious upon applying the integrated clustering method of *VOSviewer* (Waltman et al., 2010). While financially-oriented

journals, such as *Financial Management*, belong to the green cluster (middle right), management-oriented journals are affiliated to the red cluster, indicating that the field of CVC is quite dichotomous with two prevalent points of view. This result is driven by the fact that both disciplines are strongly home biased, in other words, the authors prefer to publish in their own research field. In this vein, Cumming (2015) pointed out that especially editors and referees of financial journals tend to have a low opinion on cross-citations to other disciplines, thus causing a natural selection effect.

A more fine-grained analysis (see Figure 5) illustrates the resulting relationships between all 65 articles. Accordingly, the unit of analysis was shifted from journals to single documents. Following the same logic, each node represents an article. Additionally, the size of each node relates to the number of times an article has been cited, while the colors indicate when each article was published. The colors employed range from purple, denoting publication dates from 2005 or before, to red (2015 onwards).

Figure 5: Document map based on bibliographic coupling linkages



The findings of the calculated map thus contribute to the understanding of the current research front in three ways: First, frequently cited articles are highlighted through the size of the nodes. In this vein, articles written by Dushnitsky (e.g., Dushnitsky & Lenox, 2005a; Dushnitsky & Lenox, 2005b; Dushnitsky & Lenox, 2006) and Keil (e.g., Keil, 2004; Keil et al., 2008) have shaped the CVC discussion and therefore acquired must-cite status within and

beyond the discussion of the CVC phenomenon. In addition, the work of Gupta and Sapienza (1992), Schildt et al., (2005), Wadhwa and Kotha (2006), Hill and Birkinshaw (2008), and Zahra and Hayton (2008) attracted a great deal of attention, according to the number of their citations. Second, in contrast to the journal map (Figure 4) the document map provides information on the development of the CVC research front over time. As already shown in Figure 3, articles focused on CVC are growing steadily. Thereby, the network map helps to separate older from more-recently published articles. For instance, the work of Gupta and Sapienza (1992) and Pahnke, Katila, and Eisenhardt (2015) were published 23 years apart. Accordingly, it is evident that the focus within the CVC field moved from learning aspects (on the left-hand side, blue and purple) over more outcome-related articles (on the right-hand side, green) toward the organizational settings of CVC units (on the top-right, yellow and red). Third, as expected and predicted by Cumming (2015), the separation of finance and management publications is also evident on the document level. The publications of Masulis and Nahata (2009, 2011), Benson and Ziedonis (2010), Ivanov and Xie (2010), Kim, Kim, and Lee (2011), Chemmanur, Loutskina, and Tian (2014) and Guo, Lou, and Pérez-Castrillo (2015) and are therefore placed in the bottom right corner, because they tend to cite the same financially-oriented references.

2.5 Overview of the articles considered

After the underlying structure of the CVC research front had been revealed, all articles within the sample were thoroughly examined. In this vein and in line with other literature reviews (Crossan & Apaydin, 2010; Keupp, Palmié, & Gassmann, 2012; Lour, Lu, Yu, & Chang, 2014; Köhn, 2018), I subsequently collected information from each published article on the authors, the main data sources, the sample's geographical coverage, the sample size and period, the industry focus, the underlying methodology (conceptual vs. empirical), the main analytical method, and the paper's main focus. The results are summarized in Table 3. The findings of the bibliographic analysis enhance the understanding of the structural status quo of the CVC literature, highlighting that the field of CVC is driven by two dominant logics. In particular, it was revealed that both literature streams fail to take their interrelationship into consideration. Accordingly, the following review aims to present and restructure the main findings of those two logics by transferring the articles' results into a holistic framework. To do so, the relevant focus of all 65 papers in the analysis, presented in Table 3, were used as a starting point to iteratively group the articles' main results. Building

on the work of Bruton, Ahlstrom, and Li (2010), this process resulted in the identification of five different research streams. The resulting framework, which is depicted in Table 2, provides a logical structure for the review's findings. To clearly distinguish between the level of analysis, that is, the corporate mother firm, the CVC unit, and the venture (the CVC triad), the framework also includes information on the research object (for a similar approach see Narayanan et al., 2009).

Table 2: Overview of the extracted research streams

Research stream	**Research object**	**Research focus**
Drivers of CVC adoption	Corporate mother	Firm level drivers Industry level drivers
CVC governance aspects	CVC unit	CVC staff and compensation Organizational structure
CVC investment procedure	CVC unit	Pre-investment phase Post-investment phase
Value-added contributions	Portfolio companies	Implication for a venture's innovation performance Implication for a venture's financial performance Various implications
Implications for corporate mothers	Corporate mother	Strategic Learning Financial effects CV mode interaction

Table 3: Examined articles on CVC

Study (Year)	Main CVC data source[5]	Geographical focus	Sample size	Sample period	Industry[6]	Methodology	Analytical method	Relevant focus
Alvarez-Garrido & Dushnitsky (2016)	Thomson One	USA	545 ventures thereof 34% with CVC-backing	1990–2003	Biotechnology	Quantitative	Probit regression, Negative binomial regression	Innovation performance of CVC-backed ventures
Anokhin, Örtqvist, Thorgren, & Wincent (2011)	Thomson One, Corporate Venturing Directory & Yearbook	n/a[7]	163 corporations with CVC investments	1998–2001	No restrictions	Quantitative	Negative binomial regression	Syndication network centrality
Bassen, Blasel, Faisst, & Hagenmuller (2006)	-/-	Germany	1 CVC unit	n/a[7]	Manufacturing	Qualitative	Case study	Performance measuring of CVCs
Basu & Wadhwa (2013)	Thomson One	USA	477 corporations	1990–2000	No restrictions	Quantitative	Negative binomial regression	Strategic renewal of corporations
Basu, Phelps, & Kotha (2011)	Thomson One	USA	477 corporations thereof 83 with CVC investments	1990–2000	No restrictions	Quantitative	Negative binomial regression	Driver of CVC investments
Bengtsson & Wang (2010)	TheFunded, Thomson One	USA	526 investors thereof 2.9% CVCs	2007–2009	No restrictions	Quantitative	ANOVA, Logit regression	Entrepreneurs' stated preferences on VC abilities
Benson & Ziedonis (2009)	Thomson One, VentureSource	USA	34 corporations with CVC investments	1987–2003	Information technology	Quantitative	OLS regression	Venture acquisition performance

[5] All data sources were standardized to the latest available denotation.
[6] Owing to considerable variations in the use of SIC codes the industry sectors used were not standardized.
[7] Not applicable due to missing specifications.

Table 3: Continued

Study (Year)	Main CVC data source	Geographical focus	Sample size	Sample period	Industry	Methodology	Analytical method	Relevant focus
Benson & Ziedonis (2010)	Thomson One, VentureSource	USA	61 corporations with CVC investments	1987–2003	Information technology	Quantitative	OLS regression	Venture acquisition performance
Bertoni, Colombo, & Croce (2010)	RITA 2004	Italy	379 ventures thereof 33 with CVC-backing	1994–2003	High-tech and service	Quantitative	GMM regression	Cash flow sensibility of VC-backed ventures
Bertoni, Colombo, & Grilli (2013)	RITA 2004, Thomson One, AIFI	Italy	531 ventures thereof 24 with CVC-backing	1994–2003	High-tech and service	Quantitative	GMM regression	Growth of VC-backed ventures
Bjørgum & Sørheim (2015)	Survey	Denmark, Finland, Norway, Sweden	6 ventures thereof 3 with CVC-backing	2012	Pre-commercial and marine energy	Qualitative	Case study	Value-added contributions of CVCs
Chemmanur, Loutskina, & Tian (2014)	Thomson One	USA	2129 ventures, thereof 462 with CVC-backing	1980–2004	All other than finance, insurance and real estate	Quantitative	OLS regression, Tobit regression, Probit regression	Innovation performance of CVC-backed ventures
Dimov & Gedajlovic (2010)	Thomson One	USA	3557 investors including 763 CVC units	1962–2004	No restrictions	Quantitative	OLS regression, Logit regression	Investment decisions among VC types
Dokko & Gaba (2012)	Thomson One, Corporate Venturing Directory & Yearbook	USA	70 CVC units	1992–2008	Information technology	Quantitative	GMM regression	Career experience of CVC managers
Dushnitsky & Lavie (2010)	Thomson One	USA	372 corporations 29 thereof with CVC investments	1990–1999	Software	Quantitative	Negative binomial regression	Interplay of CVC investments and alliance formation

Table 3: Continued

Study (Year)	Main CVC data source	Geographical focus	Sample size	Sample period	Industry	Methodology	Analytical method	Relevant focus
Dushnitsky & Lenox (2005a)	Thomson One	USA	2289 corporations 247 thereof with CVC investments	1969–1999	No restrictions	Quantitative	Negative binomial regression	Variation of corporate innovation rates through the use of CVC
Dushnitsky & Lenox (2005b)	Thomson One	USA	1171 corporations 115 thereof with CVC investments	1990–1999	No restrictions	Quantitative	OLS regression	CVC adaption drivers
Dushnitsky & Lenox (2006)	Thomson One	USA	1173 corporations 171 thereof with CVC investments	1990–1999	No restrictions	Quantitative	OLS regression	Creation of value through CVC investments
Dushnitsky & Shapira (2010)	Thomson One	USA	2830 investors including 300 CVC units	1990–1999	High technology	Quantitative	Negative binomial regression, OLS regression, Logit regression	Investment practices and performance of VC types
Dushnitsky & Shaver (2009)	Thomson One	USA	167 CVC investments by 87 CVC units	1990–1999	No restrictions	Quantitative	Logit regression	IPP regime and industry overlaps in the formation of CVC-venture relationships
Gaba & Bhattacharya (2012)	Thomson One, Corporate Venturing Directory & Yearbook	USA	71 CVC units	1992–2003	Information technology	Quantitative	OLS regression	Adoption and termination of CVC units based on innovation performance
Gaba & Dokko (2016)	Thomson One, Corporate Venturing Directory & Yearbook	USA	70 CVC units	1992–2008	Information technology	Quantitative	Probit regression	CVC implementation choices on CVC abandonment
Gaba & Meyer (2008)	Thomson One, Corporate Venturing Directory & Yearbook	USA[8]	264 corporations including 94 CVC adoptions	1992–2001	Information technology	Quantitative	Probit regression	CVC adaption drivers

[8] The authors limit their geographical scope to VCs headquartered in California, Massachusetts, and Texas.

Table 3: Continued

Study (Year)	Main CVC data source	Geographical focus	Sample size	Sample period	Industry	Methodology	Analytical method	Relevant focus
Guo, Lou, & Pérez-Castrillo (2015)	Thomson One	USA	437 CVC units	1980–2004	All other than finance	Quantitative	OLS regression, Probit regression, Logit regression	Investment, duration and exit strategies
Gupta & Sapienza (1992)	Pratt's Guide to Venture Capital Sources	USA[7]	169 VCs	1987	No restrictions	Quantitative	OLS regression	VCs investment preferences
Hill & Birkinshaw (2008)	Survey	8 countries from North America, Asia, and Europe[9]	95 external CVs	2001–2003	No restrictions[10]	Quantitative	ANOVA, OLS regression, Logistic regression	CV typology and the influence on performance and survive
Hill & Birkinshaw (2014)	Survey	8 countries from North America, Asia, and Europe[9]	95 external CVs	2001–2003	No restrictions[10]	Quantitative	ANOVA, Path analysis	Influence of ambidexterity on CV survival
Hill, Maula, Birkinshaw, & Murray (2009)	Survey	8 countries from North America, Asia, and Europe[9]	95 external CVs	2001–2003	No restrictions[10]	Quantitative	ANOVA, Seemingly unrelated regression	CVC implementation choices on performance
Ivanov & Xie (2010)	Thomson One	n/a[7]	1510 IPOs 219 thereof with CVC-backing	1981–2000	No restrictions	Quantitative	Probit regression, OLS regression, Three-factor model regression	CVC value-added contributions
Keil (2004)	Interviews	Europe	2 corporations with external CVs	1996–2000	Information and communication	Qualitative	Case study	Building new capabilities through CV

[9] The authors do not provide further information on the country level.
[10] The majority of the survey responses were observed in the following industries: high technology, oil and gas, automotive, manufacturing, consumer goods, transportation, and professional services.

Table 3: Continued

Study (Year)	Main CVC data source	Geographical focus	Sample size	Sample period	Industry	Methodology	Analytical method	Relevant focus
Keil, Autio, & George (2008)	Interviews	n/a[7]	5 corporations with CVC units	1998–2002	Information and communication	Qualitative	Case study	Relationship of learning and developing capabilities in the CVC context
Keil, Maula, & Wilson (2010)	Thomson One	USA	358 corporations with CVC investments	1996–2005	No restrictions	Quantitative	GMM regression, Tobit regression	CVC resources and syndication network positions
Keil, Maula, Schildt, & Zahra (2008)	Thomson One	USA	110 corporations	1993-2000	Information and communication	Quantitative	Negative binomial regression, Poisson regression	Innovation performance and the choice of external venturing modes
Kim, Kim, & Lee (2011)	Korean Financial Supervisory Service	South Korea	934 ventures 291 thereof with CVC-backing	1999–2001	No restrictions	Quantitative	OLS regression	CVC contribution effects
Lee, Kim, & Jang (2015)	Thomson One	USA	29 corporations with CVC investments	1995–2005	Information and communication	Quantitative	Negative binomial regression	Knowledge transfer through CVC investments
LiPuma (2006)	CorpTech	USA	1348 ventures 158 thereof with CVC-backing	2003	High technology	Quantitative	Logit regression	Influence of VC types on ventures' internationalization
Masulis & Nahata (2009)	Thomson One	USA	273 CVC units invested in 177 IPO ventures	1996–2001	No restrictions	Quantitative	OLS regression, Tobit regression	Financial contracting in CVC-backed IPOs
Masulis & Nahata (2011)	Thomson One	USA	245 ventures 60 thereof with CVC-backing	1991–2006	No restrictions	Quantitative	Probit regression, Logit regression, Logistic regression	Influence of VC backing on venture profitability

Table 3: Continued

Study (Year)	Main CVC data source	Geographical focus	Sample size	Sample period	Industry	Methodology	Analytical method	Relevant focus
Maula, Autio, & Murray (2003)	Survey	USA	91 ventures with CVC-backing	2000–2001	Biotechnology, Medical, Internet, Communication, Software, Hardware	Quantitative	Structural equation modelling	Creation of social capital through CVC
Maula, Autio, & Murray (2005)	Survey	USA	91 ventures with CVC-backing	2000-2001	Biotechnology, Medical, Internet, Communication, Software, Hardware	Quantitative	ANOVA, t-Test	Value-added contribution along IVCs and CVCs
Maula, Autio, Murray (2009)	Survey	USA	91 ventures with CVC-backing	2000–2001	Biotechnology, Medical, Internet, Communication, Software, Hardware	Quantitative	Structural equation modelling	Relationship-based risk and learning benefits
Maula, Keil, & Zahra (2013)	Thomson One, SDC Platinum, LexisNexis, Mergent	n/a[7]	139478 VC investments with 250462 alliance ties	1989–2000	Information and communication	Quantitative	Cox proportional hazards regression	CVC as an alert mechanism for technology changes
Noyes, Brush, Hatten, & Smith-Doerr (2014)	Thomson One	USA	150 corporations with CVC investments	1996–2003	No restrictions	Quantitative	OLS regression	Interlocking boards and CVC investments
Pahnke, Katila, & Eisenhardt (2015)	Thomson One, VentureSource	USA	198 ventures 36 percent thereof with CVC-backing	1986–2007	Medical device	Quantitative	GEE negative binomial difference-in-difference analysis	Institutional logics and venture innovation performance
Park & Steensma (2012)	Thomson One, LinkSV	USA	508 ventures 271 thereof CVC-backed	1990–2003	Wireless communications, computer hardware, semiconductors	Quantitative	Probit regression	Value-added contributions of CVCs on venture performance
Park & Steensma (2013)	Thomson One	USA	508 ventures 271 thereof CVC-backed	1990–2003	Wireless communications, computer hardware, semiconductors	Quantitative	Probit regression, Negative binomial regression	Selection and nurturing effects of corporate investors

Table 3: Continued

Study (Year)	Main CVC data source	Geographical focus	Sample size	Sample Period	Industry	Methodology	Analytical method	Relevant focus
Sahaym, Steensma, & Barden (2010)	Thomson One	USA	400 industries	1997–1999	Manufacturing	Quantitative	Tobit regression	Industry level effects on the use of CVC
Schildt, Maula, & Keil (2005)	Thomson One	USA	110 corporations	1989–2001	Information and communication	Quantitative	Logistic regression	Choice of external venturing modes
Smith & Shah (2013)	Thomson One	USA	128 CVC-venture dyads	1978–2007	Medical device	Quantitative	Negative binomial regression	User knowledge as antecedents of CVC investments
Souitaris & Zerbinati (2014)	Interviews	n/a[7,11]	13 CVC units	2002, 2011–12	12 industries	Qualitative	Case study	CVC investment practices
Souitaris, Zerbinati, & Liu (2012)	Interviews	USA and Europe	6 CVC units	2002	6 industries	Qualitative	Case study	Institutional isomorphism within CVCs
Teppo & Wüstenhagen (2009)	Interview	North America and Europe[12]	11 CVC units and 16 VCs	2003–2005	Energy	Qualitative	Case study	Determinants of fund survival
Tong & Li (2011)	SDC Platinum	USA	546 investments by 99 CVCs	2003–2005	All other than finance	Quantitative	Probit regression	Choices between CVC and acquisitions
Van de Vrande & Vanhaverbeke (2013)	Thomson One	USA	78 corporations with CVC investments	1990–2000	Pharmaceutical	Quantitative	Log–log regression	Alliance formation through prior CVC investments

[11] Souitaris and Zerbinati (2014) only report the geographical investment preferences of the observed CVC units.
[12] In detail: Denmark, Finland, France, Germany, Norway, Sweden, and Switzerland.

Table 3: Continued

Study (Year)	Main CVC data source	Geographical focus	Sample size	Sample Period	Industry	Methodology	Analytical method	Relevant focus
Van de Vrande, Vanhaverbeke, & Duysters (2011)	Thomson One	USA	153 corporations	1990–2000	Pharmaceutical	Quantitative	Negative binomial regression	Creation of innovation through external venture modes
Wadhwa & Basu (2013)	Thomson One	USA	248 investments by 43 CVC units	1996–2000	Telecommunication, Semiconductor, and Computer	Quantitative	Tobit regression	Resource commitment and exploration in CVC investments
Wadhwa & Kotha (2006)	Thomson One	USA	36 corporations with CVC investments	1989–1999	Telecommunication	Quantitative	Negative binomial regression	Knowledge creation through external venturing
Wang & Wan (2013)	SDC Platinum, Thomson One	USA	200 ventures with VC backing	2000–2007	No restrictions	Quantitative	OLS regression	IPO underpricing of VC-backed ventures
Weber & Weber (2010)	Interviews	Germany	7 CVC-venture dyads	n/a[7]	n/a[7]	Quantitative	Regression analysis[13]	Social capital and knowledge relatedness in CVC dyads
Weber & Weber (2011)	Interview	Germany	6 CVC triads	2002	Media and high technology	Qualitative	Case study	Antecedents of social liabilities in CVC triads
Yang (2012)	Survey, Thomson One, Corporate Venturing Directory & Yearbook	USA	232 CVC unit investments	1996–2000	No restrictions	Quantitative	OLS regression	Organizational learning based on governance characteristics

[13] Weber and Weber (2010) provide no further information regarding the regression-based analysis used.

Table 3: Continued

Study (Year)	Main CVC data source	Geographical focus	Sample size	Sample Period	Industry	Methodology	Analytical method	Relevant focus
Yang, Narayanan, & De Carolis (2014)	Thomson One	USA	189 corporations with CVC investments	1990–2004	All other than finance	Quantitative	OLS regression	Portfolio diversification on firm value
Yang, Narayanan, & Zahra (2009)	Thomson One	USA	166 corporations with 2110 CVC investments	1990–2001	No restrictions	Quantitative	Logit regression, Negative binomial regression	Performance and valuation identification ability
Zahra & Hayton (2008)	Survey, Lexis Nexis	Worldwide	217 corporations	2000–2003	Manufacturing	Quantitative	OLS regression	Use of international CVC investments on a corporate's performance
Zu Knyphausen-Aufsess (2005)	Interviews	USA and Germany	8 CVC units	1998–2002	Consulting, Manufacturing, Financial, Publishing, High technology	Qualitative	Case study	Value-added contributions of CVC investors

2.6 Drivers of CVC adoption

When implementing CVC practices, established corporations tend to struggle with internal resistance such as the excessive diversion of management time and the general corporate mindset (Bannock Consulting, 2001). To overcome these obstacles, an emerging research stream introduced several drivers on both the firm and industry levels that influence the adoption and intensity of corporate investment activities.

2.6.1 Firm level drivers

Astonishingly, a relatively small number of articles uses historical accounting data or other firm-specific measurements to examine the conditions under which established corporations are most likely to support ventures through CVC investments. Among those, Basu, Phelps, and Kotha (2011) noted that a high level of marketing expenditure and a corporation's technological resources could stimulate the use of CVC. In addition, Dushnitsky and Lenox (2005b) highlighted the role of a corporation's cash flow and innovation stock as antecedents of CVC investments.

2.6.2 Industry level drivers

Some articles direct attention to mimetic behavior within a corporation's peer group. Noyes et al. (2014) presented a network derived from interlocking boards as a possible antecedent of a firm's commitment to CVC investments. Within those networks, two corporate mothers are considered to be related when they share at least one board member. The authors argue that interlocking boards play a vital role in the diffusion and adoption of management practices. Therefore, if a corporation has direct ties to a firm that is already engaged in CVC activities, it can optimize the information inflow and hence increase the engagement in CVC investments.

Moreover, Gaba and Bhattacharya (2012) rely on an organizational decision making perspective to answer the question of under which conditions firms are willing to accept the organizational risks associated with the use of CVC investments. When evaluating their performance, organizations use a predefined aspiration level as a reference point to compare their outcomes either with their past performance or that of their peers. In fact, differences between aspirations and the actual observed performance outcomes can motivate

organizations to review their risk-taking behavior and subsequently adopt CVC practices. A major finding of this study is that corporations tend to establish a CVC unit when their innovation performance is close to their social aspirations.

Gaba and Meyer (2008) focused on management innovations (i.e., the adoption of CVC practices) that can spread through social networks and thus cross organizational boundaries within a corporation's peer group. The authors argue that the general popularity of CVC within a corporation's peer group, the status of early CVC adaptors, the geographical proximity of corporations to existing CVC units, and the outcome experience of those prior adopters can be interpreted as a contagious impulse that influences the likelihood of establishing a CVC program. The same also holds for impulses originating from the IVC industry. For instance, by taking the weighted average of the geographical distance of the three predominant VC clusters (Silicon Valley, New York, and Route 128) the probability of a CVC adoption increases, if the firms' headquarters are located close to one of the IVC clusters.

Moreover, several other drivers on the industry level such as, the competitiveness of an industry (Basu et al., 2011), the intellectual property regime (Dushnitsky & Lenox, 2005b; Basu et al., 2011), the technology-related circumstances (Dushnitsky & Lenox, 2005b; Sahaym, Steensma, & Barden, 2010; Basu et al., 2011), the total factor productivity, the environmental munificence, and the R&D intensity within a firm's industry (Sahaym et al., 2010) could also influence the attractiveness of CVC.

2.6.3 CVC governance aspects

Dushnitsky (2006) notes that the governance of CVC activities is a multifaceted topic. Owing to limited data availability, only a few articles address governance-related topics, including the work of Hill, Maula, Birkinshaw, & Murray (2009), Teppo and Wüstenhagen (2009), Dushnitsky and Shapira (2010), Souitaris et al. (2012), Hill and Birkinshaw (2014), and Gaba and Dokko (2016).

2.6.3.1 CVC staff and compensation

Among the published articles, only a small number discuss the importance of personnel-related aspects (e.g., staffing of the CVC unit and the compensation of investment managers) in the CVC setup. For instance, staffing decisions in general and a CVC managers' career experiences in particular are important aspects of the longevity and efficiency of such CVC initiatives. Gaba and Dokko (2016) found that putting a staff manager with considerable firm-specific experience with the corporate mother in charge can be detrimental to a CVC unit because internal hires struggle to acquire the depth of knowledge necessary to understand the value of CVC practices for the firm. Furthermore, internal hires tend to view CVC investments as a primary tool to deliver strategic benefits for the corporate mother, and therefore might neglect financial objectives. On the other hand, staffing a CVC unit with managers with an IVC background could increase the CVC vehicle's longevity.

Furthermore, Dokko and Gaba (2012) investigated the effect of individuals' career experiences on the extent of variation in practice. The research was spurred by the recognition that individuals who implement and manage adopted practices from the IVC industry also play a vital role in the interpretation and translation of those practices in the corporate context. The results indicated that CVC units staffed by managers with IVC experience tended to adopt the prevailing practices from that particular environment to leverage financially-oriented goals through investments in early-stage ventures. In addition, CVC units staffed with managers with prior firm-specific and engineering experience tend to prioritize strategic benefits over financial ones and tend to invest in later-stage ventures.

Beyond the staffing aspects, the compensation of CVC managers is an emerging topic within the governance-related research stream. While Dushnitsky and Shapira (2010) found evidence that the compensation schemes used by CVC vehicles could influence the overall performance of a CVC unit, some authors showed that the use of an IVC incentive scheme could also have negative consequences: For instance, Hill et al. (2009) highlight that the use of high-powered equity-based compensation to reward and incentivize managers has a positive effect on the financial performance of the CV unit, but astonishingly does not stimulate strategic performance. In addition, Yang (2012) observed in a survey based on 18 participants (generally CVC managers or executives responsible for new business development) that an IVC-like incentive scheme could reduce the strategic innovativeness of the corporate investor.

2.6.3.2 Organizational structure

Besides staffing and compensation related governance topics, some articles discuss the organizational structure of CVC programs. While some authors highlight the autonomy (Hill et al., 2009; Teppo & Wüstenhagen, 2009) and cultural aspects (Teppo & Wüstenhagen, 2009), a widely neglected topic investigates the fundamental view on CVC within existing organizational boundaries.

Among those, Hill and Birkinshaw (2008) initially analyzed different organizational configurations of CVC units. Beyond that, Hill and Birkinshaw (2014) drew on the well-established interplay of exploration (building new capabilities) and exploitation (using existing capabilities) to link the general orientation of CV units to their survival rates. The results indicate that CV units relying on an ambidextrous approach in the form of the simultaneous use of CV as an instrument to explore and exploit capabilities, have a higher survival rate than those with a clear focus. Those units are typically characterized by a high level of interaction with all parties involved, such as senior executives, business units, and members of the VC community.

In addition, Souitaris et al. (2012) observe how new organizational units, such as CVCs, reconcile the competing forces from two different institutional environments. CVC units might focus their organizational structures on either their corporate parents (endoisomorphism) or on the IVC industry (exoisomorphism). The direction the unit favors is influenced by staffing decisions and the legitimacy the CVC units seek. CVC units aligning with their parent's norms (endoisomorphism) are more likely to develop mechanistic structures with command-like communication, concentrated decision making, fixed and written procedures, and a clear division of labor into specific tasks. In contrast, CVC units aligning with the norms of the IVC industry (exoisomorphism) are usually characterized by a consultative style of communication, flexible and unwritten procedures, evenly distributed decision making, and overlapping responsibilities. Owing to the relatively small sample of six cases, Souitaris et al. (2012) could not relate the concept of isomorphism to performance.

Finally, the organizational structure also defines the way in which CVC performance is measured. This issue raised by Teppo and Wüstenhagen (2009) includes how corporations measure CVC success and deal with failures. This article is one of those addressing the fact that CVC units need to act accept risk and be innovative in an environment characterized by

error avoidance. Thus, the work of Bassen et al. (2006) suggested a solution might be to adopt a "Balanced Scorecard" approach to connect both worlds.

2.6.4 CVC investment procedure

The following section discusses the issue of how CVC investors structure and monitor their investments. The prevailing literature outlines a well-documented investment process (Tyebjee & Bruno, 1984; Wright & Robbie, 1998) that is essentially oriented toward IVCs, and therefore does not entirely suit the managerial investment practices of CVC units. Souitaris and Zerbinati (2014) drew on their previously formulated concept of isomorphic tendencies to develop a conceptual model of corporate investment practices. The authors describe the CVC deal-making process through outlining eight subsequent stages which can be summarized as relating to either the pre-investment or post-investment stage.

2.6.4.1 Pre-investment phase

As a first step, CVC units can source potential deals internally or rely on contacts within the VC industry. By communicating regularly with their VC peers, CVC investors spot new investment opportunities and acquire insights into the required capabilities of established IVCs (Hill et al., 2009). Accordingly, attention should be paid to several search patterns CVCs tend to use. For instance, the industrial overlap and the IP regime of a potential portfolio company play a crucial role in the investment decision process of CVCs. This topic was raised in several articles such as those by Dushnitsky and Lenox (2005b) and Dushnitsky and Shaver (2009). Above, Wadhwa and Basu (2013) showed that the technological and market-related overlap of investor and investee is also a good predictor of the financial commitment of a CVC unit.

Driven by the power of available databases a wide range of articles observe the decision to syndicate investments with IVCs and other complementary funds such as CVCs or governmental VCs. By syndicating these investments (Jääskeläinen, 2012), a CVC can reduce its risk exposure, gain a central position within the VC network, and simultaneously improve its ability to identify ventures with a strong strategic fit (Yang, Narayanan, & Zahra, 2009). Some articles indicate that the participation of a CVC vehicle increases the total number of co-investors (Dushnitsky & Shapira, 2010), which can influence the overall financial

performance positively (Hill et al., 2009). For instance, Keil, Maula, and Wilson (2010) investigated 358 corporate investment vehicles and observed how CVC units rapidly attained central positions within a syndication network. Owing to the fact that IVCs in particular tend to seek prestigious co-investors with the same central network position, new entrants face considerable barriers to entry into the VC market. By providing a fundamentally different resource base to IVCs, new corporate entrants can bridge peripheral network positions by syndicating their investments with IVCs despite being newcomers. Illustrating another point of view, Anokhin, Örtqvist, and Thorgren (2011) noted that, in addition to a central network position, the investment strategy pursued is a key factor for CVC units in highly concentrated industries. The authors argue that CVC units limit their potential benefits by placing themselves in the middle of the syndication network while supporting as many ventures as possible. In contrast, the most appropriate strategy for CVC investors in these industries is to keep away from the center of the syndication network by investing in portfolio companies without the participation of well-positioned co-investors. The so-called maximizing isolationist strategy is the exact opposite of the second-best investment strategy, which combines reduced investment activity with a central position in the syndicate network (minimizing centralist).

2.6.4.2 Post-investment phase

Nevertheless, once an investment is made, investors can employ various instruments to influence the behavior of their portfolio companies and to overcome agency problems. First, CVC vehicles can organize their investment in such a way that financing is only released when predefined milestones are met (known as investment staging). Second, lead investors usually receive a seat on the board to be able to monitor the management's behavior. Besides Gompers and Lerner (2000), Yang (2012) argued that representation on a venture's board of directors is a crucial instrument in exercising control rights and at the same time helps to stimulate knowledge outflow through the absorption of information in terms of industry trends and technological insights. Surprisingly, the study of Yang (2012) could not find a significant link between board representation and knowledge outflow. However, CVC units with a complementary relationship to their supported ventures are granted more representation on boards than their counterparts whose parents are potential competitors of their portfolio companies. In addition, if CVCs are lead investors they receive significantly lower board seats than lead IVCs (Masulis & Nahatan, 2009). Ivanov and Xie (2010) argue

that strategically oriented CVCs tend to have a higher level of board representatives than their financially oriented counterparts. However, the topic of social interaction between investor and investee is discussed in several articles (e.g., Maula, Autio, & Murray, 2003; Maula, Autio, & Murray, 2009; Weber & Weber, 2010; Weber & Weber, 2011).

2.6.5 Value-added contributions

As already mentioned, the behavior of ventures backed by VCs is strongly influenced by the institutional logic their investors rely on. Their different resource bases and complementary assets mean that CVC units can make various value-added contributions to their portfolio companies. The value-added activities flowing from CVC investors are well documented and have been analyzed in a wide range of studies that also take account of the value adding potential of different types of CVC investors (Zu Knyphausen-Aufsess, 2005) and other investment vehicles such as business angels and IVCs (Bjørgum & Sørheim, 2015).

2.6.5.1 Implication for a venture's innovation performance

Recent CVC literature focuses far more on the interaction between a VC funding event and a venture's patenting activity than was the case previously. In general, the support of a VC investor can stimulate innovation output through diminishing financial constraints. Consequently, the availability of further financial resources increases the R&D investments of these ventures and helps them to outperform their counterparts lacking VC backing (Bertoni, Colombo, & Croce, 2010). Comparing ventures based in the US, the work of both Park and Steensma (2013) and Alvarez-Garrido and Dushnitsky (2016) demonstrates that the innovation output of these ventures is sensitive to the relevant investor type. In both studies, the innovation output of CVC-backed ventures outperformed that of their IVC-backed counterparts, whether measured through patents granted or patent applications. Chemmanur et al. (2014) also used the patent outcome measure in their research and found support for the innovation performance implications. In contrast to these findings, Pahnke et al. (2015) argue that this potential benefit could be narrowed through the corporate logic on which the CVC units rely. In this case, the participation of CVC investors within a funding round has no effect on the level of technological or commercial innovation.

2.6.5.2 Implication for a venture's financial performance

In addition to the literature adopting a purely patent-driven view, a small research branch also takes alternative measures into account when evaluating the value-added contributions of CVC investors. While Kim et al. (2011) observed no difference between the investment of dependent and independent VCs, and the performance of ventures (i.e., sales, employees, R&D intensity, and return on equity (ROE), Park and Steensma (2012) demonstrated there were conditions under which ventures with CVC funding could outperform IVC-backed ones. By evaluating the IPO and failure rates of ventures, the study shows that new ventures, particularly those seeking specialized complementary assets or those operating in uncertain environments, profit from the participation of a CVC unit in terms of higher IPO fractions and lower failure rates.

Furthermore, Ivanov and Xie (2010) found that CVC vehicles add value to entrepreneurial companies only if those ventures have a strategic fit to the corporate mother. In this case, strategic CVC-backed ventures had a higher IPO valuation than their purely IVC-financed peers. However, if the ventures are strongly associated with the strategy of the corporate mother, CVC-backed targets also attract higher takeover premiums in the case of an acquisition. Furthermore, the study of Wang and Wan (2013), which is based on signaling theory, demonstrates that the investment of a CVC unit can be interpreted as a positive signal for the quality of a venture, in the sense that CVC-backing helps to attract a sufficient number of subscriptions without diminishing the offer price. Hence, a high level of involvement of the CVC unit can reduce the risk of an IPO being underpriced. Additionally, Masulis and Nahata (2011) show that CVC-backing leads to higher announcement returns compared with ventures backed by IVCs.

Alongside exit events, Bertoni, Colombo, and Grilli (2013) examined the employment and sales growth of 531 Italian ventures and concluded that CVC-associated investments have positive effects on their portfolio companies. Based on the same data set, Bertoni et al. (2010) observed investment behavior after a successful VC finance round. The authors argue that the financing event can be interpreted as a removal of financial constraints and thus one that positively influences the investment rate of ventures. This effect holds for both IVC and CVC-backed ventures. From a long-term perspective, the equity origin affects the sensitivity levels of investments. While IVCs reduce investment-cash flow sensitivity through the

constant withdrawal of a venture's financial constraints, CVC investors fail to do so in the long term.

2.6.5.3 Various implications

Maula et al. (2005) compared the value-added activities of IVCs and CVC vehicles using data from ventures that received funding from both investor types. In both cases, ventures could benefit substantially from their investors. The study highlights that CVC units outperformed their independent counterparts by helping their portfolio companies to attract new foreign customers and acquire valuable information on new technologies. On the other hand, IVCs offered more assistance in recruiting key employees and in the process of restructuring the organization. The results regarding the internationalization behavior of CVC-backed ventures emphasize that corporations can support their portfolio companies by bridging the so-called liability of alienness through their own track records. Regarding the internationalization of CVC-backed ventures, LiPuma (2006) found contradictory results. Based on a sample of 1348 ventures the author could not find a positive relationship between CVC funding and the internationalization intensity of ventures.

From a founder's perspective, Bengtsson and Wang (2010) investigated how entrepreneurs evaluated the cooperation with their investors. By obtaining data from a unique online community named *TheFunded*, where entrepreneurs anonymously rate and share their experience within the VC industry after a funding event, the authors showed that entrepreneurs prefer funding from IVCs. The entrepreneurs surveyed evaluated the track record, the operating competence, and the pre-investment communication (pitching efficiency) of CVC units at a significantly lower level than they did the same aspects of IVCs. Furthermore, CVC vehicles received fewer positive comments and more negative comments than IVCs.

2.6.6 Implications for corporate mothers

The literature highlights several ways in which established corporations benefit from external venture activities. Besides the creation of firm value and learning aspects, some authors take the benefits from the interaction of CVC and other external CV modes such as acquisitions or alliances into account.

2.6.6.1 Strategic learning

Several articles focus on the concept of learning (e.g., Keil, 2004; Keil, Autio, & George, 2008) through CVC. For instance, Keil (2004) introduced a model showing that established corporations can initiate learning processes to establish CV capability. Hence, learning processes can be stimulated in two ways. Referring to Levitt and March (1988), the author argued that one part of this learning process takes place within the CVC triad in the form of learning-by-doing. Moreover, corporations are able to learn from their industry peers by filling vacant positions with experienced managers. Several authors point to the innovation output of a corporation as a potential outcome of learning processes. Dushnitsky and Lenox (2005a) found evidence that CVC investments could increase a firm's innovation rate, especially when the IP protection in the target industry was weak; whereas Wadhwa and Kotha (2006) found that the relationship was only valid for corporate investors with a high level of involvement with their portfolio firms; otherwise, a higher number of CVC investments was associated with a decreasing innovation rate. In addition, two articles are discussing the relationship between the use of CVC and knowledge-related outcomes such as patents. While Schildt et al. (2005) found a positive linear relationship, Lee, Kim, & Jang (2015) showed that beyond a certain point the engagement in CVC can also diminish patent-driven activities.

Adopting a different point of view, Smith and Shah (2013), built a theoretical framework to explain how user knowledge could provide corporations with more useful and innovative insights than other sources of information. Subsequently, the relevant hypotheses were tested using CVC transactions within the medical device industry. It is apparent that the level of knowledge acquisition can vary and that established corporations can benefit most by accessing knowledge from innovative users.

However, Basu and Wadhwa (2013) revealed a potential drawback of the above notion when investigating the ways in which the use of external venturing mechanisms could influence the strategic renewal tendencies of corporations. Relying on longitudinal data, the authors argued that CVC investments are mainly used to enable growth opportunities in existing and new businesses, but that such investments did not result in a withdrawal from a corporation's core business. This negative relationship between strategic renewal and the use

of CVC is heightened for corporations operating in highly dynamic environments and with strong internal capabilities.

2.6.6.2 Financial effects

Some articles study the relationship between the use of CVC and corporations' financial performance. By using Tobin's Q as an indicator of a firm's growth opportunities, strategic investors can benefit from the use of CVC (Dushnitsky & Lenox, 2006). In another study, Zahra and Hayton (2008) investigated the relationship between a firm's external venturing activities and its financial outcomes. Using primary and secondary data, the authors found evidence that investments made through CVC funds are positively associated with a corporation's ROE and revenue growth. The finding underscores the absorptive capacity of an investor. In other words, the ability to exploit external information positively moderates the relationship between the use of CVC and financial performance. From a financial point of view, the short-term inefficiencies and costs of CVC initiatives can be compensated for, if corporations understand the use of CVC as a long-term instrument.

2.6.6.3 CV mode interaction

While most authors test their hypothesis in a comparative setting (e.g., Schildt et al., 2005, Keil et al., 2008; Tong & Li, 2011; Van de Vrande et al., 2011), only few authors (e.g., Benson & Ziedonis, 2009, 2010; Dushnitsky & Lavie, 2010; Masulis & Nahata, 2011; Van de Vrande & Vanhaverbeke, 2013) consider the subsequent use of two external CV modes. While finance-related publications (such as Benson & Ziedonis, 2009, 2010) focus on the interplay of CVC and acquisitions, some articles provide information about the interaction between CVC and the formation of subsequent alliances.

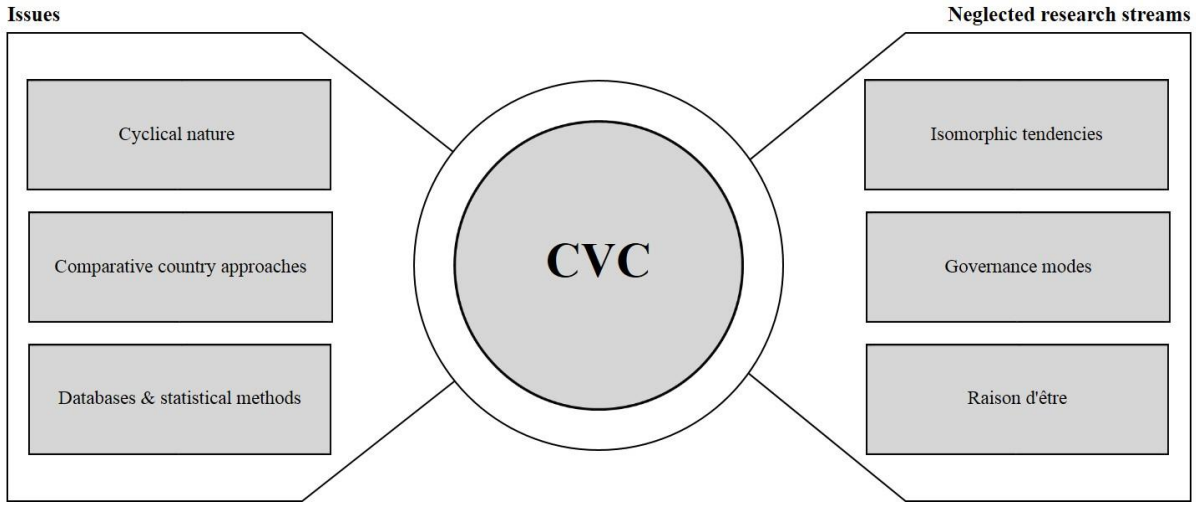
In terms of acquisitions, Benson and Ziedonis (2010) underline possible drawbacks involved in acquiring a venture which already received funding from a mother firm's own CVC unit. The study argues that the acquisition of such entrepreneurial ventures can undermine the value of shareholders for the acquirer. A possible explanation for acquisition premiums could be the emotional attachment of corporate managers. Particularly managers with a strong technical background tend to become attached to a portfolio company's projects and ideas and can be prone to overvalue a venture.

Analyzing 372 software firms in the 1990s, Dushnitsky and Lavie (2010) revealed an inverted U-shaped association between the use of CVC investments and alliance formation. Both external venturing modes are typically managed separately. For the first time, Dushnitsky and Lavie (2010) demonstrated that both modes cannot be considered independently. As a result, the number of CVC investments first increases and then decreases with the total number of alliances formed. Extending these findings, Van de Vrande and Vanhaverbeke (2013) investigated how prior CVC investments shape the odds of establishing a strategic alliance between the supported ventures and the corporate mother. The authors' complementary log–log model included potential antecedents such as market uncertainty and technological proximity. The commitment of CVC in a prior financing round increased the probability of establishing a follow-on strategic alliance with the venture. This relationship was positively influenced by the technological proximity of both parties involved. The findings indicate that established companies are more likely to form an alliance with their portfolio company if there is a considerable overlap of technological competencies.

2.7 Discussion

In recent decades (see Figure 2), the academic discussion stressed the importance of CVC within the VC ecosystem. Accordingly, this paper contributes to this debate by structuring and analyzing 65 empirical articles from both a bibliographical and a content-driven point of view. In addition, the analyzed articles reveal several issues and neglected research streams that merit future research (Figure 6).

Figure 6: Issues and neglected research streams extracted from the underlying sample



Cyclical nature. As Gompers and Lerner (2000) report, the use of CVC investments is strongly associated with the general state of economic development. Early research offers insights suggesting that early adopters of CV activities struggle to deal with insufficient commitment (Siegel, Siegel, & MacMillan, 1988), the absence of a well-defined mission (Rind, 1981), and an inadequate compensation scheme based on the corporate mothers' guidelines (Block & Ornati, 1987; Sykes, 1990). Taking these considerations into account, there is a danger that firms tend to abandon their CVC activities at too early at a stage and fail to evaluate their future prospects correctly, especially in the face of upcoming external shocks (Zu Knyphausen-Aufsess, 2005). However, recent literature has increasingly turned to examining the antecedents of CVC unit withdrawal (e.g., Hill & Birkinshaw, 2008; Gaba & Bhattacharya, 2012; Gaba & Dokko, 2016). Only 11 of the 65 articles reviewed consider this fact when assessing the study's observation period. Therefore, future scholars should carefully review and argue why a specific time period is chosen.

Comparative country approaches. Similarly to other research streams (i.e., Bruton et al., 2010), 76.9% (n=50) of the articles in the sample focus their empirical analysis on single countries. Only seven articles (e.g., Hill & Birkinshaw, 2008; Zahra & Hayton, 2008; Teppo & Wüstenhagen, 2009) are based on data from at least two different geographical areas. Within the sample, the majority of articles (n=45; 70%) draw exclusively on data from the well-developed US-CVC market. Because cross-border CVC investments are viewed as important within the academic and practical discourse, and corporations from Europe and Asia are discovering the use of CVC to reinvigorate their innovation portfolio, single country studies are not well-suited to contribute to the understanding of how several aspects of the CVC phenomenon can be influenced by endogenous factors like cultural or institutional settings. Therefore, to broaden our understanding of the worldwide CVC market, future studies should not neglect cross–cultural aspects. It would be interesting to study the investment behavior of CVC units in light of the geographical distance from potential target ventures by building on the approach of Gaba and Meyer (2008).

Databases and statistical methods. Owing to the constantly increasing data coverage and quality of widely used databases such as *ThomsonOne* (formerly known as *VentureXpert* or *Venture Economics*) and *VentureSource* (formerly known as *VentureOne*), only eight studies in the sample based their multivariate analysis on primary data. The work of Hill and Birkinshaw (2008, 2014) and Hill et al. (2009) and the publications of Maula et al. (2003,

2005, 2009) are based on the same data, thereby reducing the number of conducted surveys. Accordingly, future studies could benefit from using primary data to examine new research questions; although it must be acknowledged that the CVC unit population has proved reluctant to contribute to prior surveys (e.g., Maula et al., 2003; Hill & Birkinshaw, 2008). Nevertheless, studies relying on secondary data have shown that the use of emerging databases can result in unique research questions that can foster CVC research. For instance, as mentioned above, Bengtsson and Wang (2010) accessed *TheFunded* to tap into entrepreneurs' experiences of the VC industry. Databases such as *Mattermark*, *Tracxn*, *Owler*, *PrivCo*, *Crunchbase*, or *Bison* might also assist future research projects to fully grasp the CVC phenomenon. Not surprisingly, the sample is dominated by regression-based analysis. With the exception of the work of Hill and Birkinshaw (2014), and Maula et al. (2003, 2005, 2009), all quantitative articles were based on regression analysis. Accordingly, the use of OLS regressions (n=19), negative binomial regressions (n=14), and probit regressions (n=10) are the most common statistical methods for testing hypotheses in the CVC setting.[14] Owing to the fact that the CVC literature is strongly influenced by management-related journals (see Figure 4), further research could introduce emergent and management-related statistical methods into the field of CVC. In this vein, a survey conducted by Kuckertz and Prochotta (2018) identified several upcoming or neglected research methods such as multilevel modeling, data mining or qualitative comparative analysis (QCA) that could shed light on hitherto underrepresented CVC aspects. Owing to the fact that the CVC triad is notably hierarchical in nature, some authors address the issue through the use of hierarchical linear models (e.g., Röhm et al., 2018). Additionally, some authors use the combination of QCA and well-established methods such as OLS to emphasize how qualitative and quantitative methods could complement each other and therefore contribute to a multifaceted view on specific topics (e.g., Skaaning, 2007).

Isomorphic tendencies. Alongside examining the cyclical nature of CVC investments, the isomorphic tendencies of a CVC unit provide an interesting starting point for further research. Primarily, Souitaris et al. (2012) observed how CVC units structure their organization within different institutional environments. The authors argue that based on prevailing norms, CVC units seek legitimacy either with their corporate parent (endoisomorphism) or with the IVC industry (exoisomorphism). Accordingly, CVC units

[14] Please note, counts are not mutually exclusive due to the fact that articles could apply several statistical methods simultaneously.

usually not only operate within two different environments but also in different cultural regions. For instance, in addition to their US headquarters, Qualcomm Ventures operates offices in several geographical regions including Europe, India, Israel, China, and Korea. Therefore, future research could examine how those different cultural settings influence the process of isomorphism as such, and also address the question of whether varying tendencies can coexist simultaneously within a CVC unit. In addition, the isomorphic processes of CVC units could also restrict the selection of a syndication partner in a funding round. However, their relatively small sample meant Souitaris et al. (2012) could not relate the concept of isomorphism to performance. Therefore, future research could link the organizational structures of CVC vehicles to performance metrics such as the survival of a unit or to exit rates.

Governance modes. To the best of the author's knowledge there is almost no evidence regarding the interplay of the CVC governance modes and performance. As Dushnitsky (2006) already mentioned, the adoption of investment practices from IVCs can be organized in three ways. Besides self-managed and wholly-owned subsidiaries, some corporations tend to operate as an LP in pooled or dedicated funds, typically managed by IVCs. Those different organizational settings (i.e., the level of autonomy or the compensation of managers) could strengthen or weaken the potential benefits associated with the support of portfolio companies. Other scholars might address the question of which governmental mode is most suitable for corporations facing different circumstances.

Raison d'être. Another major academic and practical issue arises from the cyclicality of CVC activities. If a corporation is already committed to CVC, further performance measurements and tools will be necessary to support managers trying to convey the value of a CVC unit, especially if the unit fails to deliver the anticipated financial gains. This question raised by Teppo and Wüstenhagen (2009) involves the way corporations develop suitable performance metrics to measure the benefits associated with CVC. With the exception of the work of Bassen et al. (2006), research examining this issue is nonexistent, although such new measurements could stimulate research by drawing a clearer picture of the successful contributions of CVC.

2.8 Limitations

As with any research, the current study does have some technical limitations. While *VOSviewer* is particularly well-suited for visualizing larger networks (Van Eck & Waltman, 2014) and its set of unique and valuable techniques is undoubtedly useful compared to other science mapping software tools (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2011), the interdisciplinary approach of this literature review and the resulting sample of 65 articles might have influenced the results provided by *VOSviewer*. First, owing to the underlying sample, journals with a relatively small number of CVC-related articles tend to be isolated (e.g., the *International Journal of Technology Management*) or be assigned to an inappropriate cluster; however, this is an issue affecting only one paper in the current analysis. The journal *Administrative Science Quarterly* is grouped with the finance-oriented literature but mainly addresses management-related topics. This is confirmed by only the article of Pahnke et al. (2015) being published in this journal. Second, this issue is strengthened by the fact that the prevailing literature is highly heterogeneous in terms of the articles' dates of publication (ranging from 1992 to 2016) and the use of full counting, where each bibliographic coupling link has the same weight (for a similar approach see, Van Raan, 2015). Consequently, to paint a holistic picture of the CVC literature, predefined *VOSViewer* thresholds regarding the total number of documents constituting a source and the number of bibliographic coupling links were set to the appropriate minimum levels.

It should be mentioned that there is an ongoing discourse questioning the importance of received citations as a proxy for academic quality, creativity, and impact (Wang, 2014). Based on the "Matthew effect" a vast number of articles aim to investigate the antecedents of received citations in the academic landscape. For instance, there is evidence that research from prestigious universities (Crane, 1965; Medoff, 2006), papers published in highly-ranked journals (Judge, Cable, Colbert, & Rynes, 2007; Lariviere & Gingras, 2010), awards earned (Azoulay, Stuart, & Wang, 2013), and a well-development network (Gonzalez-Brambila, Veloso, & Krackhardt, 2013; Li, Liao, & Yen, 2013) can positively affect the citations of a paper, resulting in a cumulative advantage. However, Lariviere and Gingras (2010) argue that the intrinsic value of an article is only a weak signal of quality and particularly journals with a high impact factor could add a significant quality surplus that results in a greater probability of citation. Hence, it could be possible that the citation-based analysis such as is applied in this article (see Figure 4 and 5) could be skewed to favor highly-ranked journals and well-

established members of the academic community. In this vein, it could be argued, that articles with a long reference list influence the presented results. It therefore seems obvious that articles submitted to higher-ranked journals (A+ and A) tend to have extended reference lists, since the theoretical grounding is more rigorous. That demand for rigor means papers in A+ or A journals average 90.47 citations (SD=36.207), while articles published in B journals or lower draw on an average of 78.37 sources (SD=33.022). However, a *t-test* showed that this difference is statistically not significant.

To expand the findings of the literature review, subsequent studies might reduce the selection criteria applied here or adopt cut-off criteria based on impact factor, such as the *Thomson Reuters* Journal Citation Reports (JCR) or the SCImago Journal Rank (SJR) provided by *Scopus* to ensure quality (Bouncken, Gast, Kraus, & Bogers, 2015).

2.9 Conclusion

To conclude, this review explored the prevailing literature within the CVC research stream from both a bibliographical and a content-driven perspective. The article uses a network analysis approach to emphasize the current structure within the CVC field by introducing bibliographic methods into this particular research area. Consequently, the bibliographic network analysis revealed that the extant work is mainly driven by two dominant logics, management and finance. Both streams try to capture particular facets of the CVC phenomenon from different perspectives. More precisely, because both logics tend to separate themselves from each other, this article thoroughly examined emerging research trends and issues from a sample of 65 articles. The review consequently outlines several paths for further work and research gaps that might stimulate the academic discussion in the CVC context.

3 A World of Difference? The Impact of Corporate Venture Capitalists' Investment Motivation on Startup Valuation[15]

Abstract

CVC investors are regularly painted with the same brush, a fact underscored by the often observed belief in the extant literature that CVCs form a homogeneous group. In contrast to this simplifying perspective, this paper categorizes CVCs into subgroups by examining their levels of strategic and financial investment motivation using CATA and cluster analysis. To validate the resulting clusters, this paper studies the impact of CVC type on startup valuation from an intra-group perspective by applying HLM, thus illustrating which particular investment motivation might be preferable to others in the context of negotiating valuations. An empirical analysis of 52 CVC mission statements and 147 startup valuations between January 2009 and January 2016 revealed that first, CVCs with a strategic investment motivation assign lower startup valuations than CVCs with an analytic motivation that have moderate levels of the two scrutinized dimensions, suggesting that entrepreneurs trade off these CVCs' value-adding contributions against a valuation discount; second, CVCs with an unfocused investment motivation pay significantly higher purchase prices, thus supporting the hypothesis that they have a so-called liability of vacillation; and third, the valuations of CVCs with a financial investment motive are not significantly different from those of their analytic peers. In sum, our results add to the knowledge of the continuum of corporate investors' investment motivation by illustrating how startup valuations differ across CVC types.

3.1 Introduction

CVC, which comprises minority equity investments from incumbent enterprises in private startups, is on the increase and has now returned to the levels of its heyday in 2000, a fact that underscores the cyclical nature of CVC (Gompers & Lerner, 2000; Dushnitsky & Lenox, 2006; Caldbeck, 2015; NVCA, 2016). According to the MoneyTree Report published by the *NVCA* and *PwC*, CVCs participated in 905 transactions representing 21% of all US VC

[15] This study is published under an open access license. The original publication Röhm et al. (2018) appeared in: Journal of Business Economics, Vol. 88, Issue 3-4, pp. 531-557, which can be found at the following address https://doi.org/10.1007/s11573-017-0857-5.

deals in 2015 (NVCA, 2015, 2016). In light of this, it is scarcely surprising that researchers have increased their interest in the role of CVCs in startup valuations (Gompers & Lerner, 2000; Hellmann, 2002; Masulis & Nahata, 2009; Heughebaert & Manigart, 2012). The empirical evidence, however, is mixed; for instance, Gompers and Lerner (2000) reported that CVCs pay higher purchase prices than IVCs, while Heughebaert and Manigart (2012) found no significant difference between the two investor types. Intriguingly, it is well established that CVCs differ in their motivation regarding the target of strategic goals, such as gaining a window on technology, and financial returns (Gompers & Lerner, 2000; Dushnitsky & Lenox, 2006). It is therefore surprising that to date the impact of CVCs' heterogeneity on startup valuations in terms of their strategic and financial investment motivation has not been explored further. To address this conundrum, we analyzed the variability of startup valuations with CVC involvement against the backdrop of CVCs' underlying investment motivations. Therefore, in contrast to previous research that generally studies the inter-group comparison between the valuations of CVCs and IVCs, we deliberately shift the focus to an intra-group perspective to effectively scrutinize how CVCs' startup valuations differ based on the evidence of their publicly stated investment motives.

To discern a corporate investor's levels of strategic and financial motivation, we analyzed the public statements from the websites of 52 CVCs using CATA (Short, Broberg, Cogliser, & Brigham, 2010; McKenny, Short, & Payne, 2013). Our exploratory cluster analysis identified four types of CVCs: CVCs with a (i) strategic, (ii) financial, (iii) analytic, and (iv) unfocused motivation. It should be noted that for the last two CVC motivations, we draw on the labeling and findings of the seminal work of Miles, Snow, Meyer, and Coleman (1978). To validate the identified clusters within the paper's theory-testing section, we applied HLM to explore 147 startup valuations between January 2009 and January 2016 that characterized the first round of CVC involvement.

Consequently, we contribute to multiple streams of research. Our first contribution is that we extend current research by classifying CVCs into more fine-grained subgroups. Specifically, by focusing on CVCs' investment motivation our research differs from Gompers and Lerner (2000), who used CVCs' parent firms' annual reports to assess the strategic fit between a corporate parent's business lines and the startup for each investment. By evaluating the type of investment in terms of its strategic fit, the approach of Gompers and Lerner (2000) implies that multiple investment categories can be assigned to a single CVC, thereby

disregarding the implications of a CVC's holistic investment motivation for the valuation of a startup. Thus, we deliberately analyze a CVC's overall investment motivation and hence extend the black and white approach of Dushnitsky and Lenox (2006), classifying CVCs' investment motivation as either strategic or financial, and go beyond that to address its limitations stemming from the drawbacks of human coding (Neuendorf, 2002; Short et al., 2010). We do this by introducing CATA and cluster analysis to measure CVCs' degree of strategic and financial motivation. A second contribution of the current study lies in adding to the studies of Basu et al. (2011), Cumming and Dai (2011) and Heughebaert and Manigart (2012) by examining how the heterogeneous characteristics of CVCs affect the valuation of startups. The findings of the current research also contribute to the prevailing literature stream by providing evidence that CVCs with a high strategic motivation pay lower purchase prices. This, in turn, suggests that entrepreneurs trade off highly strategically motivated CVCs' value-adding contributions against a valuation discount.

The remainder of this study is structured as follows: Section 3.2 reviews the current literature addressing distinctive CVC investment motives, and reflects the paper's underlying motivation. Section 3.3, the paper's explorative part, describes the data to construct the study's underlying sample and describes its approach of clustering CVCs into mutually exclusive subgroups. Section 3.4, the theory-testing part, borrows from the extant VC and CVC literature to develop hypotheses about the impact of the identified types of CVC motivation on startup valuations while also describing the paper's methodological approach and outlining the main empirical findings. Section 3.5 discusses the results and Section 3.6 draws a conclusion.

3.2 Literature review and motivation

Gompers and Lerner (2000) were the first to find empirical evidence that CVCs assigned significantly higher startup valuations than IVCs, indicating that CVCs pay a strategic premium. The study further subdivided CVC investments into two classes by analyzing the parent companies' annual reports to search for connections between the parents' business lines and the startup investments they sanctioned. The first class included CVC investments where CVC parent companies had direct strategic relations with a venture, while the second class encompassed investments for which the authors did not find such a relation. Interestingly, the authors reported that the average pre-money valuation paid for CVC

investments with a strategic fit was lower than that reported by their peers, even though one might intuitively expect higher prices for such investments. Building on this, Masulis and Nahata (2009) found empirical evidence that complementary CVCs, which invest in startups with products that complement those of the CVCs' parent companies (as opposed to competitive CVCs, which favor startups with products that compete with those of their parent firms) pay lower purchase prices. Moreover, among others, Chesbrough (2002), Dushnitsky and Lenox (2006) and Ivanov and Xie (2010) draw a line between strategic and financial or non-strategic CVCs.

The distinction between strategic and financial CVCs seems to be well established. The critical issue, however, is how to determine and measure the degree of a CVC's strategic and financial motivation. While most scholars, like Masulis and Nahata (2009) and Ivanov and Xie (2010), present financial CVCs as merely the opposite of their strategic counterparts, we believe that this approach does not capture a more moderate motivation of CVCs. Interestingly enough, Dushnitsky and Lenox (2006) were unable to classify 116 of their total 171 CVCs as having either a strategic or a financial investment motivation. For this reason—and also because Heughebaert and Manigart (2012) establish that the type of VC investor influences the valuations assigned to startups—studying the different investor types of the VC landscape is important. The prevailing simplistic black and white approach dominating the academic discourse in the CVC literature highlights the absence of empirical work scrutinizing the continuum of CVCs' investment motivation.

Identifying the varying types of CVCs' investment motivation will thus help to shed light on the interactions of CVCs and entrepreneurs and, in turn, the variability of CVCs' startup valuations. The following example illustrates the topic's relevance: A startup entrepreneur looking for funding receives offers from both a financially and a strategically motivated CVC. While the financially motivated CVC only invests for financial reasons, the strategically motivated CVC, owing to its intrinsic investment motivation, will commit to providing the startup with access to its resource base. That resource base can benefit the startup, for instance, by attracting new foreign and domestic customers, or by helping the startup's technologies to evolve, implying a higher value-add potential. Hence, based on the well-established reasoning within the literature that entrepreneurs trade off higher value-add potential against a lower valuation (Hsu, 2004), it must be concluded that the strategically motivated CVC should be able to negotiate a lower valuation. Nevertheless, despite the

evident importance of CVCs' investment motivation to startup valuations, the extant literature has not comprehensively studied its impact. To fill this research gap, the current study intends to expand the prevailing black and white approach to CVCs' investment motivation and then to validate the cogency of the explored CVC types against the assigned startup valuations.

3.3 Exploring CVCs' investment motivation

The explorative part of this paper investigates the different types of CVC investment motivation. To overcome the limitations of the current literature, our explorative research strategy is based on a rigorous combination of CATA and cluster analysis because that approach permits us to objectively identify the whole continuum of CVCs' investment motivation. Furthermore, we followed the approach of Dushnitsky and Lenox (2006) in relying on CVCs' publicly disclosed statements as this makes it possible to parse a CVC's investment motivation in a front-stage setting.

3.3.1 Data and sample design

To construct a sample of CVCs unbiased by cross-country differences, like the institutional or cultural environment (Wright, Pruthi, & Lockett, 2005), we searched *Dow Jones VentureSource* database, which is commonly used in the VC literature (Korteweg & Sorensen, 2010), for accessing details of domestic startup investments by US-based CVCs. To account for the cyclical nature of CVC, we considered the time period between January 2009 and January 2016 because CVCs have played an increasingly important role in startup investments since the economic crisis in 2008, and because it is apparently the most recent CVC wave (Dushnitsky & Lenox, 2006; Roof, 2015).[16] We further limited our search to transactions stating the startups' post-money valuation (i.e., the valuation after a financing round, including the amount invested) and excluded deals which only reported the estimated post-money valuation provided by *VentureSource*. By excluding estimated valuations, we avoided the risk that the underlying assumptions of the estimation algorithm would bias our analysis. Indeed, the algorithm from *VentureSource* in partnership with *Sand Hill Econometrics* does not even incorporate different types of VC firms as predictor variables (Blosser & Woodward, 2014). Thus, we considered it unlikely that the reported estimations

[16] In January 2015 Michael Yang, managing director at *Comcast Ventures*, stated: "Corporate venture capital has been on the rise since the bowels of 2008" (Roof, 2015).

could capture potential valuation impacts in light of CVCs' investment motivation. As this, however, is the center of our empirical analysis, we decided to exclude estimated valuations from our sample.

In general, we focus on financing rounds where CVCs invest in a startup for the first time rather than on follow-on rounds, as the initial investment round is when the impact of CVC investment motivation might be expected to be most pronounced (see also Zhang, Wong, & Ho, 2016). In cases where multiple CVCs initially invested in the same investment round, we followed Masulis and Nahata (2009) and treated each CVC-startup dyad separately. This process yielded an initial sample of 58 CVCs with 161 distinctive CVC-startup pairs. Finally, we reviewed the identified CVCs and included only those that complied with the definition and governance of CVCs proposed by Dushnitsky and Lavie (2010), focusing on legally separate CVC arms and established companies with external corporate business development units. Hence, we excluded the direct startup investments of *JumpStart Inc*., *Facebook Inc*., *Citrix Systems Inc.*, *MasterCard Inc.*, *Second Century Ventures LLC* and *Peacock Equity*, resulting in a final sample of 52 CVCs with 147 unique investments, which compares favorably to the sample sizes of Dushnitsky and Lenox (2006) and Wadhwa and Basu (2013). The size of the final sample is driven by our focus on deals with both first time CVC involvement and a stated post-money valuation, which is sensitive information and accordingly less-frequently revealed (Kaplan et al., 2002).

Having compiled a sample of CVCs, we next—based on the aforementioned front-stage approach of Dushnitsky and Lenox (2006)—gathered the relevant information available from each CVC's mission statement from its website. The approach ensures the closest possible fit between our research question and the type of documents used, as recommended by Duriau, Reger, and Pfarrer (2007). Accordingly, the following website information sources were included: *Message from the CEO*, *About Us*, *Who We Are*, *Our Approach*, *Our Mission* or alternatively a CVC unit's description of itself found in press releases. Hence, all organizationally produced texts offer a clear view of the underlying mission statements (e.g., Cochran & David, 1986; Pearce & Fred, 1987; Mullane, 2002). It should be remarked that when a CVC's website was not active as of January 2016 due to a merger, spin-out, acquisition, or abandonment, we retrospectively accessed the required information using the *Internet Archive's Wayback Machine* (Hackett, Parmanto, & Zeng, 2004); a technique that has been applied previously (e.g., Youtie, Hicks, Shapira, & Horsley, 2012).

3.3.2 Capturing investment motivation through CATA

We relied on CATA to capture CVCs' levels of strategic and financial investment motivation from their public mission statements. The underlying idea of CATA is to classify communication while simultaneously allowing for contextual inferences (Weber, 1990; Krippendorff, 2004), which offer researchers deep insights into the perceptions and beliefs behind an organization's narrative (D'Aveni & MacMillan, 1990). Previous articles used CATA to derive theoretically based but otherwise difficult to measure constructs from organizational narratives such as an IPO prospectus (Payne, Moore, Bell, & Zachary, 2013), a shutdown message (Mandl, Berger, & Kuckertz, 2016), a corporate website (Zachary, McKenny, Short, Davis, & Wu, 2011) or an annual report (Moss, Payne, & Moore, 2014). In contrast to human coding, where experts and trained coders evaluate the underlying text corpus, CATA improves the reliability and speed of the considered measurements substantially (Rosenberg, Schnurr, & Oxman, 1990; Morris, 1994; Krippendorff, 2004). Furthermore, we chose CATA because this method focuses solely on publicly accessible information, overcoming the issue of insufficient response rates when conducting survey studies (Zachary, McKenny, Short, & Payne, 2011). Especially in entrepreneurial and VC related articles, the population of LPs (e.g., Kuckertz, Kollmann, Röhm, & Middelberg, 2015), IVCs (e.g., Fried, Bruton, & Hisrich, 1998) and corporate investment vehicles has proved reluctant to respond to prior surveys (Maula, Autio, & Murray, 2003; Maula et al., 2005; Hill & Birkinshaw, 2014; Proksch, Röhr, Ernst, Pinkwart, & Schefczyk, 2017). In general, the gathered mission statements comprise between 42 and 8,136 words, resulting in a mean word count of 428 and a standard deviation (SD) of 1,098. On average, a sentence comprises 24 words (SD = 6).

To enhance the construct validity, we utilized the procedures introduced by Short et al. (2010) to develop mutually exclusive word lists capturing the whole continuum of CVCs' investment motivation. To capture all facets of the underlying theoretical construct and increase its validation simultaneously, Short et al. (2010) recommend the use of both deductively and inductively derived word lists. As a starting point, we developed a deductively derived word list building on prior theory (Potter & Levine-Donnerstein, 1999). Therefore, we created a working definition for each investment motive based on the findings

of Winters and Murfin (1988), Chesbrough (2002), Ernst et al. (2005), Weber and Weber (2005), and Dushnitsky and Lenox (2006).

Word representatives and synonyms were generated in turn for each construct (i.e., financial and strategic), using Rodale's (1978) *The Synonym Finder*, integrated dictionaries (money and quantitative) of *LIWC2015* and the already established profitability word list by Zachary, McKenny, Short, and Payne (2011). Although initially written in 1978, *The Synonym Finder* remains deeply rooted and widely accepted within the academic landscape (e.g., Moss, Short, Payne, & Lumpkin, 2011; Zachary et al., 2011; McKenny et al., 2013; Brigham, Lumpkin, Payne, & Zachary, 2014; Podsakoff, MacKenzie, & Podsakoff, 2016; Vracheva, Judge, & Madden, 2016). Owing to this impressive coverage, we decided to apply *The Synonym Finder* over other comparable and more recent dictionaries. The resulting word lists were then supplemented by a systematic analysis of all publications within the CVC research branch using the *WordStat* text analysis program from *Provalis Research* to extract knowledge and trends from an underlying text corpus. Consequently, a total of 300 additional words and 1,344 phrases (e.g., window on technology, promote entrepreneurship, assets under management, and return on investment) which appeared at least 25 times were analyzed and allocated. In a last step, the construct validity of the word lists was assessed by two independent experts. Based on Holsti (1969) interrater reliabilities of .89 (strategic dimension) and .90 (financial dimension) were determined, indicating substantial agreement between the two raters (Short et al., 2010). Following this, we applied an inductive analysis supplementing the deductive lists with additional words and phrases directly stemming from the extracted mission statements. The combination of inductively and deductively derived word lists is commonly used in the field of organizational studies (Duriau et al., 2007; Zachary et al., 2011; Moss et al., 2014; Wolfe & Shepherd, 2015) and helps to forge links between theoretically driven research branches and more practically oriented ones (Van De Ven & Johnson, 2006; Short et al., 2010). Table 4 reports the full lists of all deductively and inductively derived words.

Table 4: Applied word lists to operationalize a CVC's investment motivation

Variable	Word lists†
Strategic deductive (68 words)	alliance, blueprint, boost demand, complement*, continuity, core, create new, development process, emerg*, enabling, entrepreneurial culture, entrepreneurial spirit, exploit*, explor*, external growth, fit, future, generalship, goal, opportun*, improve corporate image, increase demand, innovat*, instrumentality, Intellectual Property, internal efficiency, IP, key, knowledge, learning, long term, long-term, monitor*, new markets, new technologies, objective*, partner*, patent*, path, pioneer*, pivot*, plan*, position, program*, project, promote entrepreneurship, R&D, raise demand, renewal, research & development, research and development, shift*, social interaction, sourcing mode, spinoff*, spin-off*, stimulating demand, substi*, sustainable, synergi*, tactic*, talent, technological development, transfer*, venturing, vision, window on technology
Strategic inductive (23 words)	absorb*, access*, adapt*, capabilit*, capacit*, catalys*, collaborat*, commerciali*, flexibility, foster*, hiring, incubat*, integrat*, path, problem*, radar, recruit*, scout*, solution*, spinout*, trend*, strategic*, spin-out*
Financial deductive (79 words)	acqui*, assets under management, AUM, bottom line, buy back, buyback, buyout, buy-out, capital commitment, capital efficien*, capital expenditures, capital under management, cash flow, cash on cash, CoC, cash*, cost effective*, cost effic*, cost*, DEBT, distributed to paid in, DPI, dividend*, earn*, EBIT, EBITDA, economic, emolument, equity, exit, finance*, fiscal, gain*, hurdle rate, income*, initial public offering, investment, IPO, IRR, liquidity, loan, lucrative, lucre, M&A, market to book, market-to-book, merger, mezzanine, monetary, money*, paid off, pay off, pay*, pecuniary, performance, profit*, quartile, recompense, remunerat*, return*, revenue*, reward*, risk, ROI, sale*, scalability, secondary purchase, share*, stake, surplus, takeover, term sheet, track record, TVPI, valu*, well-paying, winnings, wins, yield*
Financial inductive (7 words)	capitalis*, discount*, maximi*, metric, odds, price, streamline*

† A wildcard (*) indicates that the root and different variants of a word were used. In addition, all abbreviations were also considered in their full forms.
This table presents the resulting word lists based on the deductive and inductive approaches. The first row contains the deductively derived words for the strategic dimension and the second row the respective inductively compiled words. In sum, 91 words on the strategic side were taken as basis for CATA. The third and fourth row report the deductively and inductively derived words for the financial dimension, resulting in a total of 86 words.

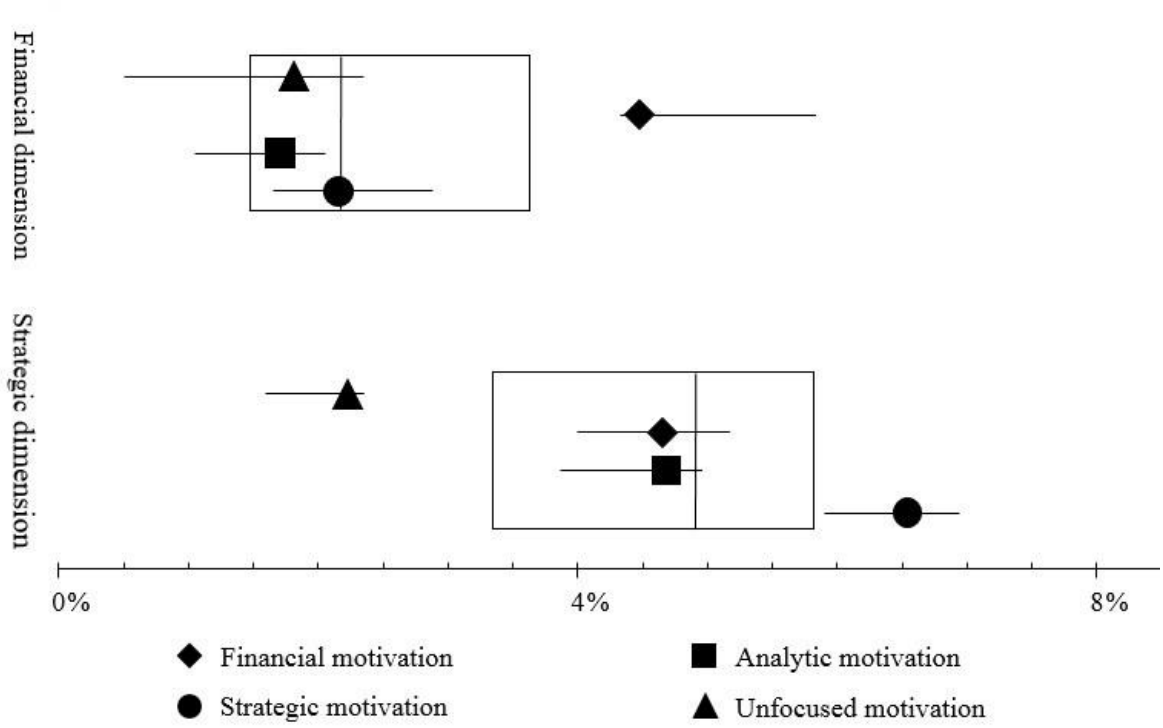
After merging the deductively and inductively derived word lists, we subsequently relied on *LIWC2015*, a powerful computerized text analysis tool introduced by Tausczik and Pennebaker (2010), to extract the variables of interest. In addition, we followed Jegadeesh and Wu (2013) and omitted words that are accompanied by a negator (i.e., not, no, and never) within the space of three words. By standardizing all measures as a percentage of overall words, *LIWC2015* controls for the variance that could arise from the total word count of an underlying text corpus by default. Because longer mission statements increase the likelihood of there being strategic and financial related content, *LIWC2015* provides standardized output variables to compare the investment motivation of all 52 corporate investment vehicles in our dataset. Hence, we calculated the strategic and financial investment motivation for every CVC. Across all CVC mission statements, we found an average word count of 4.61% (SD = 1.89, max. 10.75) representing a strategic investment motive respectively 2.57% (SD = 1.73, max. 8.16) for the financial dimension. To control for potential volatility in CVCs' investment motivation, we have conducted an extensive test to validate the conformity of the long-term nature of CVCs' underlying investment motive. Briefly, using the *Wayback Machine* (Hackett et al., 2004), we gathered the historic mission statements of all retrospectively accessible CVC websites. To observe the longevity of CVCs' investment motivation, we then chose the very first participation of a particular corporate investor within our sample as a reference point for the data collection. Furthermore, we draw on the *Directory of Venture Capital and Private Equity Firms* (Gottlieb, 2008) and historical press releases to identify variances of URL addresses. For instance, *Comcast Ventures* was initially incorporated under the name of *Comcast Interactive Capital*. Unfortunately, not all CVC websites could be restored. Hence, this procedure resulted in a total subsample of 44 clearly identified CVCs. In a final step, we analyzed the narrowed subsample by correlating the historic and current investment motives, indicating strong support for CVCs' stable investment motivation. In detail, we found a high correlation between both points in time for the financial ($r = .921$; $p \leq .01$) and strategic dimension ($r = .651$; $p \leq .01$).

3.3.3 Clustering CVCs based on their investment motivation

To classify the different levels of CVCs' strategic and financial investment motivation, we employed cluster analysis to identify mutually exclusive segments of CVCs with a comparable investment motivation (Chiu, Fang, Chen, Wang, & Jeris, 2001). The clustering method used is based on a two-step procedure, where subclusters are initially defined and

subsequently merged until an optimal number of clusters is reached. We chose this method because within the second step, a standard agglomerative clustering algorithm estimates myriad solutions that are reduced to an optimal number of clusters. To do this, we applied Schwarz's (1978) Bayesian inference criterion (BIC) that features less subjectivity than other clustering methods (see Ketchen & Shook, 1996 for an overview of alternative clustering methods and criteria). Based on the BIC, we then clustered the 52 CVCs into four mutually exclusive subgroups.

Figure 7: Results of the two-step cluster analysis approach



This figure depicts the resulting box plots of the cluster analysis. While the box plots represent the distribution of the overall sample, the within cluster distribution is shown as whiskers. Thus, the depicted cluster symbols represent the corresponding median values. The x-axis states the calculated ratio of all words that match our predefined word lists and the total word count of the underlying text document, thereby controlling for size effects. CVCs with a strategic motivation score very high on the strategic dimension, while their counterparts with a financial motivation do so on the financial side. Their counterparts with an analytic motivation show moderate levels of both dimensions, whereas CVCs with an unfocused motivation lack a clear investment motivation, considerably underperforming their peers on the strategic dimension.

Figure 7 depicts the results of the cluster analysis. Overall, the box plots of our cluster analysis reveal that CVCs in general are more strategically motivated (see also Dushnitsky & Lenox, 2006). Nonetheless, the box plots also point to significant intra-group differences. Thus, to better grasp the varying investment motivation and to clarify the following empirical discussion, we assigned each CVC cluster a label encapsulating its specific characteristics. The labeling process was based on the argument that CVCs' strategic and financial

investment motivations are two ends of a continuum, while an analytic motivation shows moderate levels of the two. Accordingly, CVCs with a strategic motivation (15 CVCs) score very highly on our strategic dimension, meaning that these CVCs have an exceptionally strong focus on achieving strategic benefits. In contrast, their counterparts with a financial motivation (13 CVCs) are characterized by a strong financial focus in their investment motivation. CVCs with an analytic motivation (15 CVCs), on the other hand, exhibit more moderate levels of the two criteria with a greater tendency toward the strategic dimension. CVCs with an unfocused motivation (9 CVCs) are ranked in the moderate bracket of our financial criteria, but substantially underperform their counterparts on the strategic side, and are moreover comparable to the residual strategy type called reactors by Miles et al. (1978).

To further verify our resulting clusters, we followed Ketchen and Shook (1996) and sought expert opinion on them from two anonymous executives with relevant experience in the field of corporate investments. Their feedback was that our findings aligned with their perception of the actual CVC landscape. Illustrative text excerpts are used to exemplify the types of CVC investment motivation identified (see Table 5).

Table 5: Illustrative text excerpts of the identified clusters

	● *Strategic motivation*	◆ *Financial motivation*	■ *Analytic motivation*	▲ *Unfocused motivation*
Illustrative text excerpts	We work with our investment candidates and portfolio companies to ensure that any synergies are explored and developed. (…) focuses on emerging (…) technology companies that have the potential to provide long-term strategic growth options (…).	(…) attractive financial return potential commensurate to the risk profile of the investment. We invest for financial return (…).	Our approach reflects our understanding of the limitations of both traditional corporate and financial venture capital models. We offer entrepreneurs all the strengths of a strategic investor (…). But, like a traditional or independent fund, we measure our success by the returns of our portfolio companies (…).	(…) provides seed, venture, and growth-stage funding to the best companies not strategic investments (…). We started (…) with a mission to help entrepreneurs make the world better.
Number of CVCs	15	13	15	9

This table shows illustrative text excerpts from the mission statements of each CVC type. It also states the total number of the respective cluster.

3.4 Validating the identified clusters: CVCs' investment motivation and startup valuation

To empirically test the cogency of clusters, Ketchen and Shook (1996) strongly recommend applying multivariate analysis using external variables that were not considered in the cluster analysis itself, but that have a theoretical connection with the resulting clusters. In our case, relying on the work of Heughebaert and Manigart (2012), the valuation of the CVC-backed startups provides such an external benchmark variable. Accordingly, the theory-testing section of this paper draws from the extant literature to hypothesize how the identified CVC types might affect startup valuations. Regarding the hypotheses development, it should be noted that we use the CVC cluster with an analytic motivation as reference group since this allows us to derive more accessible intra-group suppositions relating to the other CVC types with either a strategic and financial or an unfocused motivation.

3.5 Theoretical development and hypotheses

From a strategic point of view, CVC investments, in contrast to IVC investments, are typically marked by dual reciprocity and thus represent a triad between CVC unit, startup, and the CVC's parent company (Chesbrough, 2002; Weber & Weber, 2011).

The literature distinguishes between the absorptive capacity entailed by the use of CVC as well as CVCs' value-added services supplied to startups (e.g., Dushnitsky & Lenox, 2005a, 2005b; Maula et al., 2005; Zu Knyphausen-Aufsess, 2005; Ivanov & Xie, 2010). Absorptive capacity means that CVCs' parent organizations exploit knowledge through their venture investments, primarily to gain a window on innovative technology but also to explore new products and industry trends (Winters & Murfin, 1988; Keil, 2000; Maula, 2007). In fact, there is some empirical evidence reporting higher CVC investment activity is associated with an increase in CVCs' parent firms' levels of patenting (Dushnitsky & Lenox, 2005a). Similarly, Dushnitsky and Lenox (2005b) found that CVCs' parent companies capitalize on the knowledge base of startups to complement their own innovativeness.

The majority of papers, however, analyze the opposite value transfer within the CVC triad, namely the value-adding services CVCs' parent organizations provide to startups (e.g., McNally, 1995). In this regard, the findings of Maula et al. (2005) highlight that CVCs'

value-adding contributions differ from those of IVCs, suggesting that there are probably circumstances when entrepreneurs consciously accept the involvement of CVCs. Specifically, startups have been found to be able to capitalize on an incumbent's brand name to establish their trustworthiness by gaining access to a corporation's network of cooperation partners (Zu Knyphausen-Aufsess, 2005). Additionally, Maula et al. (2005) found evidence that corporates are particularly valuable for startups due to their capability to offer technological support and attract foreign customers, which allows the startups to scale their business internationally more rapidly. Moreover, Park and Steensma (2013), Chemmanur et al., (2014), and Alvarez-Garrido and Dushnitsky (2016) showed that after CVC involvement, ventures' innovativeness rates measured in terms of numbers of patents were higher than those of their counterparts backed by IVCs. In this regard, Ivanov and Xie (2010) found that CVCs only add value to startups that have a strategic fit with their parent organizations. Interestingly, from a CVC intra-group perspective, Gompers and Lerner (2000) reported that startup investments with a strategic fit with CVCs' parent firms, on average received a lower valuation than startup investments lacking such a relationship. Therefore, we suggest that CVCs with a strategic motivation should have and provide more value-added support capabilities than their analytic peers. In sum, all this implies that there are reasonable grounds to assume that (just as with more reputable IVCs who are expected to provide more value-adding services) there could be circumstances when entrepreneurs tolerate lower valuations. This in turn implies that entrepreneurs are willing to accept valuation discounts in exchange for more comprehensive value-adding contributions through highly strategically motivated CVCs (Hsu, 2004).

Hypothesis 1: Everything else being equal, CVCs with a *strategic motivation* assign lower valuations to startups than CVCs with an *analytic motivation* do.

Our cluster analysis confirmed current research revealing that there are CVCs who invest in startups primarily for financial reasons (e.g., Gompers & Lerner, 2000; Masulis & Nahata, 2009). This means that financially motivated CVCs stand in direct competition with IVCs (Heughebaert & Manigart, 2012). However, IVCs are financial professionals who look for attractive risk-return profiles when investing in startups and, among other things, add value through their networks within the financial services community (Maula et al., 2005). Financially motivated CVCs in contrast, might lack such broad connections within the financial services community as they generally have less experience of startup investments.

This, in turn, could put these CVCs in an adverse position in terms of both value-add potential and credibility (Maula et al., 2005; Hill & Birkinshaw, 2014). Accordingly, financially motivated CVCs might lack the capabilities to select the startups that are most attractive from a pure risk-return perspective, and furthermore might lack the necessary valuation expertise. It follows that financially motivated CVCs, as opposed to strategically motivated ones, could, at least in part, fail to have a comparative advantage and a well-defined position within the VC industry and thus, potentially only offer a second-best solution for entrepreneurs seeking a financial investor. Therefore, we predict that CVCs with a financial motivation pay higher purchase prices than CVCs with an analytic motivation.

Hypothesis 2: Everything else being equal CVCs with a *financial motivation* assign higher valuations to startups than CVCs with an *analytic motivation* do.

Our CATA and cluster analysis identified a CVC cluster with an unfocused motivation, something we consider particularly interesting. CVCs with an unfocused motivation lack a focus on a specific investment motive. This type of CVC investor lacks the commitment to seek out strategic investments. One reason for this weak strategic motivation could be that these CVCs do not receive sufficient backing from their corporate parents, which could negatively influence the CVC-startup relationship. Close relationships between CVCs and entrepreneurs and a mutual understanding of the investment motivation is an important factor in CVC investments (Hardymon, DeNino, & Salter, 1983; Sykes, 1990). However, in the case of CVCs with an unfocused motivation, a lack of a clearly defined investment motive might cause entrepreneurs to be wary of agency problems stemming from a potential lack of alignment on goals between themselves and the CVCs. Consequently, that potential goal incongruence could cause entrepreneurs severe moral hazard concerns, because rather unfocused CVCs could lack the effort and serious intentions necessary to support their portfolio firms (Eisenhardt, 1989a; Maula, 2001). Hellmann (2002) and Masulis and Nahata (2009) have pointed out that entrepreneurs facing severe moral hazard issues extract higher valuations from CVCs. In other words, this is in line with standard bargaining theory implying that entrepreneurs demand a valuation premium in anticipation of potential moral hazard problems. From a CVC perspective, this valuation premium, in turn, could point to a liability of vacillation as these CVCs lack a consistent and tangible investment motivation. Consequently, we hypothesize that CVCs with an unfocused motivation in comparison to

their analytic counterparts, who are likely to have a substantially more tactile investment motivation, pay higher purchase prices for startups.

Hypothesis 3: Everything else being equal, CVCs with an *unfocused motivation* assign higher valuations to startups than CVCs with an *analytic motivation* do.

3.6 Measures and descriptive statistics

We obtained the data underlying the analysis from the sample described in Section 3.3.1 and supplemented it with additional information on startups' and CVCs' parent firms' SIC code classifications from the *Thomson One* database. We further followed Bernerth and Aguinis (2016) and Raudenbush and Bryk (2002) in limiting our predictor variables to those we considered most relevant. Table 6 provides an overview of the underlying variables and their respective definitions.

The outcome variable of our multilevel analysis is a startup's post-money valuation (i.e., the valuation after a financing round, including the amount invested); a variable regularly used in the VC literature (e.g., Yang et al., 2009; Block, De Vries, Schumann, & Sandner, 2014). We included with level 1 (startups), startup characteristics related to financing round, startup age at CVC investment, industry and location as predictor variables (e.g., Heughebaert & Manigart, 2012). In view of CVCs' fears of supporting a future competitor, we controlled for a startup's financing round. In addition, future payoffs of startups are more stable in their later than in their early stages leading to an increasing valuation as they age. Moreover, considering the fact that fast growing industries attract more solvent and reputable investors, we controlled for a startup's industry. In so doing, we relied on a dummy variable to determine whether a startup operates in a high-technology industry (see also Antonczyk, Breuer, & Mark, 2007), by using the SIC code classifications of Bhojraj and Lee (2002) and the extended version of Klobucnik and Sievers (2013).[17]

[17] We therefore considered startups and CVCs' parent companies with the following SIC codes to operate in high-technology industries: biotechnology (SIC codes 2833-2836 and 8731-8734), computers, computer programming, data process (SIC codes 3570-3577 and 7370-7379), electronics (SIC codes 3600-3674) and telecommunication (SIC codes 4810-4841).

Table 6: List of variables and their definitions

Variable	Definition
Dependent variable	
Startup valuation	Natural logarithm of a startup's post-money valuation, i.e. the valuation after a financing round including the amount invested
Independent variables	
Level 1: Startup level	
Startup financing round	Financing round in which a startup raised money from a CVC investor
Startup industry	Dummy variable indicating the affiliation of a startup to a high-technology industry
Startup location	Dummy variable referring to the geographical affiliation of a startup's headquarters to the predominating VC ecosystems of California (Silicon Valley), Massachusetts (Route 128) and New York
Startup age	Startup age in years at the year of CVC funding
Level 2: CVC level	
CVC reputation	Aggregated number of a CVC's performed IPOs
CVC industry	Dummy variable indicating the affiliation of a CVC's corporate parent to a high-technology industry
Strategic motivation	Dummy variable representing CVCs with a strategic investment motivation
Unfocused motivation	Dummy variable representing CVCs with an unfocused investment motivation
Analytic motivation	Dummy variable representing CVCs with an analytic investment motivation
Financial motivation	Dummy variable representing CVCs with a financial investment motivation

We included the geographical location dummy variable because startups headquartered within the three main US VC clusters, California (Silicon Valley), Massachusetts (Route 128) and New York, might benefit from better access to VC funding (Inderst & Müller, 2004; Gaba & Meyer, 2008; Zheng, Liu, & George, 2010) and a higher level of interorganizational knowledge spillover (Jaffe, Trajtenberg, & Henderson 1993). At level 2 (CVCs), we considered CVC reputation, the industry of a CVC's parent firm and the identified CVC clusters as predictor variables. As a proxy for CVC reputation, we took a CVC's aggregated number of startups that went public up until January 2016 (e.g., Masulis & Nahata, 2009). This predictor variable allowed us to take into consideration startup entrepreneurs preferring the offers of more reputable investors at lower prices (Hsu, 2004). Additionally, and analogous to level 1, we coded a dummy variable to distinguish whether a CVC's parent organization operates in a high-technology sector. Moreover, as the identified CVC subgroups form the key interest of our analysis, we operationalized three dummy variables: strategic motivation, financial motivation, and unfocused motivation to account for a CVC's cluster membership. A fourth dummy variable, analytic motivation, was chosen as the reference category.

Table 7 summarizes the means, SDs, and intercorrelations of all variables used in this study. Given the fact that CVCs tend to be later-stage investors (Masulis & Nahata, 2009), our sample's average CVC investment takes place between the third and fourth financing round with a mean post-money valuation of USD 263.67 million (median = USD 65.00 million, SD = USD 663.40 million). At the time of the first CVC investment, the startups were at most 16 years old and on average were four years old. Unsurprisingly, 76% of our sample's CVC investments were related to startups headquartered in either California, Massachusetts, or New York. Notably in our sample, CVC programs are equally divided among parent companies from high-technology industries and parent firms from sectors other than high-technology. The CVCs in our sample prefer to invest in startups from high-technology sectors (mean = .72, SD = .45). With respect to the intercorrelation matrix, on level 1 we found evidence that the financing round ($r = .44$, $p \leq .001$), as well as startup age ($r = .34$, $p \leq .001$) are positively related to the post-money valuation. Obviously, this coherence is driven by the fact that, over time, a startup's payoffs typically reach a less volatile level, with the consequence that the observed valuations increase substantially. Moreover, on level 2, only investment vehicles with corporate parents operating in high-technology industries ($r = .23$, $p \leq .05$) and CVCs with an unfocused motivation ($r = .30$, $p \leq .05$) are related to the total number of IPOs initiated.

Table 7: Descriptive statistics and intercorrelations

Variable	Max	Mean	SD	1.	2.	3.	4.	5.	6.
Level 1: Startup level									
1. Startup valuation [m]	4,500	263.67	663.40	- / -					
2. Startup financing round	16.00	3.62	2.46	.44***	- / -				
3. Startup industry	1.00	.72	.45	-.13	-.18*	- / -			
4. Startup location	1.00	.76	.43	.03	-.14†	.04	- / -		
5. Startup age	16.00	4.39	3.37	.34***	.62***	-.07	-.11	- / -	
Level 2: CVC level									
1. CVC reputation	125.00	7.77	18.81	- / -					
2. CVC industry	1.00	.50	.51	.23*	- / -				
3. Strategic motivation	1.00	.29	.46	-.09	.21	- / -			
4. Unfocused motivation	1.00	.17	.38	.30*	-.05	n.a.	- / -		
5. Analytic motivation	1.00	.29	.46	-.12	.04	n.a.	n.a.	- / -	
6. Financial motivation	1.00	.25	.44	-.05	-.22	n.a.	n.a.	n.a.	- / -

*** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$; † $p \leq .1$. n.a. = not applicable.

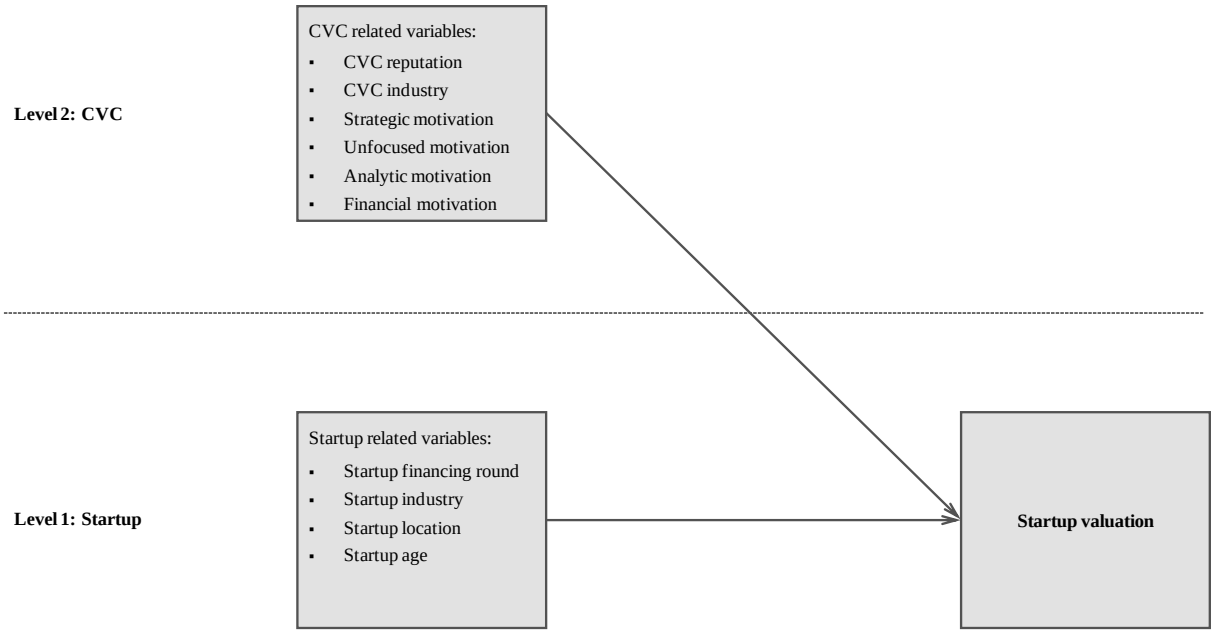
This table reports the descriptive statistics and intercorrelations for a sample of 147 startups and 52 CVCs. Startup valuation is the valuation after a financing round including the amount invested. Startup financing round reflects the financing round in which a startup raised money from a CVC investor. Startup industry reports whether a startup operates in a high-technology industry. As mentioned in footnote 17, the following SIC codes were considered high-technology industries: biotechnology (SIC codes 2833-2836 and 8731-8734), computers, computer programming, data process (SIC codes 3570-3577 and 7370-7379), electronics (SIC codes 3600-3674) and telecommunication (SIC codes 4810-4841). Startup location indicates whether a startup is headquartered in one of the predominating US VC clusters, that is, California (Silicon Valley), Massachusetts (Route 128), and New York. Startup age is calculated as the startup's age in years in the year it received CVC funding. CVC reputation serves as a proxy for a CVC's reputation, measured as a CVC's aggregated number of performed IPOs. CVC industry states whether a CVC's corporate parent operates in a high-technology industry, and is determined analogously to Startup industry. Strategic motivation is a dummy variable for CVCs with a highly strategically motivated investment motive. Unfocused motivation is a dummy variable for CVCs lacking a consistent and tangible investment motivation. Analytic motivation is a dummy variable representing CVCs with moderate levels on the strategic and financial dimensions. Financial motivation is a dummy variable standing for CVCs with a high financial investment motivation.

3.6.1 Method of analysis

To analyze the underlying data, we used HLM, a statistical method that allows researchers to explain the variance of the dependent variable with predictor variables from two or more different levels, that is, the individual level (startups) and the contextual level (CVCs). Accordingly, HLM surpasses the feasibility of standard OLS regressions (Raudenbush & Bryk, 2002). In general, nested data structures, where the objects of investigations are hierarchically separated, are frequently observed in the fields of management (e.g., Van Der Vegt, Van De Vliert, & Huang, 2005; Misangyi, Elms, Greckhamer, & Lepine, 2006) and finance (e.g., Engelen & van Essen, 2010; Kayo & Kimura, 2011). In light of the fact that our research design assessed the impact of investor related predictors on startup related ones, we consequently applied a two-level HLM approach (see Figure 8). We consider it appropriate to assume that startups receiving funding from a particular CVC are generally more readily comparable than portfolio companies from another corporate investor. This means that a CVC following a particular investment motivation also targets startups that are more similar to each other, indicating a natural hierarchical nesting. Usually, studies within the VC context ignore the hierarchical nature of such investor-investee relationships, thereby alleging that the estimated effects between two variables are constant across the whole data sample.

Thus, the problems associated with standard OLS methods dealing with nested data in the VC context are twofold: First, by disaggregating all investor related variables to the startup level, the assumption of independence between the observations is violated, contradicting the prerequisites of the OLS regression. Subsequently, by ignoring the differences between the investor related variables on level 2, OLS regressions tend to underestimate the standard errors which, in turn, are positively associated with more statistically significant coherences. Second, by aggregating the startup related variables to the less specific investor level, researchers are unable to observe the within-group variation because all startups are implicitly treated as homogeneous entities (Osborne, 2000).

Figure 8: Underlying conceptual model



The figure visualizes the paper's HLM approach, summarizing the predictor variables of the contextual level of the CVCs (level 2) as well as predictor variables together with the dependent variable, i.e. startup valuation, on the individual level of the startup (level 1). The arrows depict the influence of both the level 2 and level 1 predictor variables on a startup's post-money valuation.

In this regard, Roberts (2004) found evidence that the presence of nested structures can affect the findings of an empirical analysis dramatically. Hence, to avoid such a bias in our results, we formally accounted for the presence of nested structures employing an unconditional model to determine the amount of variance of the dependent variable that exists within and between the groups of CVCs. The analysis used *HLM7*, a software package by *SSI* that applies a sequential procedure. In a first step, for each level 2 entity (CVCs) the effects of all level 1 (startups) predictors are estimated separately, producing intercepts and slopes that directly link the predictors to the dependent variable. Within the second step, those randomly varying intercepts and slopes are used as outcome variables themselves and are predicted with level 2 variables (Raudenbush & Bryk, 2002).

Following Raudenbush and Bryk (2002), an iterative process was conducted to calculate all HLM models (see Table 8). First, as mentioned above, we estimated a conditional null model that revealed a significant intercept component (γ_{00} = 17.941, $p < .001$) and, in turn, a significant intra-class correlation coefficient (ICC) of .102, underscoring that the application of multilevel analysis is suitable and required for our data structure (Hofmann, 1997; Ozkaya, Dabas, Kolev, Hult, Dahlquist, & Manjeshwar, 2013). After that, we estimated

a random coefficient model addressing only level 1 variables and an intercept-as-outcome model including all level 1 and level 2 variables. The following equations illustrate the intercept-as-outcome model that we applied to test Hypothesis 1 to 3 and that accounts for both fixed (γ) and random effects (r, u):

Level 1 Model:

$$\text{Startup valuation}_{ij} = \beta_{0j} + \beta_{1j}\,(\text{Startup financing round}) + \beta_{2j}\,(\text{Startup industry}) + \beta_{3j}\,(\text{Startup location}) + \beta_{4j}\,(\text{Startup age}) + r_{ij}$$

Level 2 Model:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\,(\text{CVC reputation}) + \gamma_{02}\,(\text{Strategic motivation}) + \gamma_{03}\,(\text{Unfocused motivation}) + \gamma_{04}\,(\text{Financial motivation}) + \gamma_{05}\,(\text{CVC industry}) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j} \quad \beta_{2j} = \gamma_{20} + u_{2j} \quad \beta_{3j} = \gamma_{30} + u_{3j} \quad \beta_{4j} = \gamma_{40} + u_{4j}$$

3.6.2 Results

The findings of the HLM framework are presented in Table 8. Of key interest was the relationship between the post-money valuation of startups (level 1 outcome variable) and the CVC subgroups (level 2 predictor variables) identified in the course of the CATA and cluster analysis. To assess the overall goodness of fit, we estimated our models using the full maximum likelihood approach (Luo & Azen, 2013). The calculated deviance as well as the pseudo R^2 statistics for level 1 (Snijders & Bosker, 1999) and level 2 (Kreft & De Leeuw, 1998; Singer, 1998) indicate a satisfactory model (see Table 8). Consequently, our final model explains 65% of the within-CVC variance and 50% of the between-CVC variance.

The control variables of the intercept-as-outcomes model (Model III) show the expected signs and except for Startup industry and Startup location are statistically significant at the startup level. At level 1 (startups), in line with Heughebaert and Manigart (2012), the high-technology industry dummy, however, is negative and not statistically significant (γ_{20} = -.246, p = .278). Additionally, we find that consistent with prior research, CVCs assign higher valuations to startups headquartered in California, Massachusetts, or New York, albeit the coefficient is statistically insignificant (γ_{30} = .202, p = .381). Furthermore, both the financing round and the age of a startup at the point of CVC investment are positively and significantly related to post-money valuations (γ_{10} = .317, p < .001; γ_{40} = .117, p = .045). At level 2 (CVCs), corporate investors with a stronger reputation in terms of companies taken public pay significantly lower purchase prices (γ_{01} = -.008, p = .023). Interestingly, CVCs whose parent companies operate in high-technology industries assign significantly higher valuations to startups (γ_{05} = .759, p = .002). One possible explanation of this finding could be that parent companies operating in high-technology sectors are under more pressure to implement strategic renewal due to the rapidly changing industry environment, and are therefore willing to pay higher purchase prices for startups to avoid disruption sparked by incumbents and new competitors (Keil, 2002).

Table 8 Hierarchical linear models and estimated results

	Model I		Model II		Model III	
	Null model		Random coefficient model		Intercept-as-outcome model	
	γ	SE	γ	SE	γ	SE
Fixed effects						
Level 1: Startup level						
Intercept, γ_{00}	17.941***	.149	16.371***	.305	16.170***	.338
Startup financing round, γ_{10}			.291***	.073	.317***	.073
Startup industry, γ_{20}			-.072	.226	-.246	.224
Startup location, γ_{30}			.250	.231	.202	.228
Startup age, γ_{40}			.080	.060	.117*	.057
Level 2: CVC level						
CVC reputation, γ_{01}					-.008*	.003
CVC industry, γ_{05}					.759**	.228
Strategic motivation, γ_{02}					-.820**	.281
Unfocused motivation, γ_{03}					.600*	.268
Financial motivation, γ_{04}					-.256	.286
Variance components (random effects)						
Level 1 residual variance, σ^2	2.098		.734		.706	
Level 2 residual variance, τ^2	.237*		.216*		.118**	
Level 1 slope variance for Startup financing round, u_1			.037		.047	
Level 1 slope variance for Startup industry, u_2			.301**		.228**	
Level 1 slope variance for Startup location, u_3			.367*		.366*	
Level 1 slope variance for Startup age, u_4			.046*		.040*	
Model fit						

ICC = $\tau^2 / (\tau^2 + \sigma^2)$	.102		
$R^2_{\text{Level 1}}$		.593	.647
$R^2_{\text{Level 2}}$		.089	.502
Deviance	522.855	438.192	424.852

*** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$; † $p \leq .1$.

This table reports the results of the fixed and random effects HLM model of the level 1 and level 2 predictor variables on a startup's post-money valuation for a sample of 147 startups and 52 CVCs. An iterative process was performed. Model I represents the null model and was used to test if the HLM model is generally appropriable to the underlying data. This model reveals a significant intra-class correlation coefficient (ICC) of .102, therefore the application of HLM is suitable. Model II is a random coefficient model only considering level 1 predictor variables. Model III, the intercept-as-outcome model, considers all level 1 and level 2 predictor variables. Overall, the pseudo R^2 statistics for level 1 with 65% and level 2 with 50% show a satisfying model fit.

Overall, our hypotheses regarding the impact of CVCs' investment motivation on startup valuations receive substantial support. CVCs with a strategic motivation are associated with significantly lower valuations than those with an analytic motivation (γ_{02} = -.820, p = .005) supporting Hypothesis 1. Consequently, in line with the findings of Hsu (2004) for IVCs, from a CVC intra-group perspective, we found evidence for CVCs having a value-adding role, indicating that startup entrepreneurs also appear to accept valuation discounts from CVCs with a strategic motivation in anticipation of more value-adding contributions. In other words, entrepreneurs seem to trade off the higher value-add potential of these CVCs against a lower valuation. As for CVCs with a financial motivation our results do not provide a statistically significant coefficient (γ_{04} = -.256, p = .376). Consequently, Hypothesis 2 is not supported, which suggests there is no significant difference between the assigned startup valuations of CVCs with an analytic motivation and their peers with a financial motivation. In accordance with Hypothesis 3, our results indicate that CVCs with an unfocused motivation pay significantly higher purchase prices for startups (γ_{03} = .600, p = .030) than their peers with an analytic motivation. This confirms our supposition that CVCs with an unfocused motivation are faced with a liability of vacillation as they might lack a tangible investment motive. Thus, entrepreneurs apparently demand a valuation premium in expectation of eventual moral hazard problems.

To confirm our findings, we conducted further analyses by additionally controlling for a startup's business model, that is, whether a startup operates a B2B business model, as well as a CVC's fund size and its age at funding. Owing to the limited data coverage, we created a subsample where we were able to access the above mentioned data, resulting in a narrowed sample of 23 CVCs and their responding 87 startup investments. As expected, the effects of CVCs' investment motivation also hold for our subsample, and therefore confirm the results of our full model.

Overall, our findings show that the different forms of investment motivation among CVCs are important factors in explaining the valuations of startups. We therefore extend the findings of Heughebaert and Manigart (2012) highlighting that research should not only differentiate between VC types like IVCs, CVCs, and governmental VCs, but also between the different subgroups of CVCs.

3.7 Discussion

3.7.1 Theoretical and practical implications

Extant research overlooks the possible impact of the divergent degrees of CVCs' investment motivation on the startup valuations they assign. Accordingly, the goal of this study was to explore this effect and it is to the best of the authors' knowledge the first paper addressing this potential interplay in detail. To achieve the above research goal, the current study analyzes 52 CVC mission statements and 147 startup valuations between January 2009 and January 2016, applying CATA and cluster analysis to identify different types of CVCs according to their degree of strategic and financial motivation. We then applied HLM to examine the effects of CVC type on startup valuation. Overall, our findings emphasize that CVCs' characteristics in terms of their investment motivation appear to play a decisive role in explaining startup valuations. Specifically, we found empirical evidence that when all other factors are equal, CVCs with a strategic motivation pay significantly lower purchase prices for startups than their counterparts with an analytic motivation, supporting our hypothesis about the value-adding role of highly strategically motivated CVCs. For CVCs with a financial motivation, on the other hand, we did not find a significant valuation impact. However, we illustrated that entrepreneurs extract higher valuations from CVCs with an unfocused motivation, underscoring our notion that these CVCs have a liability of vacillation owing to their potential lack of a tangible investment motivation and entrepreneurs' moral hazard concerns.

In light of these results, our paper makes multiple contributions to the VC and CVC literature. First, we extend previous work by adding to the continuum of CVCs' investment motivation, thereby demonstrating that they form a heterogeneous group (e.g., Dushnitsky and Lenox 2006; Wadhwa and Basu 2013). More specifically, we introduced CATA together with a clustering technique as objectifiable means to measure the divergent levels of CVCs' strategic and financial investment motive. This, in turn, allowed us to overcome the black and white approach of current research, which has so far only differentiated between strategic and financial CVCs. Consequently, we propose a more fine-grained classification of CVCs. Furthermore, in contrast to previous articles that studied the valuation impact of CVCs as opposed to IVCs from an inter-group perspective (e.g., Gompers & Lerner, 2000; Heughebaert & Manigart, 2012), we deliberately shifted the focus to an intra-group perspective, which enabled us to effectively scrutinize the valuation effects of different CVC

types in a unique empirical setting. We therefore add to the studies of Cumming and Dai (2011) and Heughebaert and Manigart (2012) by explicitly considering CVCs' characteristics in terms of their underlying investment motivation as determinants of the purchase prices they pay. In doing so, our work addresses the current research gap regarding the variability of CVCs' startup valuations. In addition to this, our results are interesting, precisely because they might initially appear counterintuitive. Specifically, we found that the involvement of CVCs with a strategic motivation leads to a lower valuation than when their CVC counterparts with an analytic motivation are involved. Accordingly, the presence of CVCs with an unfocused motivation contradicts the initial idea of corporate investment practice regarding their non-sufficient-strategic investment motive. Dealing with a liability of vacillation those CVCs seem to lack a clear investment motivation which could be a signal for the absence of comprehensive corporate backing. Nonetheless, when startups actively seek CVC funding, they evaluate the potential value-added contributions resulting from a corporates' unique resource base (Ernst et al., 2005; Maula et al., 2005). Hence, due to the dearth of strategic investment motivation, those CVCs might need to increase their general attractiveness through offering higher purchase prices. Alternatively, CVCs with a strategic motivation are expected to provide a broader basis of complementary assets for startups, thereby enabling their portfolio firms to scale their business more rapidly. In this regard, the entrepreneurs behind such startups apparently tend to accept valuation discounts in exchange for more substantial value-add activities from those CVCs than the investment offerings from CVCs with an analytic motivation.

Moreover, this study should also be of significant value for entrepreneurs in outlining clusters of CVCs that reflect a specific investment motivation. Our cluster approach, in turn, could help entrepreneurs to segment CVCs and to align their investor choice with their business and exit strategy. Having a CVC with an unfocused motivation in the early stage to push for a higher valuation might be helpful in terms of signaling when planning to exit via an IPO in the long run, whereas entrepreneurs seeking value-adding contributions might be interested in maintaining a close relationship with CVCs with a strategic motivation.

3.7.2 Limitations and avenues for future research

Several limitations of this study illuminate promising avenues for future research. In particular, four limitations seem worthy of consideration. First, we applied CATA to measure

CVCs' levels of strategic and financial motivation. However, it might be that this approach does not fully capture CVCs' real investment behavior, an inherent drawback of applying CATA (e.g., Moss et al., 2014). More importantly, CVCs' front-stage investment statements might differ from their actual back-stage actions (Fiol, 1995). We would therefore encourage future research to benchmark our front-stage findings against CVCs' back-stage statements on their investment motivation by analyzing, for instance, internal memos or meeting transcripts (Zachary et al., 2011). Second, we differentiated between CVCs' strategic and financial investment motivations. Nevertheless, we are well aware of the fact that there are other differentiating characteristics among CVCs, such as their exploitative and explorative investment motives (Hill & Birkinshaw, 2014). Therefore, we propose that future research should study the effects of these other CVC characteristics on startup valuation. Third, we deliberately focused our study on the US CVC market, implying that our findings are geographically limited; however, for a first analysis of the valuation impact of CVCs' heterogeneous investment motivation, the mature and very active US VC market, with its ample data coverage, provides a perfect empirical setting (Da Rin, Hellmann, & Puri, 2013). Nonetheless, this also implies that we consciously scrutinized a common set of institutional and cultural factors. In view of this, we consider it an important second step for scholars to analyze the transferability of our findings to other VC markets with a range of institutional and cultural settings (Wright et al., 2005). Additionally, we focused on CVC investments between January 2009 and January 2016. However, as already outlined above, CVC activity is very cyclical in nature and we thus leave it up to future work to externally validate our findings for different time periods (McNally, 1995; Gompers & Lerner, 2000; Dushnitsky & Lenox, 2006). Fourth, even though our study sheds light on CVCs' heterogeneous investment motivation, it could not address which particular startup characteristics the identified CVC types consider when making an investment decision. We would therefore encourage future research scrutinizing the matching characteristics between the differing CVC and startup types (e.g., Maula et al., 2009). It would be interesting for instance to understand why startups accept the offers of CVCs with an unfocused motivation who seem unable to demonstrate a concrete investment motive. Similarly, as the underlying data cannot answer these questions, future work should address how the identified types of CVCs' investment motivation relate to their particular business practices, such as their holding periods or their proportions of equity stake taken in startups. This, in turn, will help to further validate the paper's findings and to expand the literature on CVC heterogeneity.

3.8 Conclusion

A rigorous combination of explorative and theory-testing approaches meant we were able to illustrate that the investment motivation of CVCs goes beyond the simplistic assumptions currently dominating the academic discourse. In general, these motivations not only shape how CVCs behave in the market for startup investments, they also determine the startup valuations those CVCs assign. For our research design, we constructed a unique sample of 52 CVCs and their corresponding 147 startup valuations for the time period between January 2009 and January 2016. Owing to the natural hierarchical structure within the CVC-startup reciprocity, we also instituted an HLM regression method. The underlying data identified four differing types of CVC motivation and showed that they affect the startup valuations CVCs assign. The current study challenges the prevailing black and white approach to CVC investment motives, demonstrating that there is a continuum of CVC investment motivation, and thus implying that CVCs form a heterogeneous group, and which explains the variability of their startup valuations.

4 From Investment to Acquisition: The Impact of Exploration and Exploitation on CVC Acquisition

Abstract

This study applies the framework of exploration and exploitation to scrutinize the interplay of corporate venture capital investments and subsequent startup acquisitions. We analyze 901 unique CVC triads comprising a corporate mother, CVC unit, and startup covering the period 1996–2016. A total of 124 transactions of our sample mark a CVC acquisition, that is, a corporate mother acquires a portfolio startup of its CVC unit. Our findings show that a corporate mother's explorative and exploitative orientation has significant effects on the likelihood of a CVC acquisition, albeit moderated by the product market relatedness between corporate mother and startup.

4.1 Introduction

In 2016, U.S. corporations conducted 317 domestic venture capital-backed startup acquisitions, according to data from the *Dow Jones VentureSource*. Among the most active acquirers are companies like *Google*, *Intel*, *Salesforce.com*, and *Verizon* that operate their own corporate venture capital units. Those corporations use their CVC units to take minority equity stakes in startups to extend and improve their own knowledge base (Hill & Birkinshaw, 2008). It is particularly intriguing that a salient motive for CVC investments is to seek out promising acquisition targets (Benson & Ziedonis, 2010). Consequently, CVC investments can play a vital role in the identification of acquisition targets, above all in light of the fact that corporations often find it challenging to spot new knowledge from external sources in terms of product, services, and technologies (Benson & Ziedonis, 2009). The rationale of a CVC unit is precisely to alleviate this issue (Keil, 2004; Dushnitsky & Lenox, 2005a). There is a growing body of literature examining ECV activities in a comparative setting, and this research seeks to answer the question of which external venturing mode, i.e. alliances, joint ventures, or CVC investments is preferred in specific circumstances (e.g., Keil et al., 2008; Tong & Li, 2011; Titus, House, & Covin, 2017). However, this research does not investigate the inherent option of making CVC investments to ultimately acquire a startup. Therefore, this paper focuses on the phenomenon of CVC acquisitions, which means that a

corporate mother acquires a startup which was funded through its CVC unit (Benson & Ziedonis, 2010). Remarkably, despite its practical and theoretical relevance, there is scant research on startup acquisitions in general (Andersson & Xiao, 2016), and virtually no work on the phenomenon of CVC acquisitions in particular. In the latter context, Benson and Ziedonis (2010) explore the effect of CVC acquisitions on the shareholder value, while Dimitrova (2015) scrutinizes the determinants leading to a CVC acquisition, but the research lacks a clear theoretical anchor. However, as suggested by March (1991), organizational learning can be driven by two fundamental patterns of behavior, that is, exploration and exploitation (E/E). While exploitative behavior is strongly associated with the utilization of a corporation's existing knowledge base, exploration requires a clear shift toward new skills and capabilities to leverage the existing knowledge base (Lavie et al., 2010). Therefore, the continuum of these patterns can influence the risk-taking behavior of corporations (March, 1991). Accordingly, the goal of this study is to fill this gap by linking the phenomenon of CVC acquisitions to the explorative and exploitative orientation of a corporate mother, and thus to answer the research question: What is the effect of a corporate mother's degree of explorative and exploitative orientation on CVC acquisition? The theory of exploration and exploitation has received attention in the mergers and acquisition literature (e.g., Phene et al., 2012) as well as the CVC research stream (e.g., Schildt et al., 2005; Hill & Birkinshaw, 2008). It is in turn a logical and necessary step to link the theory of E/E to CVC acquisitions.

To address the paper's research question, we applied a logistic regression by using a carefully compiled sample of 901 unique U.S. CVC triads. We employed CATA to discern a corporate mother's degree of explorative and exploitative orientation from the firm's shareholder letters. Furthermore, we followed Benson and Ziedonis (2010) in distinguishing between CVC and non-CVC acquisitions, and similar to that study find that 14% of the acquired startups had previous equity relationships with the CVC units of their acquirers. In sum, the current research makes three main contributions. First, it contributes to the CV literature by going beyond the prevailing separate view on the external venturing modes of CVC investments and startup acquisitions. Instead of analyzing external venturing modes in a comparative setting, the article shifts the focus on to the specific interplay of CVC investments and startup acquisitions. Second, it contributes to the under-researched topic of startup acquisition in general, and specifically extends the extant literature on the phenomenon of CVC acquisitions by directly linking it to the theoretical framework of E/E. The results indicate that corporate mothers with a greater degree of explorative orientation are

more likely to acquire startups funded through their CVC units, whereas we find the opposite effect for corporate mothers with a greater degree of exploitative orientation, and thereby also confirm the findings of previous research on E/E. Additionally, we provide evidence that the effect of exploitation on CVC acquisition is increased when corporate mothers and startups operate in related product markets. Third, we contribute to the current academic discourse within the syndication literature on the effects of CVC investments from an acquisition perspective by providing empirical evidence that the number of different CVC investors in a startup affects the likelihood of a CVC acquisition.

4.2 Theory and hypotheses

4.2.1 Corporate venture capital

Research on CVC—that are direct minority equity investments in startups by large and established corporations through a corporate investment vehicle (Gompers & Lerner, 2000; Dushnitsky & Lenox, 2006)—is usually grounded in the CV or corporate entrepreneurship literature (Narayanan et al., 2009). Ellis and Taylor (1987, p. 528) define CV as the adoption of the "structure of an independent unit […] to involve a process of assembling and configuring novel resources". Particularly CVC practices can help corporations to overcome their internal R&D limitations (Brockhoff, 1998) by fostering innovation, technological development, and business practices across organizational boundaries (Winters & Murfin, 1988; Keil, 2000; Keil, 2004; Maula, 2007; Narayanan et al., 2009). How those CVC activities are structured depends on the underlying motivation of the corporate mother, a topic that has received wide-spread attention in the CVC literature (Winters & Murfin, 1988; Chesbrough, 2002; Ernst et al., 2005; Weber & Weber, 2005; Dushnitsky & Lenox, 2006; Röhm et al., 2018). Generally, CVC units are organized in one of two ways; either the corporate investment vehicle provides startups with equity through a self-managed and wholly-owned subsidiary, or the CVC unit acts as a LP in pooled and dedicated funds, typically managed by a third party such as an independent venture capitalist (McNally, 1995; Keil, 2000). The remainder of this study envisages the former organizational structure of a CVC unit, similar to the work of Ernst et al. (2005), because its aim is to investigate CVC acquisitions against the backdrop of a corporate mother's explorative or exploitative orientation. We believe that within the setting of CVC acquisitions the direct relationship between corporation and startup is paramount, which is evident in the amount of equity directly invested into the startup.

In view of the fact that corporations tend to explore and exploit through several external venturing modes such as alliances, joint ventures, or acquisitions (Narayanan et al., 2009), the case of CVC acquisitions provides a unique context. This is because CVC acquisitions allow us to scrutinize how pre-existing startup relationships in terms of CVC investments can ultimately result in an acquisition. Interestingly, prior research only reveals how corporations deal with both external venturing modes in comparative settings. For instance, based on real options logic, Tong and Li (2011) examine the choice between CVC investments and acquisitions as alternative venturing modes. The authors find that a corporation's propensity for CVC will increase if an investment is surrounded by an elevated level of market uncertainty. This finding is based on the fact that CVC investments can be staged, and therefore offer greater flexibility than acquisitions, which require a strong and irreversible financial commitment. Drawing on the same argumentation, Schildt et al. (2005) provide evidence that external venturing modes such as CVC, alliances, and joint ventures are preferable to acquisitions. Moreover, the literature highlights several ways in which established corporations benefit from CVC investments. In general, the use of CVC is positively related to a corporate mother's return on equity and revenue growth (Zahra & Hayton, 2008), the creation of firm value (Dushnitsky & Lenox, 2006) and the growth a corporate mother's innovation rate (Dushnitsky & Lenox, 2005a). However, acquisitions are also commonly said to be used to realize tax benefits (Hayn, 1989), create economic value (Chatterjee, 1986), or to gain access to customers, markets, and technologies (Salter & Weinhold, 1978).

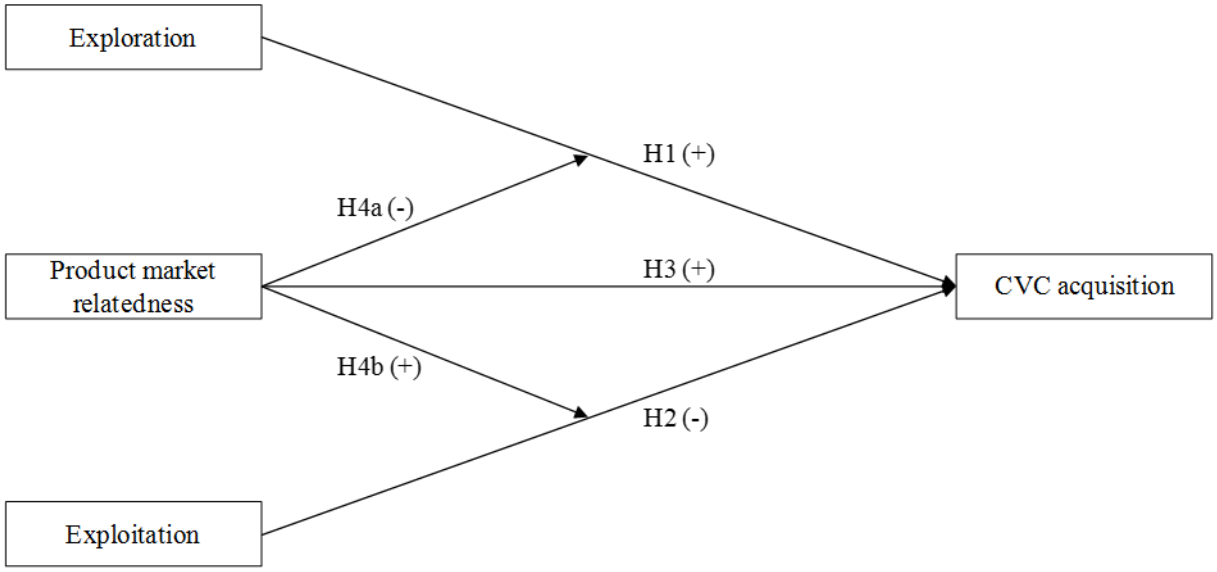
Astonishingly, only a few articles shift the independent view of the external venturing modes to a sequential one, where CVC vehicles are used as a strategic instrument to materialize startup investments into an acquisition by the corporate mother at a later point in time (Benson & Ziedonis, 2010; Dimitrova, 2015). While Dushnitsky and Lavie (2010) study the interrelationship between CVC investments and alliance formation—finding an inverted U-shaped association between the two—relatively little is known about the interplay of CVC investments and acquisitions. Two studies are particularly worth mentioning in this context: Dimitrova (2015) shows that corporate mothers tend to acquire startups that received prior funding through the mother's CVC vehicle when the startup outperforms the corporate mother in terms of innovativeness. Further, Benson and Ziedonis (2010) illustrate that CVC

acquisitions are associated with negative stock price reactions and a reduction in abnormal returns.

4.2.2 Exploration and exploitation in the context of CVC acquisition

This paper, in contrast to the comparative setting of previous work, focuses on the interplay of CVC investments and acquisitions. We argue that, depending on a corporate mother's degree of explorative and exploitative orientation, previous CVC investments in startups can influence the likelihood of an ultimate startup acquisition. In fact, a corporation acquiring startups from its own CVC portfolio can substitute for internal shortcomings and contribute to its external knowledge capabilities (Dimitrova, 2015). Therefore, we argue that a prior CVC investment can be interpreted as a clear signal of commitment (e.g., Wadhwa & Basu, 2013; Titus et al., 2017) which can spur the possibility of a CVC acquisition by the corporate mother.

Figure 9: Underlying conceptual model



Since the introduction of March's (1991) framework of explorative and exploitative organizational behavior, a wide range of studies has applied that framework to shed light on various phenomena (Lavie et al., 2010). Following previous research (e.g., Lubatkin, Simsek, Ling, & Veiga, 2006; Sirén, Kohtamäki, & Kuckertz, 2012; Titus et al., 2017), we consider both orientations as distinct, meaning that they can occur simultaneously (see Figure 9 for our conceptual model). In turn, exploration pertains to entrepreneurial actions to overcome internal R&D limitations by investing in external relationships (Phene et al., 2012) to gain insights into innovative technologies, products, services, and processes (Sirén et al., 2012). Accordingly, explorative orientation is strongly related to innovation, variation, and risk taking (March, 1991), thereby leveraging a firm's financial performance (Auh & Menguc, 2005; Uotila, Maula, Keil, & Zahra, 2009). Hence, several publications link the degree of explorative orientation to external corporate venturing modes in a comparative setting (e.g., Schildt et al., 2005; Wadhwa & Basu, 2013; Titus et al., 2017). Moreover, as summarized by Phene et al. (2012) a large part of the literature relates acquisitions to an acquirer's inclination toward exploration, arguing that a corporate mother's absorptive capacity, that is, the ability to extract specific knowledge from ventures (Dushnitsky & Lenox, 2005a), expands its underlying knowledge base. In that sense, Wadhwa and Basu (2013) show that CVC funds with a stronger explorative orientation tend to strengthen the resource commitment between startup and corporate mother more than CVC units with a stronger exploitative orientation. Against the backdrop of our research question, this resource commitment could stimulate the use of CVC acquisitions to expand a firm's knowledge base. Therefore, and due to the fact that acquisitions are also associated with a greater willingness to take risk (Pablo, Sitkin, & Jemison, 1996), which March (1991) ascribes to exploration, we suppose that corporate mothers exhibiting a greater degree of explorative orientation are also more acquisitive with regards to the portfolio companies of their CVC units.

Hypothesis 1: All else being equal, a corporate mother's degree of explorative orientation is positively related to CVC acquisition.

Exploitative orientation involves strengthening a firm's existing knowledge base (Lubatkin et al., 2006; Lavie et al., 2010) and among other things entails investing in internal R&D (Phene et al., 2012). Since corporate mothers with a greater degree of exploitative orientation seek to improve their existing knowledge base, they can capitalize on their CVC investments without necessarily acquiring a startup. They might therefore be less prepared to

risk an acquisition and might absorb knowledge from portfolio startups, for example, through the due diligence process accompanying CVC investments (Dushnitsky & Lenox, 2005a; Keil et al., 2008; Souitaris & Zerbinati, 2014), or through the presence of a CVC investment manager on a startup's board (Anokhin et al., 2011). Consequently, as corporate mothers with a greater degree of exploitative orientation are more inclined to improve their existing resource base through internal resources (Phene et al., 2012), we also expect them to be less involved in CVC acquisitions as we suppose that they use CVC investments as a means to transfer the knowledge from the startup without ultimately acquiring it. Accordingly, CVC investments can be beneficial for them, even without the acquisition of a focal startup. We therefore suggest that corporate mothers with a greater degree of exploitative orientation are less likely to be involved in CVC acquisitions.

Hypothesis 2: All else being equal, a corporate mother's degree of exploitative orientation is negatively related to CVC acquisition.

4.2.3 The moderating role of product market relatedness

The product market relatedness between acquirer and target has received significant attention in the literature (see Stellner (2015) for an overview). Cohen and Levinthal (1990) find that the absorptive capacity of an acquirer is enhanced when it operates in a similar industry as its target. This finding rests on the rationale that when the knowledge base and business conduct of both acquirer and target are aligned, it is easier for the acquirer to successfully integrate and exploit the knowledge of the target. A stronger product market relatedness means that the acquirer is endued with a greater market knowledge regarding products, services, customers, and suppliers (Wadhwa & Basu, 2013). In turn, Hoberg and Phillips (2010) studying the impact of product market relatedness in the formation of mergers and acquisitions, find that product market relatedness between acquirer and target increases the likelihood of a transaction. The authors argue that a higher level of product market relatedness facilitates the realization of product market synergies. Likewise, for the realm of CVC acquisitions, Dimitrova (2015) finds that industry similarity increases the likelihood of an acquisition. We hence hypothesize that CVC acquisitions are in general also more likely when corporate mother and startup operate in more closely-related product markets.

Hypothesis 3: All else being equal, the product market relatedness between startup and corporate mother is positively related to CVC acquisition.

Product market relatedness can play a decisive role in the linkage between E/E and CVC acquisition. Katila (2002) outlines how corporations with a greater tendency toward exploration are more inclined to generate knowledge distant from their existing resource base, seeking to explore products and services that are not related to their core industry. Because exploration involves risk taking and experimentation (March, 1991), it is regarded as the "pursuit of new knowledge" (Levinthal & March, 1993, p. 105). Therefore, acquirers with a greater degree of explorative orientation are likely to look for acquisition targets that operate in industries distant from their core competencies to broaden and extend their existing resource base (Phene et al., 2012). Drawing on these arguments, we suggest that the impact of exploration on CVC acquisition decreases when corporate mothers and startups operate in related industries.

Hypothesis 4a: All else being equal, the product market relatedness between startup and corporate mother negatively moderates the effect of exploration on CVC acquisition.

Levinthal and March (1993, p. 105) describe exploitation as "the use and development of things already known". Phene et al. (2012) outline that although most literature suggests that acquisitions are undertaken to aid exploration, acquisitions of targets from related industries can help the acquirer to improve its own knowledge base, for instance, through the amelioration of economies of scales in R&D. Accordingly, corporate mothers with a greater degree of exploitative orientation are likely to be more engaged in acquiring the portfolio startups of their CVC units when the startups can help them to build on their existing knowledge base, that is, to operate in closely-related product markets. In this case, corporate mothers might ultimately acquire those startups from their CVC unit's portfolio that help them to exploit their existing resource base. Consequently, we expect that a greater product–market relatedness between acquirer and startup positively moderates the effect of exploitation on CVC acquisition.

Hypothesis 4b: All else being equal, the product market relatedness between startup and corporate mother positively moderates the effect of exploitation on CVC acquisition.

4.3 Methodology

4.3.1 Sample and data

We constructed a unique data sample relying on *Dow Jones VentureSource*, a database commonly used in the CVC (e.g., Röhm et al., 2018) and venture capital (e.g., Gompers, Kovner, & Lerner, 2009) contexts. We chose *VentureSource* because the database provides valid data for more than 30,000 venture-backed startups with a strong focus on the U.S. venture capital market. The first step involved compiling all data available on startups that received at least one investment from a corporation or CVC vehicle, and that were acquired on or before 17 November 2016. Additionally, only startups headquartered in the U.S. were considered, thus excluding satellite and branch offices. In a second step, we cleaned the data obtained by dropping investment vehicles lacking a corporate background, such as hedge funds, investment banks, venture capitalists, real estate investors, angel groups, accelerators, public sector organizations, or diversified private equity investors. In line with the work of Alvarez-Garrido and Dushnitsky (2016) and other authors (e.g., Basu et al., 2011; Gaba & Dokko, 2016) we only retained corporations and CVC vehicles headquartered in the U.S., thus suppressing potential macroeconomic (e.g., Jeng & Wells, 2000) and cultural (e.g., Li & Zahra, 2012) influence factors. Owing to the predefined distinction in *VentureSource* between corporate investors and CVC being rather vague and not fitting the article's underlying definition of CVC, an additional data cleaning process was undertaken. To clearly distinguish between those two investment types, we drew on data from *S&P's Capital IQ* database, applying two classification criteria, consequently excluding those investors that did not comply with the following criteria: (i) investors must be listed as a subsidiary of a larger mother corporation, and (ii) corporate investment vehicles must not act as GPs for external investors, as this better suits the underlying motivation of CVC units to promote explorative and exploitative learning relevant for this study. Following this approach, 17 corporations that were initially not listed as CVCs by *VentureSource* were reclassified as CVCs. That group included *Tribune Ventures*, *TTC Ventures*, and the corporate investment arm of *Knight Ridder*. The above-mentioned approach also identified 40 corporations and 11 other investor types (mainly VCs, advisory corporations, and investment banks) erroneously listed on *VentureSource* as CVC vehicles, and we therefore dropped them from the sample. The excluded group contained direct startup investments from *Facebook Inc*. and *The Graham Holdings Corp*. Due to missing data in the *S&P Capital IQ* database, we could not classify 59 investors. We thus cross-checked these cases with *Bureau van Dijk's Orbis* database.

However, we encountered similar data issues and thus had to remove these 59 investors from the sample. The final sample comprises 901 unique CVC triads (Weber & Weber, 2011), each composed of a CVC vehicle, a corporate mother, and a startup.

Table 9 reports the distribution of the sample's CVC investments and the number of startups that were acquired by a corporate mother, which received at least one CVC investment through the mother's investment vehicle. We identified 124 CVC acquisitions, representing 14% of our overall sample, in the period 1996–2016. This percentage of CVC acquisitions compares favorably to that of Benson and Ziedonis (2010).

Table 9: Sample distribution of CVC investments and CVC acquisitions

Acquisition year	Acquisitions with CVC investment		CVC acquisitions	
	#	%	#	%
1996	4	.44%	1	.81%
1997	3	.33%	3	2.42%
1998	16	1.78%	3	2.42%
1999	23	2.55%	8	6.45%
2000	36	4.00%	3	2.42%
2001	43	4.77%	8	6.45%
2002	31	3.44%	4	3.23%
2003	38	4.22%	6	4.84%
2004	52	5.77%	8	6.45%
2005	70	7.77%	14	11.29%
2006	64	7.10%	11	8.87%
2007	71	7.88%	11	8.87%
2008	53	5.88%	14	11.29%
2009	46	5.11%	6	4.84%
2010	64	7.10%	8	6.45%
2011	50	5.55%	5	4.03%
2012	50	5.55%	2	1.61%
2013	40	4.44%	2	1.61%
2014	60	6.66%	4	3.23%
2015	44	4.88%	1	.81%
2016	43	4.77%	2	1.61%
Total	901	100%	124	100%

4.3.2 Measures

Dependent variable. Owing to the current study's focus on CVC acquisitions, we followed Benson and Ziedonis (2009, 2010) and Dimitrova (2015) and applied a dummy variable to capture if a CVC investment materialized into an acquisition by the corporate mother. The dependent variable is therefore dichotomous and indicates if a startup that has received prior funding through the mother's CVC vehicle has ultimately been acquired by the corporate mother or not (see Table 10 for an overview of the variables employed and their underlying definitions).

Independent variables. The first independent variable is a proxy for product market relatedness as suggested by several previous publications (e.g., Farjoun, 1998; Dushnitsky & Shaver, 2009; Wadhwa & Basu, 2013). Based on the primary SIC codes derived from *Compustat* and *Thomson One*, we calculate the product market relatedness between corporate mothers and startups. The variable takes the value of 1 if all four digits of the primary SIC codes are identical, indicating the highest possible product market overlap. Following this procedure, the variable takes the value of .75 if the first three digits match, .50 if the first two digits match, .25 if only the first digit is identical and 0 if all four digits are completely different (e.g., Schildt et al., 2005). It should be mentioned that based on the SIC codes 67% of the startups within our sample operate in service-related industries, while the majority of the corporate mothers (47%) are related to the manufacturing industry, including high-technology firms like, *Intel*, *General Electric*, *Cisco*, *Advanced Micro Device* or *Chevron*.

To operationalize the explorative and exploitative orientation of corporate mothers, we draw on the work of Moss et al. (2014). We rely on CATA (Short et al., 2010; McKenny et al., 2013) to capture the degree of a corporate mother's explorative and exploitative orientation in the fiscal year prior to the CVC acquisition. In comparison to other established measures of E/E (e.g., Auh & Menguc, 2005; Schildt et al., 2005; Hill & Birkinshaw, 2008; Phene et al., 2012; Sirén et al., 2012), the advantages using predefined word lists in conjunction with CATA are threefold.

Table 10: List of applied variables and their definitions

Variable	Definition	Data sources
Dependent variable		
CVC acquisition	Dummy variable indicating if a corporate mother has acquired a startup that has received prior funding through the mother's CVC vehicle	Dow Jones VentureSource
Independent variables		
Product market relatedness	Equals 1 if all four digits of the primary SIC codes of corporate mother and startup match; .75 if the first three digits match; .50 if the first two digits match; .25 if only the first digit matches, and 0 if all four digits are completely different	Compustat, Thomson One
Exploration	The degree of a corporate mother's explorative orientation of the fiscal year prior to the acquisition based on the word list of Moss et al. (2014)	Shareholder letter
Exploitation	The degree of a corporate mother's exploitative orientation of the fiscal year prior to the acquisition based on the word list of Moss et al. (2014)	Shareholder letter
Control variables		
Acquisition year	Year in which a CVC-backed startup was acquired	Dow Jones VentureSource
Mother total assets	Natural logarithm of the book value of a corporate mother's total assets of the fiscal year prior to the acquisition	Compustat, Bloomberg
Mother R&D intensity	Ratio of the corporate mother's R&D expenses to its revenues of the fiscal year prior to the acquisition	Compustat, Bloomberg
CVC acquisitions 3 years	Number of CVC acquisitions of the corporate mother in the three years preceding the respective acquisition	Dow Jones VentureSource
Startup age	Acquisition year minus founding year of the respective startup	Dow Jones VentureSource, Thomson One
# CVCs invested	Number of CVCs invested in a startup prior to the acquisition	Dow Jones VentureSource
[·] stage	Series of dummy variables referring to the development stage of the respective startup in the last financing round prior to the acquisition	Dow Jones VentureSource

First, this method allows us to draw on publicly accessible reports that are available for a wide range of companies, operating in profoundly different industries covering a long period of time. Second, CATA allows us to derive theoretically based but difficult to measure constructs from organizational text excerpts, accounting for a broad scope of corporate mothers' actions (Uotila et al., 2009). Third, analyzing excerpts of texts produced by an organization using CATA is deeply rooted and widely accepted within the management (e.g., Uotila et al., 2009; Zachary et al., 2011) and finance research landscape (e.g., Bukh, Nielsen, Gormsen, & Mouritsen, 2005; Li, 2010). To construct the measures of E/E, we gathered shareholder letters to extract the corporate mother's explorative and exploitative orientation. This is because shareholder letters are very important (Short et al., 2010) and the most often read organizational narrative (Courtis, 1982) as they serve to communicate the corporation's underlying strategic orientation, among other things (Moss et al., 2014). We used multiple data sources including *Morningstar*, *LexisNexis*, *Bloomberg*, *annualreports.com*, *annualreportowl.com* and corporate websites to collect the shareholder letters. In a final step, we used the software package *LIWC2015* to determine the ratio of all words that match the E/E word lists to the total word count of the underlying text corpus, thereby automatically controlling for size effects (Tausczik & Pennebaker, 2010). On average, the shareholder letters examined comprise 1,821.95 words (SD = 1,110.05, max = 7,646) with a total mean of 22.51 words per sentence (SD = 3.48, max = 33.64).

Controls. We further added an extensive number of control variables to our analysis that might influence the probability of acquiring a startup that received prior funding through the mother's CVC vehicle. Since both CVC (Gompers & Lerner, 2000; Dushnitsky & Lenox, 2006) and merger and acquisition activities (Harford, 2005; Bauer & Matzler, 2014) are cyclical in nature, we control for the year in which a CVC-backed startup was acquired. Given that prior research found positive correlations between firm size and a corporation's innovation behavior (e.g., Phene & Almeida, 2008), we control for size effects of the corporate mother, a measure commonly used in the CVC grounded literature (e.g., Dushnitsky & Lenox, 2005a; Benson & Ziedonis, 2009; Chemmanur et al., 2014). Therefore, we include the natural logarithm of the book value of a corporate mother's total assets of the fiscal year prior to the acquisition. Furthermore, by employing the ratio of the corporate mother's R&D expenses to its revenues in the fiscal year prior to the acquisition, we control for the possibility that R&D-intense acquirers have a greater tendency to be explorative (Phene & Almeida, 2008; Phene et al., 2012). For six percent of our sample, we could not find the

respective R&D expenditures in the databases. In these cases, we used the average R&D expenditures of the corresponding industry (based on the four-digit primary SIC codes) as a proxy. Furthermore, prior research from Benson and Ziedonis (2010) shows that corporate mothers tend to over-evaluate possible synergy effects when acquiring a startup from their portfolios, resulting in an escalation of commitment. On the other hand, corporate mothers that have previously undertaken CVC acquisitions might also be more likely to do so in general. To control for this, we include the total number of CVC acquisitions of the corporate mothers in the three years preceding the respective acquisition. We also account for the development stage of a startup by including a series of dummy variables and a startup's age at the acquisition (Benson & Ziedonis, 2010). Finally, in line with Dimitrova (2015) we take potential acquisition competitors into consideration by counting the number of different CVCs invested prior to the acquisition.

4.4 Results

Table 11 reports the descriptive statistics and correlations of the variables employed in the analysis. In line with Benson and Ziedonis (2010), within our sample, 14% of the acquired startups had previous equity relations in terms of receiving CVC investment through a corporate mother's CVC vehicle. At the time of acquisition, the startups were on average 7.84 years old and received funding from 1.23 CVCs. Moreover, in the three years prior to an acquisition the mother companies acquired an average of 2.75 portfolio startups of their CVC units. Notably, the maximum of 30 CVC acquisitions in the three years preceding an acquisition shows that some corporate mothers are very active in acquiring portfolio companies identified by their CVC vehicles. While previous CVC acquisitions correlate positively with the dependent variable ($r = .44$, $p \leq .001$), the number of CVCs invested is negatively related to CVC acquisition ($r = -.08$, $p \leq .05$). Moreover, startup age has a significant and negative relation with the dependent variable ($r = -.10$, $p \leq .01$). As suggested, product market relatedness shows a significant and positive correlation with CVC acquisition ($r = .07$, $p \leq .05$). The degree of the exploitative orientation of a corporate mother in the fiscal year prior to the acquisition is negatively associated with CVC acquisition ($r = -.11$, $p \leq .001$), whereas its degree of explorative orientation is positively, but non-significantly correlated with CVC acquisition ($r = .03$, n.s.). On top of this, we accounted for multicollinearity by examining the variance inflation factors (VIFs). All VIFs are far less than the suggested threshold of 10, indicating that multicollinearity is not an issue (e.g., O'Brien, 2007).

Table 11: Descriptive statistics and correlations

Variable	Max	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. CVC acquisition	1.00	.14	.35	- / -															
2. Product market relatedness	1.00	.17	.32	.07*	- / -														
3. Exploration	2.05	.64	.36	.03	.16***	- / -													
4. Exploitation	2.36	.67	.41	-.11***	-.02	-.26***	- / -												
5. Acquisition year	2016	2007.67	4.97	-.16***	.10**	.41***	-.08*	- / -											
6. Mother total assets	14.17	10.02	8.31	.05	-.13***	-.04	.08*	.10**	- / -										
7. Mother R&D intensity	.43	.09	.14	-.02	-.03	.01	.22***	.15***	.80***	- / -									
8. CVC acquisitions 3 years	30.00	2.75	5.15	.44***	-.09**	-.11***	-.01	-.32***	.07*	.03	- / -								
9. Startup age	37.00	7.84	6.22	-.10**	-.09*	.02	.01	.25***	-.06†	-.01	-.04	- / -							
10. # CVCs invested	4.00	1.23	.52	-.08*	-.05	.01	-.03	.08*	.02	-.04	-.07*	.03	- / -						
11. Product development stage	1.00	.25	.43	-.07†	.16***	.04	-.06†	.01	.05	.10**	-.07*	-.11***	-.02	- / -					
12. Beta testing stage	1.00	.06	.23	-.02	.10**	.04	-.01	.02	.02	.04	-.03	-.03	.06†	-.14***	- / -				
13. Profitable stage	1.00	.05	.22	.15***	-.06†	.01	.01	.10**	.04	.02	.09**	.20***	-.07*	-.13***	-.06†	- / -			
14. Restart stage	1.00	.00	.03	-.01	-.02	.01	-.02	-.03	.00	.01	.01	.02	-.02	-.02	-.01	-.01	- / -		
15. Startup stage	1.00	.02	.14	.04	.10**	.08*	-.04	.08*	.02	.04	-.04	-.17***	-.00	-.08*	-.04	-.03	-.01	- / -	
16. Revenue stage	1.00	.62	.49	-.01	-.19***	-.08*	.07*	-.08*	-.08*	-.13***	.04	.07*	.02	-.74***	-.32***	-.30***	-.04	-.18***	- / -

n = 901. *** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$; † $p \leq .1$.

As our dependent variable is binary in nature, we applied a logistic regression to test our hypotheses. The results of the regression are shown in Table 12. In our baseline model, we only include the control variables and then successively add the key independent variables of interest. Analogously, we add the interaction terms discussed in Hypotheses 4a and 4b in a successive manner to Model IV, meaning that Model VII represents our full model. The pseudo R^2 statistic in Model VII exhibits a decent model fit explaining 37.5% of the variance (Nagelkerke, 1991) and shows a strong increase when compared to the pseudo R^2 of 29.8% in the baseline model. The control variables in both the baseline model and Model VII, with the exception of the corporate mother's total assets and the number of CVC acquisitions, are negative and statistically significant. This means that, for instance, R&D intensity (β = -3.41, p = .078) and the number of CVCs invested (β = -.63, p = .050) reduces the likelihood of a CVC acquisition. The number of previous CVC acquisitions (β = .17, p = .000) exhibits a significantly positive coefficient. The total assets of a corporate mother (β = .21, p = .116) have a positive, but insignificant effect. Model I includes the control variables and the product market relatedness between the acquirer and the respective startup, which in line with expectations is positive and significant (β = 1.79, p = .000). In Model II together with the control variables, the degree of the explorative orientation of a corporate mother in the fiscal year prior to an acquisition is introduced, and has the expected significant and positive coefficient (β = 1.02, p = .003). In Model III analogous to Model II, the degree of a corporate mother's exploitative orientation is added to the control variables, showing the predicted significant negative coefficient (β = -1.03, p = .002). Model V presents the interaction term of exploration and product market relatedness and is as suggested negative (β = -2.11, p = .018). Analogously, Model VI includes the interaction term of exploitation and product market relatedness and shows a positive coefficient (β = 1.83, p = .013). Model VII represents the full model. For the direct effects, we find a significantly positive effect of product market relatedness on CVC acquisition (β = 1.79, p = .053), thus supporting Hypothesis 3. Furthermore, Hypothesis 1 suggested that a greater degree of explorative orientation on the part of a corporate mother increases the likelihood of a CVC acquisition. Consistent with this hypothesis, exploration is positive and significant (β = 1.33, p = .005). And Hypothesis 2, on the other hand, predicted that the degree of exploitative orientation of a corporate mother will decrease the likelihood of a CVC acquisition. Our results thus support Hypothesis 2, indicating that corporate mothers with a greater degree of exploitative orientation are significantly less likely to acquire a startup that has received previous funding from the mother's CVC unit (β = -1.45, p = .002).

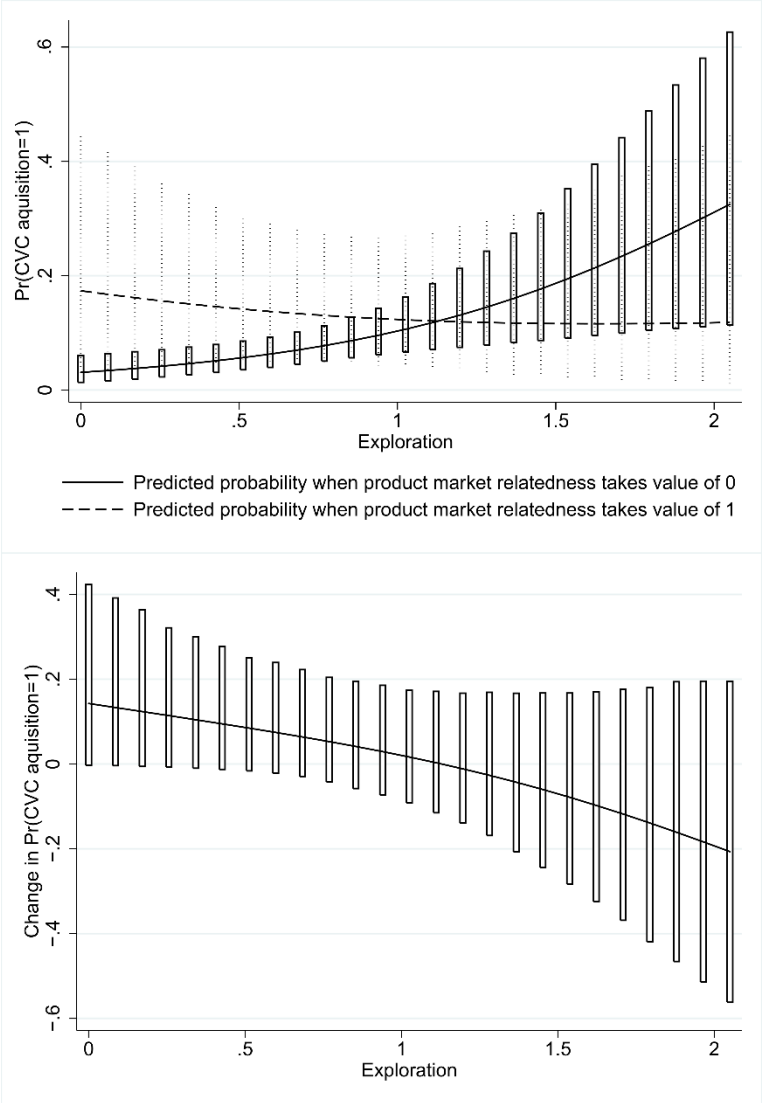
Table 12: Results of the logistic regression examining the effects on CVC acquisition

Independent variables	Baseline Model		Model I		Model II		Model III		Model IV		Model V		Model VI		Model VII	
	β (SE)	Exp(β)	β (SE)	Exp(β)	β (SE)	Exp(β)	β (SE)	Exp(β)	β (SE)	Exp(β)	β (SE)	Exp(β)	β (SE)	Exp(β)	β (SE)	Exp(β)
Product market relatedness			1.79*** (.35)	5.98					1.74*** (.36)	5.69	3.07*** (.67)	21.45	.52 (.61)	1.68	1.79† (.93)	6.00
Exploration					1.02** (.35)	2.78			.69† (.38)	2.00	1.38** (.46)	3.98	.80* (.39)	2.22	1.33** (.47)	3.77
Exploitation							-1.03** (.34)	.36	-.78* (.33)	.46	-.92** (.34)	.40	-1.49** (.47)	.23	-1.45** (.46)	.23
Exploration × Product market relatedness											-2.11* (.89)	.12			-1.65† (.91)	.19
Exploitation × Product market relatedness													1.83* (.74)	6.25	1.51* (.77)	4.52
Controls																
Acquisition year	-.05† (.03)	.95	-.07* (.03)	.93	-.08** (.03)	.92	-.06* (.03)	.95	-.10** (.03)	.91	-.10** (.03)	.91	-.10** (.03)	.90	-.10*** (.03)	.90
Mother total assets	.16 (.13)	1.18	.23† (.13)	1.26	.13 (.12)	1.14	.14 (.13)	1.16	.18 (.13)	1.19	.18 (.13)	1.20	.21 (.13)	1.24	.21 (.13)	1.23
Mother R&D intensity	-3.60* (1.67)	.03	-5.54** (1.81)	.00	-3.53* (1.68)	.03	-1.72 (1.80)	.18	-4.19* (1.92)	.02	-3.60† (1.91)	.03	-3.65† (1.96)	.03	-3.41† (1.94)	.03
CVC acquisitions 3 years	.16*** (.02)	1.17	.17*** (.02)	1.18	.17*** (.02)	1.18	.16*** (.02)	1.18	.17*** (.02)	1.19	.17*** (.02)	1.19	.17*** (.02)	1.19	.17*** (.02)	1.19
Startup age	-.04* (.02)	.96	-.04† (.02)	.96	-.04† (.02)	.97	-.04* (.02)	.96	-.04† (.02)	.97	-.04* (.02)	.96	-.03† (.02)	.97	-.04† (.02)	.96
# CVCs invested	-.61* (.30)	.55	-.58† (.31)	.56	-.61* (.31)	.55	-.60* (.30)	.55	-.57† (.31)	.57	-.62† (.32)	.54	-.59† (.32)	.55	-.63* (.32)	.53
Product development stage	Included		Included		Included		Included		Included		Included		Included		Included	
Beta testing stage	Included		Included		Included		Included		Included		Included		Included		Included	
Profitable stage	Included		Included		Included		Included		Included		Included		Included		Included	
Restart stage	Included		Included		Included		Included		Included		Included		Included		Included	
Startup stage	Included		Included		Included		Included		Included		Included		Included		Included	
Constant	Included		Included		Included		Included		Included		Included		Included		Included	
Model fit	-2 LL = 560.22 Nagelkerke's R^2 = .298		-2 LL = 535.50 Nagelkerke's R^2 = .339		-2 LL = 551.98 Nagelkerke's R^2 = .312		-2 LL = 549.67 Nagelkerke's R^2 = .316		-2 LL = 522.92 Nagelkerke's R^2 = .360		-2 LL = 517.16 Nagelkerke's R^2 = .369		-2 LL = 516.75 Nagelkerke's R^2 = .369		-2 LL = 513.40 Nagelkerke's R^2 = .375	

n = 901. *** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$; † $p \leq .1$.

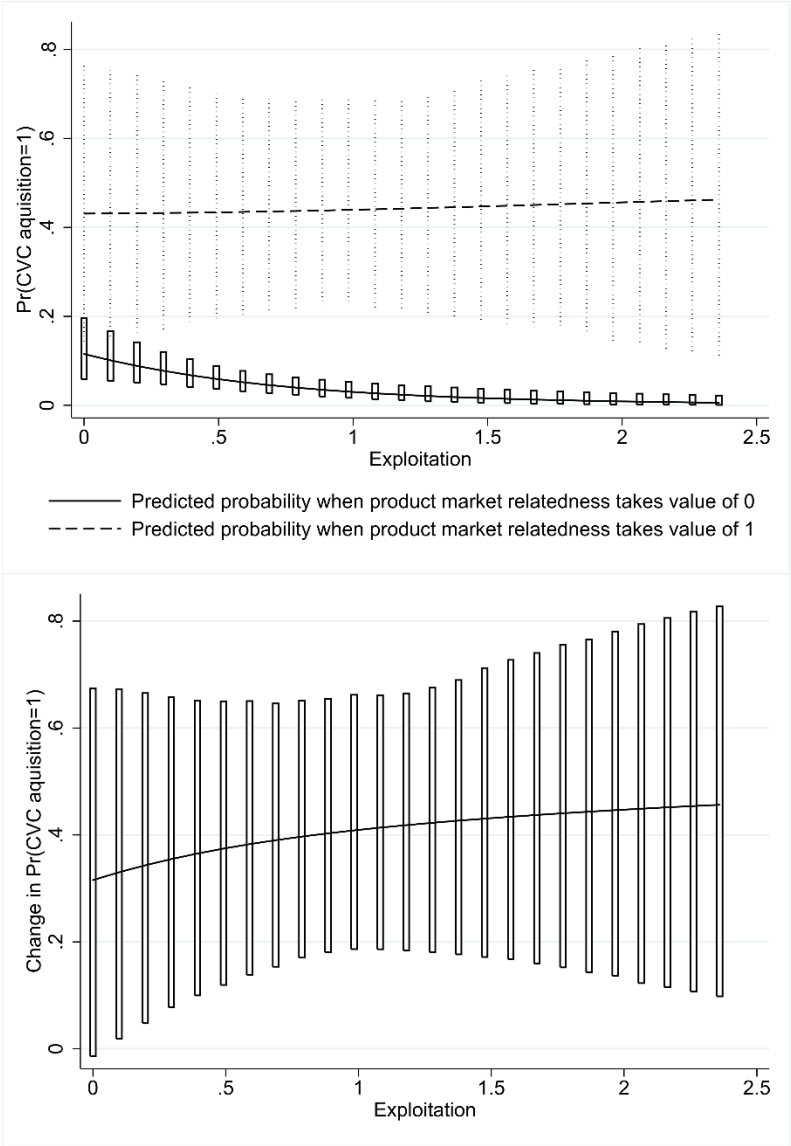
Regarding the interaction effects, Hypothesis 4a postulated that the product market relatedness negatively moderates the effect of exploration on CVC acquisition. The interaction term of exploration and product market relatedness is negative, thus generally indicating support for Hypothesis 4a (β = -1.65, p = .071). Finally, with regards to Hypothesis 4b, the results show a positive coefficient for the interaction term of exploitation and product market relatedness (β = 1.51, p = .049). To allow for a statistically valid interpretation of the interaction effects (Hypothesis 4a and 4b), we used the well-established (e.g., Kuckertz et al., 2015) simulation-based approach introduced by Zelner (2009). Following King, Tomz, & Wittenberg (2000) and Hoetker (2007) the results for the full model are also graphically depicted in Figure 10 and Figure 11.

Figure 10: Interaction analysis of exploration and product market relatedness



As outlined by Ai and Norton (2003), not considering the marginal effect of the interactions in non-linear models could lead to biases in the interpretation of their magnitude, direction and significance. Thus, we run 1,000 simulations to examine the effect of the changes of our key independent variables on the differences in predicted probabilities of the dependent variable, while holding all other variables at their corresponding means. Figure 10 shows that product market relatedness moderates the influence of exploration on the probability of a CVC acquisition negatively, for moderate to high values of exploration. However, this result is not statistically significant at the 95% confidence interval, therewith not lending support to Hypothesis 4a. Figure 11 strongly supports Hypothesis 4b showing that product market relatedness positively and significantly moderates the relationship between exploitation and CVC acquisition for all levels of exploitation.

Figure 11: Interaction analysis of exploitation and product market relatedness



In addition to the above, we conducted additional robustness checks taking into account, for instance, the travel and direct distance between the corporate mothers and the respective startups, using STATA's geodist (Picard, 2010) and georoute command (Weber & Peclat, 2016), and found robust results.

4.5 Discussion

There is an increasing amount of research that relates E/E to either CV and CVC or acquisitions, thereby ignoring the effect of E/E on the potential interplay between both external venturing modes. This study sought to fill that void by examining the interrelationship between CVC and startup acquisitions by focusing on the underlying explorative and exploitative orientation of a corporate mother. Consequently, this study is the first to empirically test this potential interplay. We test our hypotheses by applying a logistic regression analysis and further interaction analysis based on Zelner (2009) to scrutinize 901 unique CVC triads that consist of corporate mother, CVC unit, and startup. Of these 901 transactions 124 characterized CVC acquisitions, meaning that corporate mothers acquired startups funded through their own CVC unit. Furthermore, to extract a corporate mother's degree of explorative and exploitative orientation, we relied on CATA because this allowed us to draw on publicly available shareholder letters. The advantage of this measure of E/E is that we can use the organizational narrative that directly relates to the potential acquirer (Uotila et al., 2009), that is, the corporate mother, and which provides insights into the mother's business activities and its underlying self-conception (Leuthesser & Kohli, 1997). Taken together, our results untangle the interplay between CVC investments and acquisitions. In that sense, our findings indicate that the influence of a corporate mother's explorative and exploitative orientation is directly linked to the possibility of a CVC acquisition. Our results highlight that a corporate mother's explorative orientation raises the likelihood of a CVC acquisition, and vice versa for more exploitative oriented corporate mothers. However, our results also show that the product market relatedness between corporate mother and startup negatively (positively) moderates the effect of exploration (exploitation) on CVC acquisition, albeit our additional interaction analysis showed that the moderating effect is only statistically meaningful for exploitation.

In drawing on the framework of E/E, our results relating to the interplay of CVC investments and acquisitions offer interesting and novel insights into corporate mothers'

acquisition behavior. The findings therefore contribute to the under-researched topic of startup acquisitions in general (Andersson & Xiao, 2016), and specifically to the phenomenon of CVC acquisitions (Benson & Ziedonis, 2010; Dimitrova, 2015). We do this in particular by holistically taking into account all three parties involved in the CVC triad. Thus, our results help us to explain that CVC investments facilitate startup acquisitions when the corporate mother is more inclined to take risks and to learn about new opportunities, underscoring that it is more explorative in nature. We thus find strong support for the position that external venturing modes of CVC investment and acquisitions should not be considered separately but as complementary modes. Hence, our work adds to the small, but increasingly important research stream studying the interplay of external venturing modes (e.g., Dushnitsky & Lavie, 2010; Dimitrova, 2015). In light of this, we introduce the concept of E/E to the phenomenon of CVC acquisition, which enables us to explicitly examine and include the strategic orientation of a corporate mother. Doing so allows us to simultaneously study the interaction of their explorative and exploitative orientation in relation to their product market relatedness with the focal startup; an interaction we could not have explored without adopting this theoretical angle. Hence, this made it possible for us to shed light on the fact that corporate mothers with a more exploitative orientation tend to acquire startups with a high product market overlap. Our study, in turn, confirms the concept of E/E by also highlighting that corporate mothers with a greater degree of exploitative orientation capitalize on their CVC investments to acquire startups from related industries that enable them to strengthen their own knowledge base seeking to sustain a competitive advantage (Garrett, Covin, & Slevin, 2009; Sirén et al., 2012). Another important aspect of our study is that we draw on the CATA-based measure of E/E, thereby putting into perspective that exploration and exploitation are not two contradicting ends of a continuum (Gupta et al., 2006), but that corporate mothers simultaneously follow both orientations to different degrees. Our findings thus provide strong validation of the CATA-based measure of E/E introduced by Uotila et al. (2009) and extended by Moss et al. (2014). Finally, our findings indicate that a higher number of CVCs invested in a startup decreases the likelihood of the startup being acquired by an associated corporate mother. This means that corporate mothers shy away from an acquisition when other corporations had access to the same startup's knowledge, suggesting that they do not want to risk acquiring knowledge already accessed and shared with a potential competitor; an important aspect that, except in Dimitrova (2015), has not been investigated in the academic discourse. Intriguingly, in contrast to Dimitrova (2015) who discussed this aspect but could not find empirical evidence, our results support this notion.

4.5.1 Limitations and paths for future research

This paper has four noteworthy limitations that pave the way for future research. First, our study examined CVC acquisitions in the U.S. context, meaning that startups, corporate mothers, and CVC vehicles were all headquartered in the U.S. However, the explorative and exploitative orientation of a corporate mother might differ across different countries and cultures (Cui, Walsh, & Zou, 2014) and might also have a varying effect when startups are acquired worldwide (Petruzzelli, 2014). Consequently, we encourage future research to extend our work by studying the effect of E/E on CVC acquisition by similarly taking into account worldwide CVC acquisitions. In this vein, geographical distance might also play a more significant role. Second, we put careful thought into our measures of E/E to guarantee that these fit the context of the CVC triad underlying our research question. Nevertheless, as discussed above, there are many other well-established measures of E/E employed in the literature (e.g., Hill & Birkinshaw, 2008; Sirén et al., 2012). In addition, we measured the product market relatedness between corporate mothers and startups based on the overlap of their primary SIC codes. We acknowledge the criticism of this measure (Montgomery, 1982), but followed the argumentation of previous research that the SIC code is more applicable and generalizable than other measures. We thus challenge future studies to test the robustness of our findings by applying alternative measures of E/E and product market relatedness. Third, our study focused on startup acquisitions by corporate mothers that received funding through the mother's CVC unit. Indeed, since CVC investments are the most arms-length external venturing mode (Schildt et al., 2005) characterized by a strong resource commitment (Wadhwa & Basu, 2013), CVC investments are probably the most likely external venturing mode ultimately resulting in a startup acquisition. That notwithstanding, there are also other external venturing modes with pre-existing startup relationships, such as alliances (e.g., Schildt et al., 2005), that might result in the acquisition of a startup. In this regard, future research should extend our work linking E/E and startup acquisitions by simultaneously taking into account other external venturing modes alongside CVC investments. Likewise, it would constitute a fruitful avenue to examine if startups with pre-existing relationships with corporations, particularly in terms of receiving CVC investments, are more likely to be acquired by these companies as compared to startups that lack such a pre-existing relationship. Fourth, the current research has drawn on E/E theory to shed light on the determinants ultimately driving the acquisition of startups with pre-existing CVC equity relationships, and therefore has not addressed the impact of E/E on successful and

unsuccessful CVC acquisitions from a post-acquisition perspective. Interestingly, Benson and Ziedonis (2010) found that CVC acquisitions are associated with shareholder value destruction. To address this conundrum, future research should therefore include the explorative and exploitative orientation of a corporate mother so as to study the impact on the success of CVC acquisitions; particularly in light of the fact that prior research found that E/E impacts a corporation's financial performance (Uotila et al., 2009; Sirén et al., 2012).

4.6 Conclusion

Despite its theoretical and practical relevance there is virtually no research available on the phenomenon of CVC acquisition, that is, corporate mothers acquiring a startup that received funding through its CVC unit. Thus, the goal of this study was to examine the phenomenon of CVC acquisition by linking it to the explorative and exploitative orientation of corporate mothers. In doing so, the study applied a logistic regression by capitalizing on a diligently constructed sample of 901 unique CVC triads (reflecting 124 CVC acquisitions) comprising startups, CVC units and corporate mothers in the period 1996–2016. Our results show that corporate mothers with a greater degree of explorative orientation have a greater likelihood of acquiring startups that have been funded through their own CVC vehicles, while the opposite holds true for acquirers with a greater degree of exploitative orientation. In addition, our findings also reveal that the product market relatedness between corporate mother and startup negatively (positively) moderates the effect of exploration (exploitation) on the likelihood of a CVC acquisition. As shown by the supplemental simulation-based interaction analysis the interaction effect, however, is only statistically significant for exploitation. As a whole, our results emphasize the important link between E/E and CVC acquisition and thereby illuminate promising paths for future work.

5 Identifying Corporate Venture Capital Investors – A Data-Cleaning Procedure

Abstract

The majority of research on corporate venture capital relies on data retrieved from secondary databases. As a result, on most occasions CVC researchers accept the definitions that are integral to those databases. Because the definitions vary, results of empirical CVC research are often not comparable, and replicability across databases becomes impossible, thus hampering the progress of this research stream. To address this issue, we examine the scope and consistency of the two most popular databases among CVC researchers: *Eikon* from *Thomson Reuters* and *Dow Jones VentureSource*. In doing so, we develop a replicable data-cleaning procedure based on an appropriate CVC definition, thus providing a common ground for the future discourse on the CVC phenomenon.

5.1 Introduction

CVC is increasingly becoming a means through which established firms gain an edge in today's business. According to the NVCA (NVCA, 2018), CVC deals worth a record amount of over $37 billion were funded in the United States in 2017. The CVC concept is fairly straightforward. Investment funds, so called CVC units, are usually established within a parent company (Dushnitsky, 2006). The funds target nascent firms with high-potential technologies that are usually strategically aligned with the mother firm (Ernst et al., 2005). CVC investments provide start-ups with capital and industry knowledge (e.g., Park & Steensma, 2013; Chemmanur et al., 2014; Alvarez-Garrido & Dushnitsky, 2016), and in turn, the parent companies get access to potentially disruptive technologies and emerging markets (e.g., Dushnitsky & Lenox, 2005a; Wadhwa & Kotha, 2006). The increased CVC activity has stimulated academic interest in the topic, resulting in a rapidly growing body of research (see Röhm forthcoming for an overview). However, empirical research into its workings and impact has been hindered by data limitations and the lack of a common definition of CVC, and that lack of a common definition makes it particularly difficult to gauge the progress being made in CVC research.

Although there have been some attempts to propose a common theoretically-grounded CVC definition for future empirical work (e.g., Bengtsson & Wang, 2010; Dimov & Gedajlovic, 2010; Chemmanur et al., 2014; Pahnke et al., 2015), the majority of empirical studies ground their definition of CVC on presets from the corresponding data providers. The problem is that each database has its own CVC definition. *VentureSource*, for example, classifies investors as a CVC if they invest in ventures through a dedicated fund to simultaneously achieve financial and strategic objectives (personal communication, September 10, 2017). In contrast *Eikon* treats corporate subsidiaries as CVCs if they are actively involved in PE related investments (personal communication, September 21 to October 30, 2017). Even for the same database, it is hard to replicate empirical results because the understanding of CVC activities varies among researchers (see e.g., Dushnitsky, 2006 for an overview) and most studies give no detailed information on the applied search settings within the commercial databases.

Additionally, researchers have reported inconsistencies among databases. The comparison of VC related databases has only rarely been addressed in the literature (e.g., Lerner, 1994; Lerner, 1995; Kaplan, Strömberg, & Sensoy, 2002; Maats, Metrick, Yasuda, Hinkes, & Vershovski, 2011). In fact, we are unaware of any detailed comparison of CVC data. The lack of a precise CVC definition and a common data-cleaning process makes it hard to discern commonalities among previous studies. Building on the theoretical literature, we characterize CVC units as wholly-owned subsidiaries of nonfinancial corporations that invest in start-ups on behalf of their corporate parent (e.g., Souitaris et al., 2012; Chemmanaur et al., 2014) and propose a replicable data-cleaning procedure for this definition for the two databases most popular among CVC researchers: *Eikon* from *Thomson Reuters* and *Dow Jones VentureSource*. We thereby help to put future CVC research on a common footing, which would facilitate academic discussion and promote coherence across future research. Additionally, we contribute to the literature on the consistency and reliability of VC related databases (e.g., Lerner, 1994, 1995; Kaplan et al., 2002; Maats et al., 2011) by shedding light on the scope of CVC data in the two most extensively used databases.

5.2 Relevant databases for CVC research

To identify the most prominent databases for CVC research, we conducted an extensive literature review based on *Elsevier's Scopus* database. In this vein, we searched *Scopus* for

occurrences of the search strings "venture capital" or "corporate venture capital" in either the title, abstract, or keywords. Additionally, we limit the results to academic papers published in journals up until March 2018 and written in English. In total, we were able to download 2,128 unique articles. To extract information about the underlying databases used by the articles, we applied *LIWC2015* from Pennebaker, Boyd, Jordan, and Blackburn (2015), and controlled for inconsistencies in spelling.[18] With 551 appearances *Eikon* (also known as *Thomson One, VentureXpert*, or *Venture Economics* and collecting data since 1961) is used most extensively, followed by *VentureSource* (also known as *VentureOne* and collecting data since 1994) with 95 appearances. Other databases such as *Crunchbase* (26 appearances), *Preqin* (31 appearances), *Pitchbook* (9 appearances) and *CB Insights* (9 appearances) only play a minor role.[19] These results compare favorably to those of Da Rin et al. (2013), who claimed the two primary commercial databases that have been used in venture capital research are *Thomson Reuters' Eikon* and *VentureSource* from *Dow Jones*.[20] Hence, we will focus on those two databases in the remainder of this paper.

VentureSource provides information for 36,000 VC investors and offers data points for about 101,000 PE- and VC-backed companies. In cooperation with *Sand Hill Economics*, a rich collection of post-money valuations can be accessed (VentureSource, 2018). In comparison, the "private equity screener" of *Eikon* comprises information on about 22,000 investors with 51,000 funds and a total number of 133,000 PE- and VC-backed companies. Moreover, the database makes it possible to utilize the "Cambridge associates benchmark calculator" to acquire a strong understanding of performance related issues for PE investments (Thomson Reuters, 2018). The frequency of updates for both databases is comparable. To gather information from the rapidly evolving VC industry both databases use a similar procedure including the use of extensive quarterly surveys in which investors in the VC industry participate. This step in the data collection is particularly suited to gaining access to sensitive information that is not presented in official deal statements. In addition, *VentureSource* uses its *Factiva* database and a web crawler to identify information on an investor's homepage or from its press releases (personal communication, September 10, 2017). Likewise, *Eikon* draws on government fillings, public news releases, and on PE newsmakers including the *European Venture Capital and Private Equity Journal* and the

[18] For instance, we used *VentureSource* and *Venture Source* as alternative forms of spelling.
[19] Because some articles discuss several databases simultaneously, the counts cannot be interpreted as mutually exclusive.
[20] See Da Rin (2013) for a detailed overview of other data sources.

Private Equity Week (personal communication, September 21 to October 30, 2017; Thomson, 2008; Thomson, 2010).

5.3 Data sample

To develop a common data-cleaning process for the given CVC definition, we rely on the two primary databases: *Thomson Reuters' Eikon* and *Dow Jones VentureSource*. For each database we construct two samples, one for US-based CVCs and one for CVC vehicles headquartered in Europe.[21] In order to cover most of the recurring CVC waves (Gompers & Lerner, 2000; Dushnitsky & Lenox, 2006), we draw on an extensive dataset ranging from January 2000 to December 2015. In addition, we do not restrict the country of origin for the investees considered, thus allowing for cross-country investments.

In both databases, the search criteria were set to an appropriate minimum, reducing the risk of omitting a CVC unit due to incorrect classification in the databases. Accordingly, besides the geographical settings, we predefine "Corporate Venture Capital" as an investor type in *VentureSource* and "Corporate PE/Venture" as a firm type in *Eikon*. For the predefined period of sixteen years we found 629 investors, 9,602 investees and a total of 19,077 investment rounds (Europe: 282 investors, 2,737 investees, 4,540 investment rounds) for the US-based *Eikon* sample. For *VentureSource* our initial data set comprised 235 investors, 4,532 investees and a total number of 7,719 investment rounds (Europe: 171 investors, 2,026 investees, 3,283 investment rounds). The previously specified samples serve as a starting point for the subsequent data-cleaning process.

5.4 Data-cleaning process

The proposed data-cleaning procedure comprises seven steps resulting in the given definition of CVC units. The underlying methodology of the data-cleaning procedure is shown in Figure 12. In the following section, we introduce each step of the procedure separately and discuss how the underlying samples from both databases are affected. Table 13 offers an overview to outline the number of excluded investors, investees, and investment rounds for both data providers and for each continent separately, based on the criteria applied.

[21] Note that Europe also includes the non-EU countries Iceland, Norway, Russia, Switzerland, and Turkey.

Undisclosed investors. Building on the initial step of retrieving the raw data from the databases, in the second step, we drop all investors that were categorized as undisclosed investors. In those cases, we had information about the investee but not on the corresponding investors even though they were grouped as "Corporate PE/Venture" firms. This was only the case in the *Eikon* database. For the European sample of *Eikon*, we consequently omitted investors that were categorized as "Undisclosed Firm" or "Other UK Investor(s)" which removed five investees and seven investment rounds from the sample. In the US-based data we also dropped "Undisclosed Investors" which resulted in a massive reduction of 32 percent of the overall investees or respectively 33 percent of the covered investment rounds.

Unknown investors. Third, we merge all investor specific information with data from the *Capital IQ* platform of *Standard & Poor's*. This allows us to draw on an extensive data pool of more than 4 million private and listed companies covering nearly 100 percent of the world's market capitalization (S&P Global, 2018). *Capital IQ* provides information on the investors' business descriptions and information related to the company affiliation. We exclude all investors where we could not find a fitting investor profile in the *Capital IQ* database. In doing so, we ensure data consistency and simultaneously provide a solid and reliable foundation for the subsequent steps. For instance, we could not find the investors *Alps Investment Research* and *Lauder Investments*. This step led to the exclusion of 44 US-based investors appearing in the *Eikon* sample (25 in Europe) and 11 appearing in the *VentureSource* sample (7 in Europe).

Figure 12: Underlying methodology of the proposed data-cleaning procedure

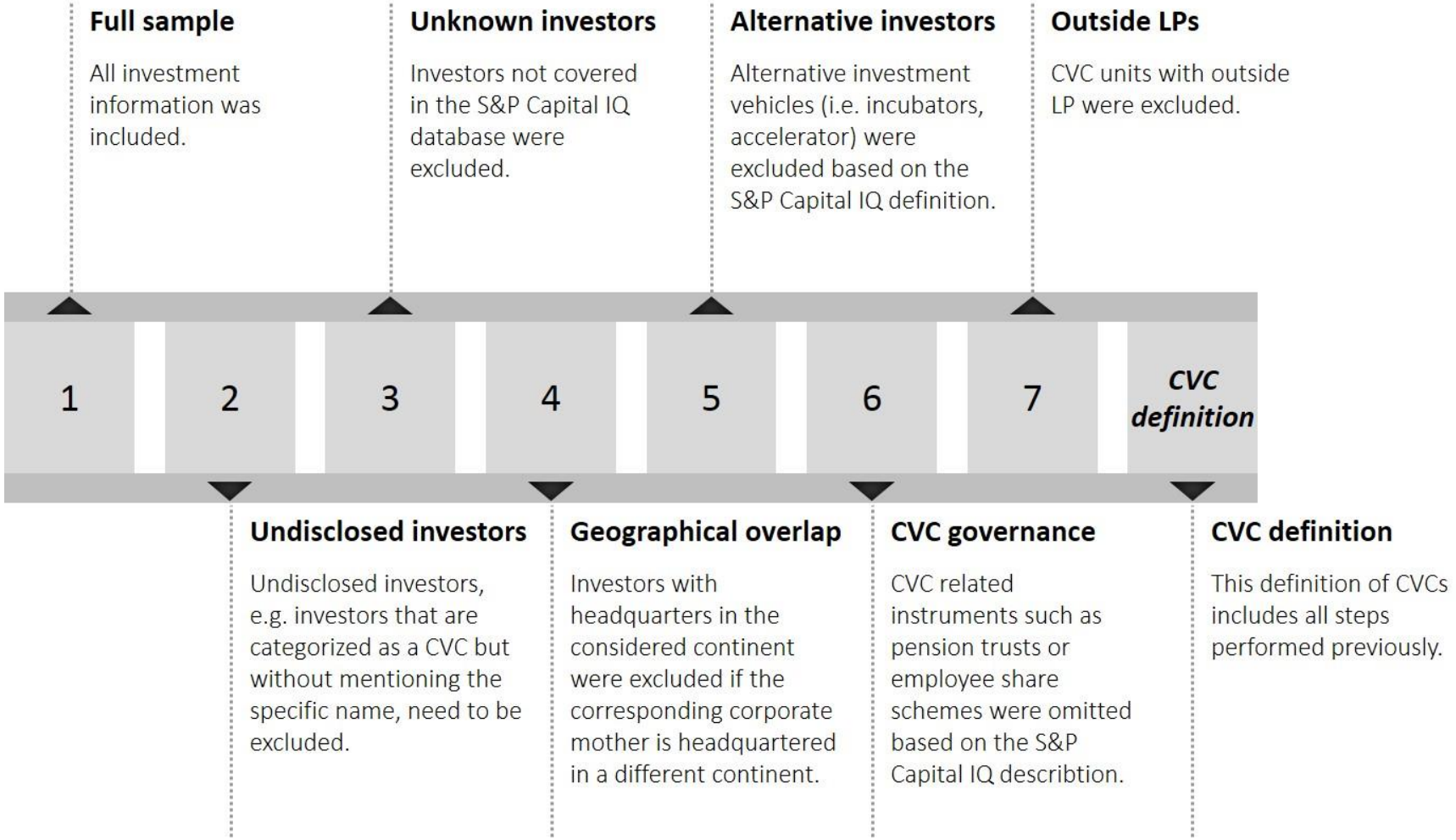


Table 13: Results from the database queries for US and European-based CVCs

		Thomson Reuters Eikon		Dow Jones VentureSource	
		US	Europe	US	Europe
Step 1: Full sample	Initial investors	629	282	235	171
	Initial investees	9,602	2,737	4,532	2,026
	Initial rounds	19,077	4,540	7,719	3,283
Step 2: Undisclosed investors	Excluded investors	1 (0%)	2 (1%)	0 (0%)	0 (0%)
	Excluded investees	3,101 (32%)	5 (0%)	0 (0%)	0 (0%)
	Excluded rounds	6,332 (33%)	8 (0%)	0 (0%)	0 (0%)
Step 3: Unknown investors	Excluded investors	44 (7%)	25 (9%)	11 (5%)	7 (4%)
	Excluded investees	92 (1%)	157 (6%)	24 (1%)	14 (1%)
	Excluded rounds	199 (2%)	213 (5%)	43 (1%)	16 (0%)
Step 4: Geographical overlap	Excluded investors	80 (14%)	7 (3%)	50 (22%)	4 (2%)
	Excluded investees	731 (11%)	55 (2%)	571 (13%)	12 (1%)
	Excluded rounds	1,885 (15%)	69 (2%)	1,161 (15%)	19 (1%)
Step 5: Alternative investors	Excluded investors	63 (13%)	61 (25%)	15 (9%)	13 (8%)
	Excluded investees	507 (9%)	636 (25%)	86 (2%)	250 (13%)
	Excluded rounds	901 (8%)	1,089 (26%)	207 (3%)	510 (16%)
Step 6: CVC governance	Excluded investors	240 (54%)	31 (17%)	33 (21%)	21 (14%)
	Excluded investees	843 (16%)	123 (7%)	276 (7%)	69 (4%)
	Excluded rounds	1,828 (19%)	155 (5%)	419 (7%)	91 (3%)
Step 7: Outside LPs	Excluded investors	22 (11%)	17 (11%)	10 (8%)	11 (9%)
	Excluded investees	1,313 (30%)	434 (25%)	1,231 (34%)	362 (22%)
	Excluded rounds	2,604 (33%)	732 (24%)	2,168 (37%)	660 (25%)
CVC definition	Remained investors	179	139	116	115
	Remained investees	3,015	1,327	2,344	1,319
	Remained rounds	5,328	2,274	3,721	1,987

Geographical overlap. The fourth step includes the analysis of the investors' position within an existing corporate network. For each investor in our samples, we draw on the *Capital IQ* database to identify potential corporate mothers and thus clarify the ownership status. Accordingly, we use the business descriptions as well as the corporate tree function of *Capital IQ* to clearly match the investor to a corporate mother. To cope with dynamic processes, we also consider historical names and also merger and acquisition (M&A) activities. We were then able to gather information about the corporate mother and to classify investors where we could not find an obvious parent company. Where a corporate mother was present, we collected various data relating to the industry, the general status (public vs. private), and geographical information. Although we excluded non-US and non-European investors respectively from our sample, we could still identify a great number of investors with a corporate mother from the excluded geographical regions. For instance, German-based companies such as *BMW* and *Bertelsmann* operate investment vehicles in the USA. Both databases classify these CVC units as US-based, although the corporate mother is from Europe. As knowledge typically flows from the investor to the corresponding corporate mother (e.g., Gupta & Govindarajan, 2000), the corporate mother determines the geographical affiliation. Accordingly, we omit all CVC units with a corporate mother from a different region. This procedure resulted in the exclusion of 80 investors from the US-sample of *Eikon* (7 in Europe) and 50 from *VentureSource* (4 in Europe).

Alternative investors. Based on the business description, we omit associations (e.g., *Massachusetts Technology Collaborative*), NGOs or universities (e.g., *Rhode Island College*), regional development vehicles (e.g., *SCRA Technology Ventures*), advisory firms (e.g., *Limestone Capital Advisors*), independent VCs (e.g., *Ulu Ventures*) and several other investment vehicles such as hedge funds, PE investors, business angel associations, incubators, and family offices. Those investor types were initially declared as CVC units in the databases but do not meet the definition owing to missing corporate parents or their self-conception in the *S&P Capital IQ* business descriptions, and thereby carry the risk of skewing the empirical analysis. Accordingly, in the fifth step between eight and twenty-five percent of the remaining investors were removed.

CVC governance. The sixth step includes the deep analysis of the remaining corporate investment vehicles. Following Dushnitsky (2006), corporations can structure their venturing activities in three ways: First, they can act as a LP in already existing funds of IVCs. Second,

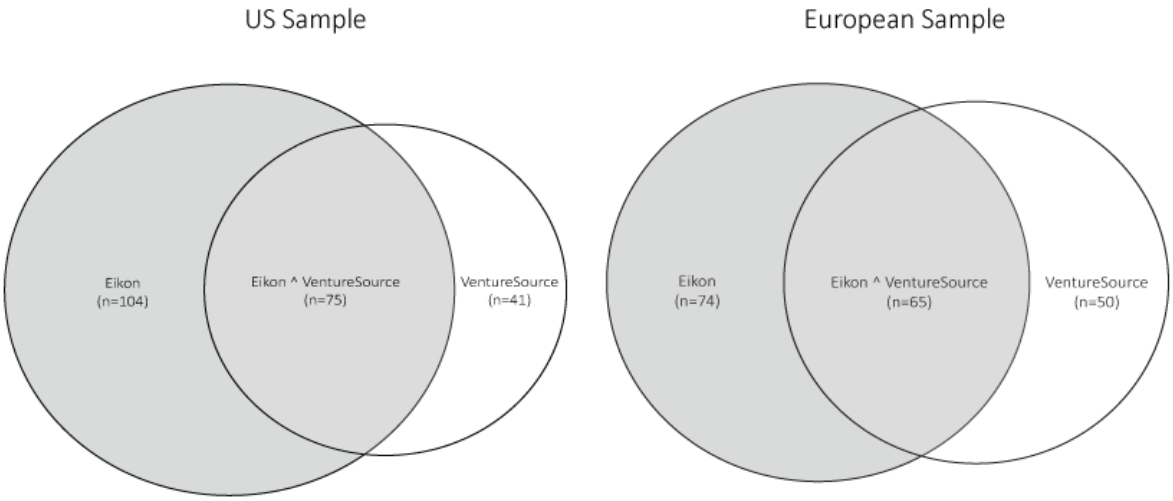
the investments can be organized through an operating business unit that is in charge of the venturing strategy (also called direct investments). In practice, as mentioned by Bertoni et al. (2013), it is mainly R&D or business development units that are responsible for those transactions. Third, CVC units can also be organized as wholly-owned subsidiaries within the corporate boundaries. The problem, however, is that investments made through IVCs cannot be assigned to a specific corporate LP and therefore are not observable in the databases. There are also challenges involved in clearly matching direct CVC investments, because commercial databases only provide information about the existing corporate entities but not on the business unit level. Consequently, only wholly-owned subsidiaries were considered in the further analysis using the corporate trees in *Capital IQ*. Following Dushnitsky and Lenox (2005), we also exclude corporate pension trusts, retirement trusts, pension plans, employee share schemes, and asset management arms. This step led to the exclusion of 54 percent of the investment vehicles in the US-based sample of *Eikon* (17 percent in Europe) and 21 percent of the *VentureSource* investors (14 percent in Europe).

Outside LPs. In contrast to the proper sense of CVC, some corporate venture units act as a general partner (GP) for external investors. In this case, LPs such as insurance firms, IVCs, and other corporate arms can invest in a fund organized and run by a CVC and benefit from the market knowledge of the GP. In a manner similar to the approach in Step 4, we argue in the seventh step that the use of this investment practice is accompanied by a risk of sharing knowledge with actual or potential competitors through a knowledge outflow. Therefore, we excluded CVC vehicles with external LPs. In this step, we excluded 22 investors from the US-sample of *Eikon*, among them prestigious CVCs such as *Intel Capital* or *TI Ventures*, the corporate investment vehicle of *Texas Instruments*. For instance, *Intel* provide access to their investment fund for external investors such as *Dell*, *Boeing*, *General Electric*, and *Morgan Stanley*. Looking at the samples of *VentureSource* we excluded investors of similar magnitude (US 8 percent; Europe 9 percent).

CVC definition. The process deployed above yields the specified CVC vehicles. Of 629 (282), we consider 179 as CVCs in the *Eikon* sample (Europe 139). In *VentureSource*, we identify out of 235 (171) listed CVCs, 116 (115) for the USA (Europe). All other firms cannot be considered a CVC because they are funded by financial companies, partnerships, or multiple corporate parents, or have a foreign or unknown parent (Chemmanur et al., 2014).

Following Maats et al. (2011), we present the resulting CVCs based on the underlying geographical sample (Figure 13) in a Venn diagram.

Figure 13: Coverage of CVC investors within the underlying data samples



In the US (European) sample, we identify 75 (65) shared CVC investors. Overall, it appears that *Eikon* offers a higher availability of CVC investors. However, a closer look reveals that this is mainly driven by past data points. More recently, *VentureSource* has caught up, offering similar numbers of CVC investors (see Table 14). When looking at the industry groups of the unique investors it appears that *Eikon* is especially suited for US-based CVCs from the transportation and utilities industries (designated by SIC codes starting with 4). In comparison, *VentureSource* has a higher availability of European CVCs from manufacturing industry (designated by SIC codes starting with 2 or 3) and US-based CVCs from the service industry (designated by SIC codes starting with 7 or 8). Regarding the covered investment rounds, *Eikon* systematically offers a higher data coverage with one exception: *VentureSource* covers more investment rounds in the European sample between the years of 2011 and 2012. Moreover, we found that the underlying definition of CVC is superior in *VentureSource* compared with the definition provided in this article.

Table 14: Unique CVCs and investment rounds covering the period from 2000 to 2015

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Unique CVCs US sample	VentureSource	31	29	24	28	26	29	25	26	35	33	33	34	30	31	36	43
	Eikon	63	58	36	44	37	43	38	38	45	34	35	42	36	38	43	45
Investment rounds US sample	VentureSource	288	180	117	109	107	136	147	147	147	136	176	203	217	252	313	381
	Eikon	716	321	166	134	150	161	214	227	234	159	210	244	246	263	284	354
Unique CVCs European sample	VentureSource	23	24	26	25	21	21	22	23	27	24	27	23	24	31	36	38
	Eikon	26	25	23	19	20	21	14	21	29	19	23	22	29	27	31	38
Investment rounds European sample	VentureSource	78	103	79	94	80	81	78	103	104	77	78	110	173	85	110	122
	Eikon	113	98	64	81	94	83	77	98	112	82	85	82	102	107	129	138

5.5 Conclusion

In analyzing the recent empirical literature on CVC, this article seeks to address how CVC activity is measured and in which ways the commonly used databases, namely *Eikon* from *Thomson Reuters* and *Dow Jones VentureSource* can be used to reach a theoretically defined dataset of CVCs. Most published studies provide researchers with insufficient information about the technical definition of CVC or base their empirical work on the definition of the commercial data providers. We propose a data-cleaning procedure to promote future coherence in research. Due to the results presented in this paper, we contribute to the ongoing discussion of CVC in several ways. By providing a data-cleaning process, we encourage researchers to pay far more attention than is typical to the criteria applied in their definition of CVC. Moreover, we provide a comprehensive analysis of the data coverage in the commonly used databases of *Eikon* and *VentureSource* to help researchers with decisions connected to the data provider or the sampling period used.

6 The Devil Inside? Organizational Voids Within Corporate Venture Capital Dyads

Abstract

Acting as an intermediary, corporate venture capital (CVC) units need to balance two different institutional settings—the rigid corporate world and the advancing startup ecosystem. As a result, CVC units are faced with multiple voids that influence their organizational orientation toward one environment. Currently however, the academic literature only considers those processes from a theoretical angle. This section in contrast employs text analysis and a unique sample of 22 CVC dyads to introduce a novel empirical way of measuring isomorphic variations. Following a mix method approach, it presents the results of interviews to shed light on potential drivers of isomorphism. The findings demonstrate that the degree of isomorphism is not only determined by initial decisions made during the initial phase of a CVC unit, but also from mimetic processes that occur within the lifespan of such investment vehicles.

6.1 Introduction

To overcome financial constraints, innovative startups often draw on external investors such as IVCs, business angels, or PEs depending on the startup's development stage (Sudek, 2006; Kollmann & Kuckertz, 2010). Since the mid-1960s, established corporations have discovered the advantages of backing such startups (Gompers & Lerner, 2000; CB Insights, 2018b). In an ideal world, CVC is associated with a wide range of benefits for all parties concerned. Acting as a broker, the CVC unit supports promising startups with money provided by the corporate mother[22]; this represents the so-called CVC triad (Weber & Weber, 2011). Prior research showed that corporate mothers' can leverage their innovation rate (e.g., Dushnitsky & Lenox, 2005a; Schildt et al., 2005; Wadhwa & Kotha, 2006) and financial performance (e.g., Zahra & Hayton, 2008) through the use of CVC investments. Likewise, startups also profit from CVC in terms of improved innovation behavior (e.g., Park &

[22] In some cases, CVC units also raise money (Kollmann, Kuckertz, & Middelberg, 2014; Kuckertz et al., 2015) from outside investors.

Steensma, 2012; Alvarez-Garrido & Dushnitsky, 2016) and better financial performance (Ivanov & Xie, 2010; Wang & Wan, 2013).

However, there is also a potential downside of the CVC phenomenon. Gompers and Lerner (2000) pointed out that CVC vehicles have a shorter lifespan than their independent counterparts. Hence, it is not surprising that data provided by *Dow Jones VentureSource*, one of the two most frequently used databases in the VC field, shows that 13.5% of all its recorded CVC units have ceased operations.[23] Some researchers blame a lack of commitment (Siegel et al., 1988; Bannock Consulting, 2001), unattractive compensation schemes (Bannock Consulting, 2001), staffing decisions (Siegel et al., 1988), or unsuitable performance measurement (Teppo & Wüstenhagen, 2009).

In addition, the high failure rates of CVC units could also be explained by CVC units acting in two competing environments simultaneously: the corporate world and the startup world. Under the label of isomorphism, Souitaris et al. (2012) showed that CVC units are caught in a continuum between two contradictions, that is, the corporate world with its rigid structures and the startup ecosystem characterized by high levels of autonomy and risk-taking behavior. Consequently, CVC units are forced to either align with the corporate mother's norms (endoisomorphism) or with the norms of the startup ecosystem (exoisomorphism). CVCs with endoisomorphic tendencies tend to develop mechanistic structures with command-like communication, concentrated decision making, fixed and written procedures, and a clear division of labor into specific tasks. Conversely, CVCs closely aligned with the startup sphere tend to develop more organic structures in terms of overlapping responsibilities, distributed decision making, flexible and unwritten procedures, and consultative communication (Burns & Stalker, 1961; Souitaris et al., 2012).

Although the seminal work of Souitaris et al. (2012) has the potential to shed light on various open questions regarding the organizational settings of CVC units, the concept of isomorphism has not been further addressed in the academic discourse. This might be grounded in the fact that observing and measuring such tendencies is an arduous task. Therefore, this section proposes a new measure of isomorphism in the CVC context. This measure considers the overlap of two organizational written mission statements, that is, from the corporate mother and its corresponding CVC unit. In doing so, we are able to extract

[23] Please note, that the search considered all recorded CVC units recorded in *VentureSource*, and was not limited to a specific time frame or country.

organizational tendencies to favor one of the environments by shifting the focus from subjective assessments to a more impartial approach. A significant benefit of this measure is the fact that it makes it possible to track the isomorphic tendencies over time. In the second part of the section, we go beyond the quantitative observation by qualitatively identifying drivers of isomorphism that could influence a CVC's decision.

6.2 Literature review

The concept of isomorphism is grounded in the question of why organizations tend to be homogeneous (DiMaggio & Powell, 1983). Isomorphic tendencies in the CVC context have surprisingly only rarely been discussed in the finance and management-related literature (Röhm, forthcoming). In their seminal work, DiMaggio and Powell (1983) observed three mechanisms of isomorphism and the factors that potentially influence them. The study describes coercive isomorphism as resulting from formal and informal pressure on an organization that stems from an interdependence with other organizations and social expectations. As a result, organizations respond to legislative changes or new regulations resulting in a homogenization of organizational structures. Second, when organizations face an uncertain environment they try to imitate structures from organizations which have already shown the ability to resist those circumstances, also known as mimetic isomorphism. Finally, an increasing standardization of occupational groups can influence the homogenization of organizations. Flowing from a high level of specialization in terms of professional training and education, standards can easily be spread through networks and can change existing procedures.

Souitaris and colleagues (2012) observed and documented isomorphic tendencies with regards to CVC units. The authors conducted six extensive case studies with newly founded CVC units from prestigious established corporations. The selected CVCs all share the idea of simultaneously leveraging strategic goals and delivering strong financial returns. Souitaris et al. (2012) draw on the work of DiMaggio and Powell (1983) and Burns and Stalker (1961) to show that CVCs either seek legitimacy with the corporate world or with the VC ecosystem. Accordingly, CVCs that align with the norms and rules of the corporate mother (i.e., they demonstrate endoisomorphism) tend to develop organizational structures comparable to the structure of the corporate mothers in terms of a formalization of tasks, centralized decision-making processes, being relatively stable and having control over tasks, and employing

command-style communication methods. CVCs that are closely aligned with the VC ecosystem (i.e., they demonstrate exoisomorphism), tend to decentralize their decisions with a low degree of specialization, and employ a consultative communication style and unwritten procedures. The existing academic discourse on CVC has focused only on some aspects of the organizational structure; for instance, Dushnitsky (2006) identifies three types of organizational settings: First, established corporations can manage their investments in technology-oriented startups through internal business units; termed a direct investment setting. Second, CVC units can also act independently by operating a fund sponsored by the corporate mother; typically organized as wholly-owned subsidiaries. This setting has proved to be a good role model owing to the greater degree of autonomy it confers. Third, established corporations can invest in open or dedicated funds run by independent VCs. In this way corporations can benefit from the IVCs network and experience without the need to build their own capabilities. With this in mind, Siegel et al. (1988) asked 52 actors from the CVC community how they organized their activities to maximize success. The paper provides useful insights into several aspects of CVCs' organizational structures such as staffing decisions, compensation aspects, and autonomy. The study's findings suggest only one in ten CVCs acts completely independently without requiring some form of approval from the corporate management. A more recent paper published by Asel, Park, and Velamuri (2015) focuses on the differences between internally and externally managed CVC programs. The study takes the underlying strategy, staffing decisions, compensation schemes, and exit considerations into account to highlight where both program structures overlap and differ.

From a human resource point of view, some articles investigate the influence of the individual experience of managers on the adoption of IVC practices (Dokko & Gaba, 2012) and on the longevity of CVC units (Gaba & Dokko, 2016). Results indicate that managers with IVC experience tend to leverage financial goals and therefore contribute positively to the lifespan of their CVC unit. Beyond those staffing discussions, there are also some articles (e.g., Dushnitsky & Shapira, 2010; Yang, 2012) that observe the influence of different remuneration schemes on the performance of the CVC unit. However, to date the literature has not presented a holistic picture. Nevertheless, the isomorphic tendencies explored by Souitaris et al. (2012) provide a unique framework that can support placing the published insights in a broader theoretical context.

6.3 Isomorphic tendencies and the call for a mixed-method approach

The relative scarcity of organizational research on VC and CVC might be expected to prompt researchers to adopt a qualitative design to illuminate a rather opaque phenomenon (Eisenhardt, 1989b; Eisenhardt & Graebner, 2007; Röhm, forthcoming). However, this section opts for a mixed-methods approach to present a more complete picture (Creswell, 2003; Tashakkori & Teddlie, 2003). Generally speaking, mixed-method designs involve the combination of "elements of qualitative and quantitative research approaches […] for the broad purposes of breadth and depth of understanding and corroboration" (Johnson, Onwuegbuzie, & Turner, 2007, p. 123). There have been occasional calls for intensified research following this paradigm in entrepreneurship research (e.g., Davidsson, 2004; Röhm, forthcoming); applications have, however, remained scarce until now (see Hohenthal, 2006 or Bryant, 2009 for noteworthy exceptions). Such mixed-methods designs can be differentiated in terms of the respective dominant paradigm within a given study, that is, they can be classified along the continuum from a purely quantitative focus to a purely qualitative one (Johnson et al., 2007). Mixed-method designs can also be distinguished according to the particular point within the research process at which a certain paradigm dominates (Morse, 2003). This method is suggested for researchers testing a theoretical model from the literature, especially if some of the components are not quantifiable. Specifically, the present study utilizes two distinct samples: first, it quantitatively explores isomorphic tendencies from a CVC headquartered in the USA to establish if those tendencies vary over time. Against the backdrop of those results, we subsequently qualitatively identify and propose several drivers of isomorphic tendencies extracted from four in-depth case studies with experienced investors from the CVC industry in Germany. The next paragraph introduces our novel way to measure isomorphic tendencies based on excerpts from organizational texts.

6.4 Making isomorphic tendencies measurable

Owing to the absence of constructs to measure the isomorphism tendencies of CVC units, this article proposes a first approach by drawing on text analysis, a method widely used in the management (for an overview see Duriau et al., 2007) and finance research communities (e.g., Jegadeesh & Wu, 2013; Röhm et al., 2018). The history of analyzing mission statements is grounded in the idea that an organization's written text is more than the sum of its words and consequently text analysis reveals the mission statement's underlying

philosophy, perceptions, and beliefs (D'Aveni & MacMillan, 1990). Considering that the methodology used and the chosen text sources need to fit the question of interest (Short et al., 2010), text analysis has a broad range of applications. In addition to website content (Zachary et al., 2011), IPO prospectuses (Bukh et al., 2005), annual reports (Titus et al., 2017), shutdown messages (Mandl et al., 2016), CEO speeches (Bannier, Pauls, & Walter, 2017) even internal data sources (McKenny et al., 2013) can be analyzed. This particular method offers a variety of advantages when measuring isomorphic tendencies over time (Duriau et al., 2007; Moss et al., 2014): (1) by drawing on organizational narratives the isomorphic tendencies can be directly derived from publicly available information, overcoming the typical limitations of personal surveys or interviews, (2) narratives such as annual reports or websites are often available for lengthy periods of time, thus enabling longitudinal analysis, (3) outcomes can be quantified and serve as a valid starting point for further statistical analysis.

To fully grasp the phenomenon of isomorphism over time, we merge data from multiple sources. To extract CVC-backed transactions in the USA that occurred from 2000 to 2010, we draw on *Dow Jones VentureSource*. This database is commonly used to investigate the VC and CVC ecosystem (e.g., Benson & Ziedonis, 2010) as it provides access to more than 130,000 private companies and 40,000 investors worldwide (VentureSource, 2018). To ensure a rigorous theoretical anchoring related to CVC units, we adapted the data cleaning process suggested by Röhm, Merz, Kuckertz (2018). In short, by merging the extracted VC data with information provided by *S&P Capital IQ*, we penetrated beyond the rather vague CVC definition often used by data providers. The cleansing process produced a set of 72 unique CVC investors. To access those investors' isomorphic tendencies and to examine how they vary over time, we subsequently collected written excerpts from the remaining 72 CVC dyads (i.e., the CVC unit and its associated corporate mother). Accordingly, we adopted two different search strategies: First, we collected all public available annual reports from the corporate mothers using the corporate websites, *Bloomberg*, *annualreports.com*, and *annualreportowl.com*. We chose annual reports because they should communicate the relevant corporate mission statement. Because annual reports address a hybrid group of stakeholders, the relevant information must be distilled down and critically reviewed by communication experts, and the resulting information therefore offers a valid starting point for our research (Stanton & Stanton, 2002). Second, examining the public websites of each

CVC unit offered an opportunity to scrutinize even more concise mission statements than those available on corporate websites (Zachary et al., 2011; Röhm et al., 2018).

To access historic mission statements from the CVC websites, we made use of the *Internet Wayback Machine* (Hackett et al., 2004). To ensure data quality, we drew on the *Directory of Venture Capital and Private Equity Firms, Domestic and International* (Gottlieb, 2008) and historical press releases to identify variances in URL addresses (on this approach see Röhm et al., 2018). Not surprisingly, we could find mission statements, contained for example in the *Message from the CEO*, *About us* or *Our Approach*, for only 22 CVC units. To analyze and compare the mission statements gathered from CVCs and their corresponding corporate mothers' we combined several text-based software packages (Short, McKenny, & Reid, 2018). To measure endoisomorphism, that is, the alignment of a CVC unit with the norms of the corporate mother, we used *NVivo* software to extract every single word of a CVC mission statement and compare it with the corresponding text excerpts from its corporate mother in a given year using the Jaccard similarity coefficient. The Jaccard coefficient measures the similarity and/or diversity of two underlying text excerpts by comparing the number of shared words in relation to the total number of words (Huang, 2008; Al-Anazi, AlMahmoud, & Al-Turaiki, 2016; Gabriel, Kuo, McAuley, & Hsu, 2018), ranging from 0 (completely dissimilar) to 1 (completely similar). We argue that this measure of document similarity provides a reliable proxy for the isomorphic tendencies over time (Souitaris et al., 2012). High values represent a greater overlap between the CVC and corporate mission statements indicating that CVCs seek alignment with the corporate world (endoisomorphism), while lower values represent a weaker degree of endoisomorphism, that is a higher level of exoisomorphism. The analysis identified several development paths for isomorphism over time. At first sight, and as depictured in Figures 14 and 15, the mean values of all 22 CVC dyads indicate that isomorphism appears to be static rather than dynamic.

Figure 14: Endoisomorphism tendencies (CVC aligning with the corporate's policies)

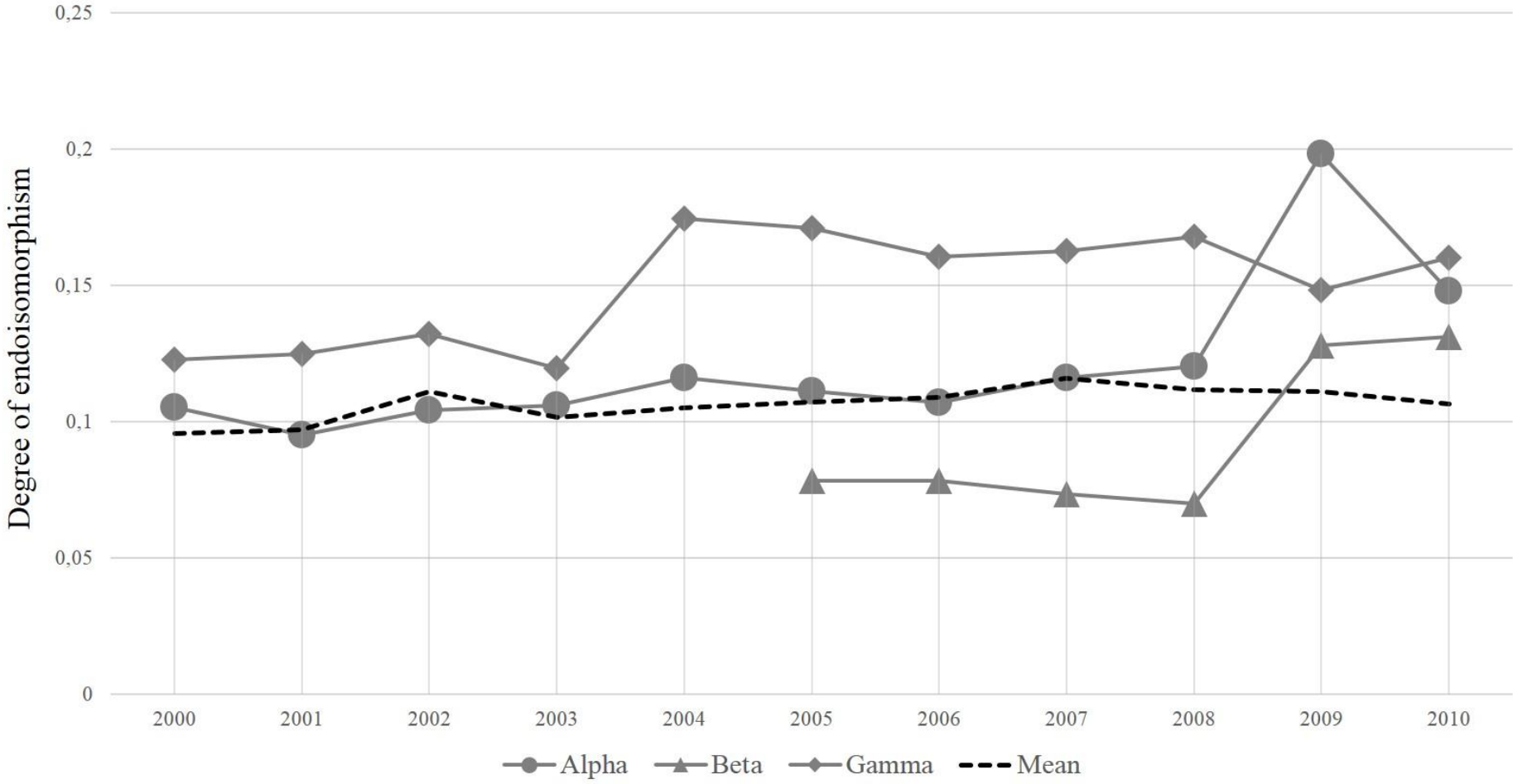
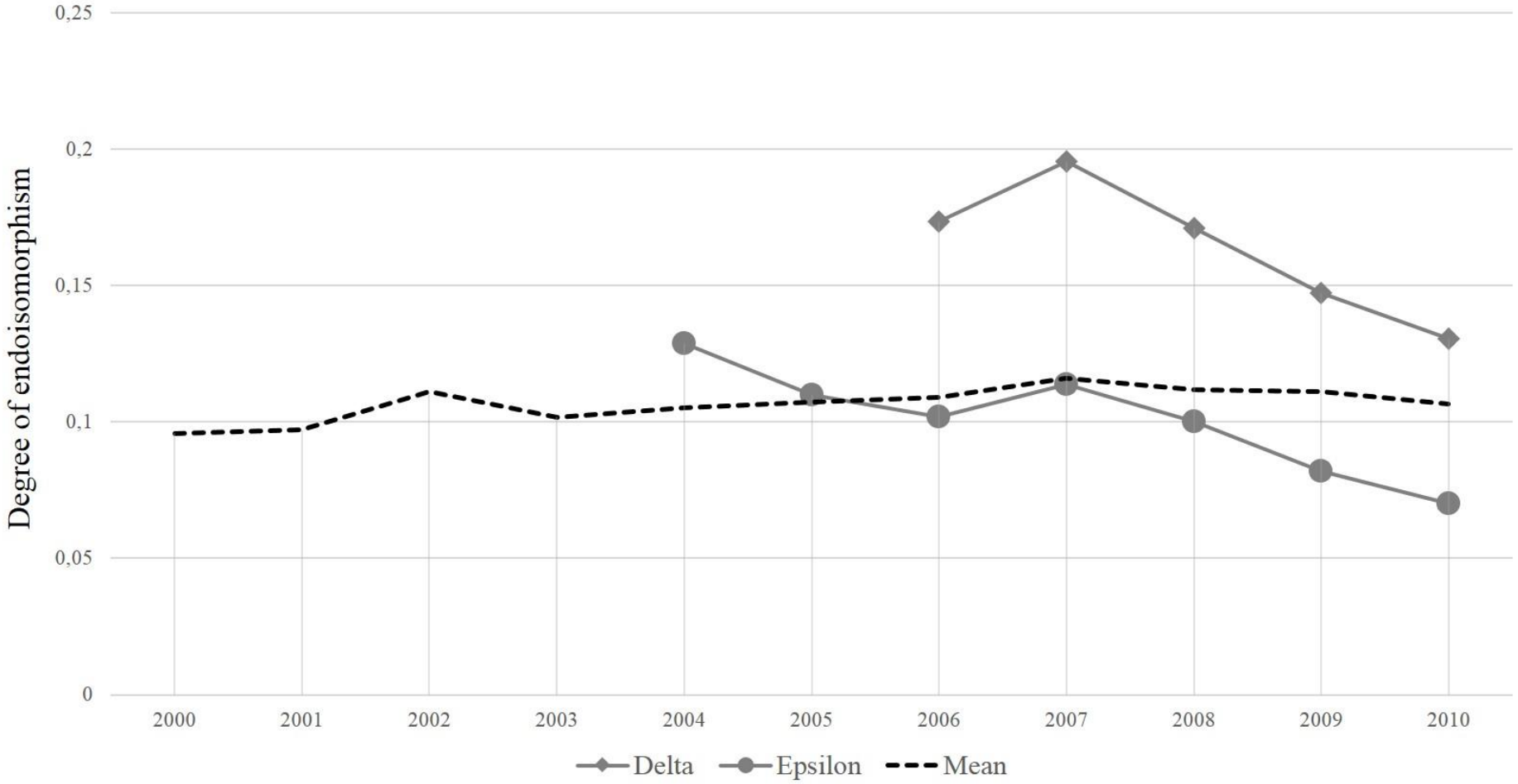


Figure 15: Exoisomorphism tendencies (CVC aligning with the startup ecosystem)



However, a detailed analysis of single cases conveys a different picture. The exemplary development paths of the CVC dyads *Alpha*, *Beta*, *Gamma*, *Delta*, and *Epsilon* in particular support the argument of isomorphic tendencies varying over time. While we found a tendency to lean toward the corporate mother in the cases of *Alpha*, *Beta* and *Gamma* (Figure 14), other CVC units tend to seek legitimacy away from the corporate mother, for example, from the startup ecosystem (*Delta* and *Epsilon*; Figure 15). Overall, we extend the work of Souitaris et al. (2012) by showing that isomorphic tendencies are not static but over a period of time depend on both external circumstances and internal decisions. To shed further light on those processes the next section deals with factors that can stimulate or diminish the tendency toward a given environment.

6.5 Disentangling potential driver of isomorphism

To paint a holistic picture of isomorphic tendencies over time, we next used a qualitative method in our mixed-method design to identify drivers that push a CVC unit toward a specific organizational environment. Like Souitaris et al. (2012), we primarily drew on semi-structured interviews, relying on the process proposed by Gioia, Corley, & Hamilton (2013). That process is based on viewing organizations as social constructs made up of individuals that can serve as informants or knowledge agents (Gioia et al., 2013). Consequently, the thoughts, intentions, and actions of those individual informants are at the core of the research method (Gioia et al., 2013).

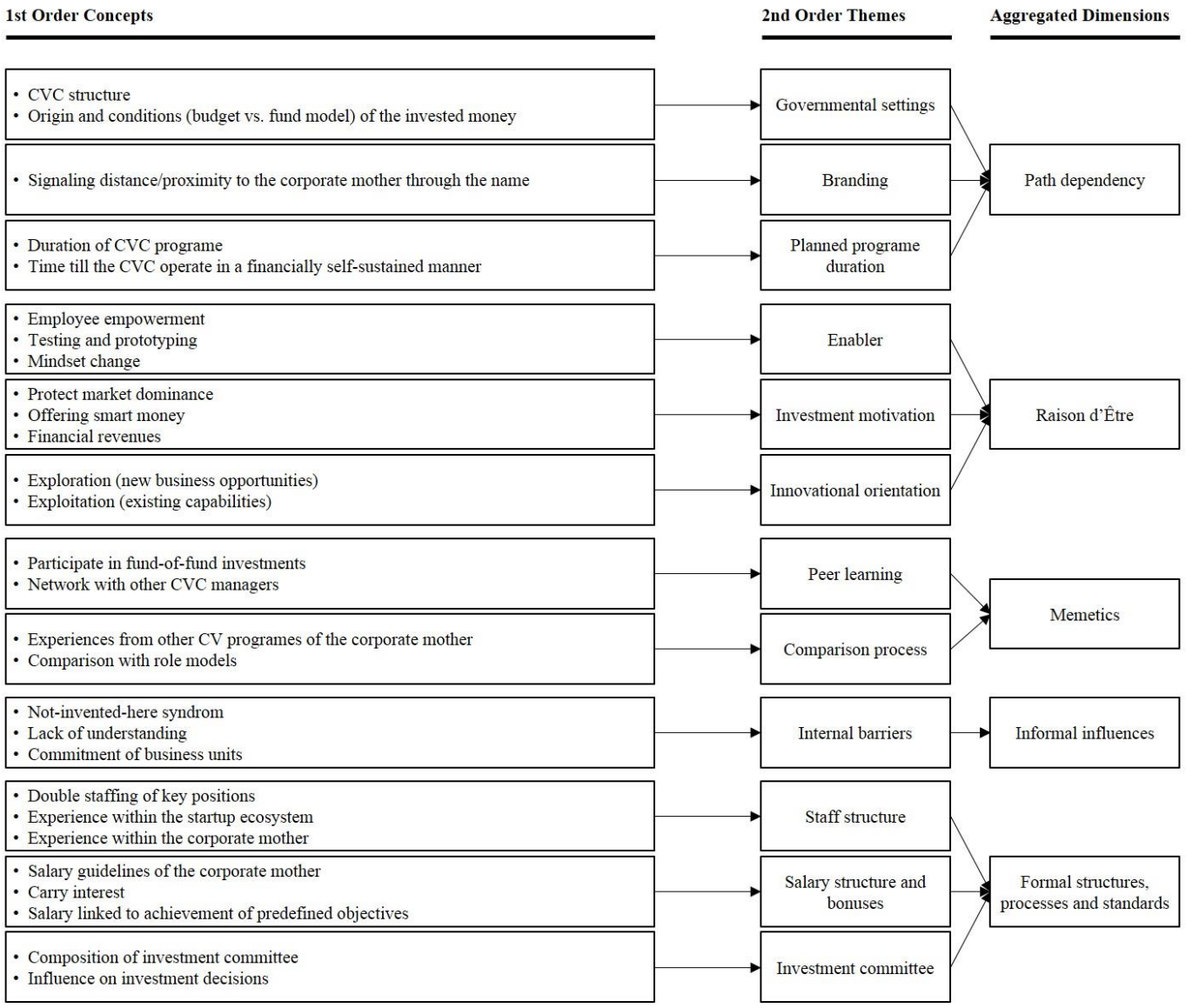
The authors used the work of Burns and Stalker (1961), DiMaggio and Powell (1983) and Souitaris et al. (2012) to compile a semi-structured interview guide. In a subsequent step, as recommended by Silvermann (2006) and Eisenhardt and Graebner (2007) we carefully constructed a theoretical sample of appropriate and diverse CVCs. To support generalizability, we did not restrict the pool of potential interview partners through criteria relating to the existing governance structure (for an overview see Dushnitsky, 2006), the industry of the corporate mother, the maturity stage, or the investment round preferences. The interviews took place in November 2017 and were transcribed. In summary, the transcribed interviews offer between 1354 and 3494 words (mean 2605 words) with a mean value of 14.81 words per sentence. Similar to Souitaris et al. (2012), we were able to speak with leading representatives of the CVC units, such as Vice Presidents and Managing Directors. Reflecting a typical characteristic of the German CVC setting, only one participant had

previously worked for an independent VC (for 3.5 years), while no one had acquired entrepreneurial experience as a founder or co-founder of a startup, but instead based their qualification for their position on extensive experience with the corporate mother (for a mean of 10.25 years). As outlined above, we drew on the work of Gioia et al. (2013) to ensure academic rigor in extracting information regarding the isomorphic tendencies from the interview data. Prior research suggests a three-stage process to identify patterns in the raw data (e.g., Strauss & Corbin, 1998). The first step involved setting up a wide range of first-order categories intended to capture all possible drivers of isomorphism in the CVC context. This step is also known as open coding. The second step employed axial coding to categorize second-order themes by their similarities and dissimilarities in relation to the first-order categories resulting from the first step. In a final step, the second-order themes were distilled down to provide more abstract and theoretically-anchored dimensions. We conducted the entire coding process utilizing the *MAXQDA* software package. The final data structure is presented in Figure 16.

To date, there have been no empirical attempts to statistically validate isomorphism tendencies in the CVC context (see Röhm, forthcoming; Souitaris et al. 2012). Although, this section aims to make those tendencies measurable, an empirical validation exceeds the underlying scope of our research design. Consequently, below we present various propositions directly derived from the first-order categories and second-order themes in Figure 16. The aim is to stimulate the academic discourse on isomorphic tendencies in the field of CVCs. When they establish a CVC unit, corporations need to balance the initial setup carefully, paying particular attention to the alignment of the underlying objective and the structural organization (Gompers & Lerner, 2004). Those initial decisions were discussed by Dushnitsky (2006) and the recommended form was later adopted by Asel et al. (2015). However, the interview data gathered for this research show that some decisions are not retractable or are only partly retractable. Among those decisions the governmental structure, the assigned name of the CVC unit, and the planned program duration can determine the level and direction of isomorphism from the outset. This might lead to a situation where CVC units prefer to preserve the status quo instead of developing a more exoisomorphic profile because of the issue of path dependency.

Proposition 1: The existence (absence) of path dependency is positively related with endoisomorphic (exoisomorphic) tendencies.

Figure 16: Data structure, extracted from the conducted interviews



Corporate mothers incorporate CVC vehicles for reasons well documented by several authors (e.g., Winters & Murfin, 1988; Chesbrough, 2002; EY, 2002; Ernst et al., 2005; Weber & Weber, 2005; Dushnitsky & Lenox, 2006). Two articles with a sole focus on the German CVC market found that besides purely strategically driven and purely financial driven CVCs, 76 percent (Ernst et al., 2005) and 37 percent respectively (Weber & Weber, 2005) of the observed CVCs were trying to achieve both objectives. By grouping CVCs' reasons for investment, Röhm et al. (2018) also empirically tested the impact of a CVC's investment motivation on a startup's valuation. However, in addition to the investment motivation of the CVC the general innovation strategy of the corporate mother can also influence the unit's isomorphic tendencies. For instance, Titus et al. (2017) investigated the effect of exploration on a corporate mother's venturing activities and, drawing on Dokko and Gaba (2012) and Gaba and Dokko (2016), found the strategy to be correlated with staffing decisions. While internal hires tend to pursue a strategic investment approach, investment managers with prior IVC experience tend to leverage financial goals by implementing IVC-like structures and decision-making processes. However, our interview data also indicate that as a unit matures it tends to align more closely with the startup environment. Some of the managing directors interviewed said that the novelty of the CVC concept led them to focus on communicating the strategic benefits of their CVC units. After that introductory stage, financial objectives became more relevant.

Proposition 2: The existence of strategic goals (financial goals) is positively related to endoisomorphic (exoisomorphic) tendencies.

Investments through CVC units have traditionally been associated with the concept of learning, and many articles have been published relating to that context (e.g., Keil, 2004; Keil, Autio, & George, 2008). However, there is also evidence that mimetic processes can effect a CVC's behavior. In general, touching points with other investment vehicles can stimulate the deal flow (Souitaris & Zerbinati, 2014), but there are also other mechanisms that could stimulate mimetic processes. For instance, Noyes et al. (2014) presented results from a network perspective, indicating that interlocking boards can stimulate the diffusion of management practices. In addition, Gaba and Meyer (2008) emphasize the importance of a corporate mother's peer group through the adoption of CVC practices. In addition, the syndication of investments with other CVCs or IVCs (e.g., Keil et al., 2010) can bring crucial advantages for the CVC. Based on a network perspective, Anokhin et al. (2011) noted the

importance of the network position for CVCs in highly concentrated industries. Accordingly, learning from competitors, IVCs, or other investment vehicles can help CVCs to overcome their liability of newness and the absence of a track record (Anokhin et al., 2011), and therefore can increase the chances of establishing more IVC-like structures. Our interviewees confirmed that the communication with IVCs was especially useful. One managing director noted that before the establishment of the firm's CVC unit, all key decision makers presented the concept to successful and established players in the IVC industry. However, the object of comparison is crucial to the adoption of isomorphic tendencies. While mimetic processes within the startup ecosystem can push a CVC unit toward an exoisomorphic profile, the learning from other corporate units (i.e., the M&A function) will contribute to enhancing an endoisomorphism profile.

Proposition 3: The existence (absence) of mimetic processes is positively related to exoisomorphic (endoisomorphic) tendencies.

Besides formal barriers such as regulations or written operating procedures (Burns & Stalker, 1961) there are also informal barriers or drivers that influence the isomorphic tendencies of CVCs. Teppo and Wüstenhagen (2009) already discussed the importance of an entrepreneurial spirit within the corporate mothers' culture for the success of corporate venturing programs. In this regard, most published literature draws on the five dimensions of the entrepreneurial orientation construct. This construct was also linked to the general performance in large- (Miller & Le Breton-Miller, 2011) and medium-sized companies (Soininen, Martikainen, Puumalainen, & Kyläheiko, 2012). This study's qualitative data, especially that on "not-invented-here syndrome" hinders fruitful cooperation between CVCs and corporate business units. By following their everyday business, employees of the corporate mother primarily need to be "infected" with the startup virus following a change of mindset. All participants in our case studies confirm that the isomorphic tendencies and the general success of the CVC program is associated with the cultural mindset of the corporate mother's staff.

Proposition 4: The existence (absence) of informal influences is positively related with endoisomorphic (exoisomorphic) tendencies.

Being located within the corporate mother's boundaries plays an important role in the isomorphic tendencies of CVCs. Souitaris et al. (2012) note that the presence or absence of formal guidelines and structures influence a CVC's isomorphic profile. Formal structures are a multifaceted topic in the CVC discourse; for instance, the corporate mother's guidelines on remuneration can directly influence the performance of CVCs. Dushnitsky and Shapira (2010) showed that a CVC's compensation scheme is directly related to the performance of its funds. Providing an IVC-like incentive scheme prompts performance improvement and also stimulates IVC-like behavior among the investment managers. Providing an incentive scheme based on the corporate mother's regulations is risky for CVCs as such regulations might incorporate fixed salary scales, leading to the CVC recruiting a high ratio of internal staff, who might favor corporate standards over the IVC working model (Dokko & Gaba, 2012). Another aspect concerns the general influence of the corporate mother through the implemented investment committee. As Teppo and Wüstenhagen (2009) and Souitaris and Zerbinati (2014) note, the investment committee and the compensation scheme play important roles. Investment committees with a high proportion of corporate managers may risk endoisomorphic tendencies due to a lack of experience with the startup ecosystem. The importance of the investment committee was also confirmed by our interviewees. Moreover, some managing directors also struggle with the corporate guidelines on the financial remuneration of hired managers, because for them, the salary is crucial to establish an IVC-like working environment. Accordingly, stringent restrictions hinder the CVC moving toward the startup ecosystem. However, within our sample there was also one CVC providing a carried interest system, which can be interpreted as an exoisomorphic signal.

Proposition 5: The existence (absences) of formal structures is positively related to endoisomorphic (exoisomorphic) tendencies.

6.6 Discussion

This section adopts a mixed-method approach to shed light on the isomorphic tendencies of CVCs. In a first step, we proposed and developed a unique method of measurement that takes organizational written excerpts into account. As mentioned above, a text analysis offers several advantages when investigating constructs that are difficult to measure (Short et al., 2010). By creating a unique sample of US-based CVCs we were able to track the isomorphic tendencies of 22 investment vehicles over 11 years of operation (2000–

2010). Based on the Jaccard index which measures the overlap between the organizational written mission statements of the corporate mother and the corresponding CVC unit, we were able to identify three groups of isomorphic profiles. One group, depicted in Figure 14, showed a clear tendency to follow the corporate mother (i.e., endoisomorphism), whereas the second group (examples presented in Figure 15) seeks legitimacy through the startup ecosystem (i.e., exoisomorphism). Beyond that, we also found CVC units with a relatively stable profile of isomorphism over time. Interestingly (and as can be observed from the plots in Figure 14 and Figure 15), the group converging toward the corporate mother achieves high levels of endoisomorphism by adjusting the positioning at one point in time, whereas CVCs with an exoisomorphic profile seem to separate themselves from the corporate mother in small incremental steps. This could point to endoisomorphic tendencies that might be due to a top-down decision by a corporate mother adjusting its strategy for its CVC unit, and exoisomorphism tendencies that might result from a CVC unit that continuously strives for independence from the corporate mother, but which is reluctant to flag those endeavors and therefore opts for an incremental approach to achieving its goal. It should be noted, that we draw on the work of Souitaris et al. (2012) in developing the measurement of isomorphic tendencies. In doing so, we assume that endoisomorphic and exoisomorphic tendencies are two poles of a continuum. Accordingly, a high level of endoisomorphism (exoisomorphism) is associated with a low level of exoisomorphism (endoisomorphism). We do acknowledge, however, that presenting the relationship as such might be to oversimplify the concept of isomorphism, and that a CVC unit's organizational DNA can be more complex, owing to a multifaceted isomorphic profile.

To explore the driving forces of isomorphism over time, we interviewed experts from the German CVC market and found that isomorphic tendencies are mainly based on mimetic processes. All interviewees pointed out that learning from other CVCs, startups, and IVCs plays a crucial role in their everyday business. One managing director particularly highlighted the value of making comparisons with IVCs and defunct CVC funds as sources of information to influence structuring the activities of the CVC unit. However, as mentioned above, the third group of CVCs with no clear tendencies toward a particular environment indicates that there are also drivers that contribute to the status quo. The conducted interviews reveal that there are decisions that are not easily overturned and therefore it can be challenging to determine the isomorphic tendencies from the beginning. Decisions on the governance structure and the planned program duration are worth mentioning in this regard. Furthermore,

we also found drivers of isomorphism that are routed in the raison d'être, the informal and formal influences from the corporate mother. As Souitaris et al. (2012) report, some of the addressed drivers are easy to influence and therefore offer decision makers the option to adjust and regulate the degree of isomorphism. For instance, our interview data supported the findings of Dokko and Gaba (2012) and Gaba and Dokko (2016) that the staff of a CVC unit shapes its structures and investment behavior. Furthermore, we found widely accepted consensus in our case studies that the salary of the investment manager poses challenges. There is a thin line between offering a remuneration package that fits with the corporate mother's scales, while simultaneously being attractive enough to hire the right people with experience in the IVC industry. This research thus bridges the gap between isomorphism and studies with a focus on CVC managers' salaries (Hill et al., 2009; Dushnitsky & Shapira, 2010; Yang, 2012). We also found that the prevalent entrepreneurial culture can influence not only the survival rate of the CVC, as mentioned by Teppo and Wüstenhagen (2009), but also its isomorphic tendencies. Several statements mentioned the poor relationship between a corporate mother's business unit and the CVC vehicles. Often CVC managers are faced with the "not-invented-here syndrome" or the general lack of motivation to participate in a startup cooperation. Finally, some of our interviewees reported being forced into endoisomorphic behavior owing to the complexity of the startup ecosystem. It is not only the absence of a track record that impels a CVC unit toward alignment with the corporate mother, but also the fact that regular business units manage key functions such as conducting due diligence, ensuring conformity with legal requirements, and sourcing. In one case, the above scenario led to the managing director of a CVC being responsible in personal union also for the Corporate Development unit of the corporate mother.

The results of this study show that isomorphism should be discussed in a broader context, particularly due to its variances over time. Future researchers should therefore take external influences into account that may temporarily push a CVC in one direction. Our proposed way of measuring isomorphic tendencies also offers a basis from which to holistically observe the influence of isomorphism on performance, a relationship that is also noted to be important by Souitaris et al. (2012). We also call for future research that takes isomorphic tendencies into account, when discussing other aspects of CVCs. By constructing a holistic framework, the tendencies toward one organizational setting can situate published insights in a broader theoretical context. The influence of isomorphism is not limited to the relationships of CVC units but also affects other organizational settings where companies are confronted with two different environments, such as joint ventures or spin-offs.

6.7 Conclusion

Through its use of a mixed-method approach, this section provides unique insights into the ongoing discussion of isomorphic tendencies in the CVC context. Consequently, we showed that CVCs tend to seek alignment either with their corporate parent or with the startup ecosystem. The tendency to favor one or the other is not only driven by initial decisions made during the starting phase of a CVC unit, but also by mimetic processes occurring in the lifespan of such vehicles. To disentangle the tendencies of 22 US-based CVCs, we introduced a unique measure based on the Jaccard index, a textual-based measurement that compares the overlaps of two written organizational excerpts. The results indicate that there are three groups of CVCs with isomorphic profiles that vary over time. Besides endoisomorphic (i.e., alignment with the corporate mother) and exoisomorphic (i.e., alignment with the startup ecosystem) tendencies we also found investment vehicles that adhere to the status quo. To extend the work of Souitaris et al. (2012), we also conducted interviews with prestigious CVC units from Germany, exploring additional drivers that influence a CVC's decision to favor one organizational setting, and found evidence that mimetic processes, path dependency, and formal and informal influences are all drivers of isomorphism over time. The current research therefore extends the work on isomorphism in the CVC context by establishing a measure that is not limited to the field of CVC but is also a potentially useful instrument to stimulate the debate in other related contexts.

7 Discussion of results and avenues for future research

After presenting the dissertation's underlying studies, this section seeks to summarize their main contributions and combine those with potential avenues for future research. The theoretical contributions are reviewed as follows: Section 7.1 discusses the influence for the CVC research field as such, while Section 7.2 focuses on the motivational aspects within the CVC dyad. Section 7.3 elaborates on the findings in the context of the concept of isomorphism. Section 7.4 closes the dissertation.

7.1 The CVC research front per se

The articles discussed in this dissertation contribute to the ongoing debate in multiple ways. Accordingly, the structured literature review (Section 2) provides a solid foundation for this dissertation but also serves as an initial reference point for guidance on the status quo. Based on a set of 65 empirical articles the study contributes to the literature by visualizing document-based networks and the identification of contentual topics. The study also reveals several under-researched topics and shortcomings worthy of consideration. In this vein, this dissertation goes beyond the identified shortcomings by using various statistical research methods (e.g., CATA, HLM, Zelner plots), unique data samples, and a strong focus on transparency with respect to data-cleaning procedures. Following the call for more academic rigor with regard to the underlying definitions and the handling of data, my co-authors and I introduced a date-driven procedure to identify CVC investors from among the records of commercial data providers, namely *Thomson* and *Dow Jones*. The proposed procedure draws on four extensive data samples, ranging from 2000 to 2015, and provides the researcher with arguments to support decisions on the time-frame chosen and the definition of a CVC unit. It should be mentioned that only a minority of authors consider the cyclical nature of CVC activities (e.g., Gompers & Lerner, 2000) when describing their underlying sample period. By proposing the data-cleaning procedure for *Eikon* and *VentureSource*, the study contributes in several ways to resolving a widely overlooked issue (Lerner 1994, 1995; Kaplan et al., 2002; Maats et al., 2011) related to databases: First, a common definition can increase the comparability, quality, and replicability of future and previously-published results. Second, the study stimulates the awareness of the need for greater transparency regarding definitional and data-cleaning aspects for both authors and reviewers. Third, the coverage of 16 consecutive years means we can provide a valid decision-making criterion for the selection of

a specific database and time-frame. However, as mentioned in Section 2, the bias toward US-based samples remains an issue within the CVC literature. Due to the fact that Europe is highly diverse in terms of cultural aspects (e.g., language) this dissertation also draws its analysis on samples from US industry. I am well aware of this limitation and hope future scholars enrich the debate with insights from Europe and other geographical contexts.

7.2 Motivation in a CVC dyad

As outlined in the dissertation's introduction, two studies use text analysis to consider motivational questions within the CVC dyad. While Section 3 focuses on the investment motivation of CVCs, Section 4 emphasizes the concept of E/E from corporate mothers. It is important to note, that both studies examine the motivational influences at various levels. While the concept of E/E is used to observe the underlying orientation of a corporate mother, the results presented in Section 3 illustrate how CVCs interpret their corporate mission. In this regard, prior research used to explain the relationship between a CVC's motivation and the creation of corporate value (Dushnitsky & Lenox 2006) by drawing solely on an either-or approach of financial or strategic motivation, thus overlooking possible interactions. This study extends the findings of existing publications (e.g., Ernst et al., 2005; Dushnitsky & Lenox, 2006; Battistini, Hacklin, & Baschera, 2013) in that it uses a unique dataset in combination with CATA, cluster analysis, and HLM to shed light on the motivational aspects of CVCs and their impact on a startup's valuation. The study finds that the motivation of CVCs can be categorized in four distinct forms: mostly strategic, mostly financial, analytical, and unfocused. Furthermore, the identification of different motivational types influences the assigned startup valuations and thereby enriches the startup valuation literature in general (e.g., Köhn, 2018) and the findings of Heughebaert and Manigart (2012) in particular. The study shows that strategic (unfocused) motivated CVCs attract lower (higher) valuations than analytically-oriented ones. By introducing CATA to measure a CVC's motivation based on written organizational mission statements we also provided a new way to measure organizational constructs without using surveys. This is important because the VC industry has proved reluctant to engage with survey data collection methods (e.g., Maula et al., 2003; Kuckertz et al., 2015). Another motivation-based research issue addressed in this dissertation was that of disentangling the relationship between a corporation's degree of E/E and the likelihood of acquiring a startup previously funded through the corporation's CVC unit. This study therefore contributes to several research streams simultaneously, including

entrepreneurial exits (e.g., Andersson & Xiao, 2016), acquisitions of prior CVC-backed startups (Dimitrova, 2015), the use of multiple ECV instruments (e.g., Van de Vrande et al., 2011), and the E/E literature (e.g., Hill & Birkinshaw, 2008; Sirén et al., 2012).

To capture the extent of E/E among corporate mothers, my co-authors and I once again draw on text analysis and a unique data sample comprising US-based CVC transactions. Having developed theory-driven hypotheses, we calculated several regressions to show how the degree of E/E influences the probability of a CVC acquisition and what moderating effects arise when taking the product market relatedness between corporate mother and the startups into account. The study complements the view of Titus et al. (2015) and contributes to the literature dealing with the importance of overlapping resources in the CVC triad (e.g., Dushnitsky & Lenox, 2005b; Schildt et al., 2005; Dushnitsky & Shaver, 2009; Van de Vrande et al., 2011; Smith & Shah, 2013). Ultimately, by answering the call of King et al. (2000) and Hoetker (2007) we promote a graphical depiction of the interaction effects in non-linear models, based on the simulation approach of Zelner (2009).

7.3 Isomorphism

Finally, this dissertation also captures the concept of isomorphism. As mentioned in Section 6, there is evidence of isomorphic processes gathered from corporations acting in different environments (Marquis & Lounsbury, 2007). By examining isomorphism in the CVC context, Souitaris et al. (2012) proved that the CVC setting provides optimal conditions for further investigation. The study presented in Section 6 answers the question of if and why isomorphic tendencies of CVC units vary over time. In doing so, we proposed a text-based measure of the overlap between a CVC unit and the corresponding corporate mother. The Jaccard index helps investigate isomorphic tendencies not only in the CVC context but also in other research settings. However, the proposed measurement still cannot answer the question of whether a CVC with a low level of endoisomorphism will automatically have a high level of exoisomorphism and vice versa. Therefore, the second part of the study contributes to the work of Souitaris et al. (2012) by revealing several drivers that influence isomorphic tendencies over time.

7.4 Conclusion

In conclusion, this dissertation sheds light on several aspects of the CVC phenomenon by drawing on a wealth of statistical methods. Besides the motivational aspects of CVCs, this dissertation also focuses on the development of the research field as such, by developing a data-driven cleaning procedure to identify CVC investors from among the records of the two most powerful data providers. By also highlighting shortcomings and under-researched topics as well as introducing a new form of measurement, this dissertation can play an important role in the further development of the research front.

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